

Generative Commons in Aid and Volunteer Infrastructures: Contribution Provenance, Value Circulation, and Institutional Governance

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Abstract

This preliminary study proposes a research framework for generative commons in aid- and volunteer-related knowledge infrastructures. Its object is the institutional organization of contribution provenance, governed reuse, recognition, and possible value-return pathways across heterogeneous actors, resources, and timescales. Drawing explicitly on existing commons scholarship, peer-production theory, generative justice, and established provenance and contributor standards, the manuscript distinguishes contribution events from their evidentiary records; permission to reuse from public accessibility; scholarly or social recognition from legally established entitlements; and value creation from the eventual availability of benefit to a participant or community. A bounded Generative Relational (GR) interpretation studies the possible coordination or disruption of these operations while preserving ontological suspension, relational reality, and manifestation reality as distinct analytical levels. The paper outlines an institutional, comparative, and ethical research programme, with particular attention to confidentiality, asymmetric power, heterogeneous value, missing historical evidence, possible network spillovers in evaluation, and rival explanations. The proposal does not imply that any particular institution has adopted the model or that the proposed mechanisms have been empirically validated.

Keywords: knowledge commons; contribution provenance; value return; aid and volunteering; institutional governance

Notices

Status. Braid–Justice Series proposed extension Paper XVII, typeset release candidate R17. The fifteen-section manuscript has undergone integrated editorial review, a complete XeLaTeX–BibTeX build, and page-level technical layout inspection; independent specialist, legal, and empirical review remain outstanding. This is a preliminary independent theoretical paper, not an institutional policy, empirical finding, legal opinion, or operating manual. The previously agreed series queue ended at Paper XVI.

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Statement on the use of language models. OpenAI’s ChatGPT assisted with literature discovery, scholarly drafting, and LaTeX preparation. The author retains responsibility for argument, permissions, factual validation, and subsequent revisions. The verification ledger records initial source checks and their limits.

1 Introduction

This paper investigates the institutional conditions through which contributions to aid- and volunteer-related research infrastructures can become reusable common resources while remaining traceable to their generators and responsive to the interests of affected participants. Its analytical object is a *generative commons*: a historically constituted arrangement in which participants jointly sustain resources, rules, and pathways for the production, recognition, governed reuse, and possible return of heterogeneous value. The term is used here as a provisional research construct, not as the name of a recognized legal entity or a universal institutional form. The inquiry asks how a contribution that is locally modest—a document, a method, a translation, a classification, an educational aid, a piece of software, or the experience needed to interpret a difficult practice—may become significant through later use in a different disciplinary or organizational setting. It also asks what institutional obligations and choices arise when that downstream significance becomes visible only after the original contributor has ceased to participate. The paper develops conceptual distinctions, governance questions, and a comparative research programme. Its proposed Generative Relational (GR) interpretation remains open to empirical rejection and revision.

The research object arises from a recurrent institutional separation between the production of contributions and the later circumstances in which those contributions acquire significance. A volunteer may assemble an orientation document that becomes useful to a student, a coordinator, or an outside researcher months later. A researcher may publish a procedure that another team modifies and integrates into a service. A community participant may identify a problem that professionals subsequently transform into a research question. A staff member may maintain a glossary, dataset description, or local knowledge record that enables an unforeseen collaboration. The contributions differ in ownership, sensitivity, expected reciprocity, quality, expertise, and institutional authorization. Their downstream forms may also differ: improved public understanding, stronger research methods, easier access to an institution, professional recognition, saved time, material returns, or the prevention of harm. The same artifact may support several of these outcomes, and the people who supplied indispensable contextual knowledge may be absent from the final publication or operational record. These examples describe possible configurations for analysis, rather than documented findings about a particular organization.

Existing scholarship provides indispensable antecedents. Ostrom’s institutional analyses establish that resource governance deserves examination through concrete arrangements, rules, monitoring practices, and conditions of collective action; the findings concerning natural common-pool resources do not automatically transfer to informational or care-related settings [47]. Hess and Ostrom’s account of knowledge commons extends the resource-governance inquiry to socially shared information and its institutions [27]. The knowledge commons framework elaborated by Frischmann, Madison, and Strandburg provides an established methodological basis for studying governed knowledge production without presuming that openness alone determines institutional success [21]. Benkler’s analysis of peer production similarly helps situate cooperation outside a simple binary between markets and firms [3]. The present study draws on this intellectual history; it does not claim to discover collective knowledge governance or networked voluntary production.

The idea of value return has a further and importantly distinct provenance. Eglash and collaborators examine *generative justice* through the circulation of value in ecological, labor, and social relations, emphasizing capacities for generators and communities to participate in the benefits of their activity [17]. The present paper neither redefines this existing programme as a GR invention nor assumes that aid organizations already realize its ideals. Its proposed contribution concerns a narrower interface problem: the connection between contribution provenance, permission to reuse, forms of recognition, future value pathways, and the distribution of institutional power over those connections. A contribution may be recorded accurately without being lawfully reusable; may be lawfully reusable without receiving adequate recognition; may be credited without enabling a meaningful return of capacity or opportunity; and may generate benefits whose recipients appropriately remain different from the original contributors. These distinctions support a specific research agenda concerning the conditions under which a commons can sustain generativity while avoiding avoidable exclusion or extractive appropriation.

For this inquiry, *contribution* denotes a situated act or set of acts through which a participant changes the feasible resources, interpretations, capacities, or practices available within a relevant relation. The analytical definition includes material, intellectual, organizational, interpretive, and maintenance work, without assuming that each contribution is copyrightable, individually attributable, or desired by the purported contributor. A *resource* is an identified object or capacity made available within a defined institutional arrangement, such as an instructional document, documented workflow, trained skill, accessible dataset, evaluation method, communication channel, or trusted connection. A *commons* is an arrangement governing some shared resources through actual rules and stewardship relations; shared accessibility alone is insufficient to establish the proposed arrangement. A *return pathway* is an institutionally intelligible possibility by which benefits, recognition, resources, capabilities, or decision influence may become available to contributors or relevant communities. The presence of a possible pathway does not guarantee that benefits will arise or that a particular person is legally entitled to receive them. The definition is designed to distinguish a prospective generative mechanism from a distributive promise.

A key conceptual requirement is to separate *the fact of contribution*, *the evidence used to recognize it*, and *the normative incidents that may follow from it*. A contribution may occur without leaving a legible written record, especially when it consists of tacit knowledge, relational labor, care, maintenance, or a critical correction. A database entry may describe an event while mistakenly omitting its source or exaggerating an individual's role. Even a perfectly accurate historical record would not itself create copyright ownership, authorship status, employment rights, informed consent, or a claim to profits. Such positions arise, if at all, from additional applicable law, agreement, institutional norms, or ethically defensible governance arrangements. Analytical precision requires examining these dimensions separately before investigating their possible coordination.

The practical literature on provenance supplies technical resources without settling the normative questions. The World Wide Web Consortium's PROV-O Recommendation provides an ontology for representing entities, activities, agents, and their provenance relations across information systems [64]. The ANSI/NISO CRediT standard supplies fourteen contributor roles intended to increase transparency concerning scholarly outputs [42]. These tools can support descriptive records, but a provenance assertion requires evidentiary validation and a role label is not itself a legal authorship adjudication. The FAIR Guiding Principles emphasize findability, accessibility, interoperability, and reusability in research data stewardship [66]. Each principle depends on lawful and appropriate conditions of use; accessibility within FAIR does not require unlimited publication of personal or sensitive records. The CARE Principles for Indigenous Data Governance give particular attention to collective benefit, authority to control, responsibility, and ethics within Indigenous data contexts [5]. Their distinctive political and historical rationale must be preserved when drawing lessons about authority and collective benefit in other settings. These antecedents make a design question more exact: which institutional fields, review procedures, correction paths, and disclosure restrictions are needed for a contribution record to be useful without converting visibility into an obligation to expose information?

An equally important distinction concerns intellectual-property licences. Permission to copy, adapt, and distribute a resource can be granted under a specific licence where the licensor possesses the relevant rights. For example, the Creative Commons Attribution 4.0 International licence specifies conditions on sharing licensed material, including specified creator identification, modification indication, and preservation of licence information when applicable [13]. Such conditions depend on the licence actually attached to the material and cannot be presumed for all commons resources. A contribution record identifying a person as a translator or methodological reviewer may serve a different function from an attribution notice legally required by a licence. Data protection, duties of confidentiality, third-party contractual restrictions, institutional approvals, security concerns, and the expectations of affected people further constrain appropriate reuse. The proposed generative commons must therefore distinguish permission, attribution, recognition, control, and disclosure. It would be a category error to claim that an open licence permits the unrestricted release of patient information, confidential humanitarian observations, or another person's private account.

The proposed domain of application is *aid- and volunteer-related research infrastructure*, conceived

broadly enough to include collaborative educational methods, administrative knowledge, ethically authorized research resources, cross-disciplinary interpretation, and documentation developed in connection with activities of assistance. The framework does not presuppose that a university hospital, humanitarian agency, volunteer group, or civil-society organization should adopt a single governance template. Some institutions possess close connections to research and education, while others depend mainly on local professional knowledge and community relationships. Institutional capacities, participant vulnerability, resource security, and legal mandate all affect which forms of sharing are appropriate. In sensitive environments the most valuable shared object may be a carefully abstracted method or a governed description of a workflow rather than the underlying individual-level data. A collective benefit can sometimes be generated by maintaining a boundary, as when confidentiality makes it possible for vulnerable participants to communicate safely with a trusted practitioner.

The relationship among participating disciplines presents a further governance challenge. Researchers, students, clinicians, social workers, legal scholars, archivists, volunteers, and affected communities may recognize different things as valuable. An anonymized methodological account may be useful to a statistician, while an operational explanation is useful to a coordinator and a language-access improvement is valuable to service recipients. The institution may act as an intermediary that brings these resources into possible relation, yet it need not prescribe a single metric by which the contributions of distinct domains are ranked. The relevant analytical question is whether the institutional arrangement enlarges feasible and ethically permissible opportunities for participants to develop their own work, respond to others, and obtain recognition or benefits appropriate to the contribution and context. This question calls for plural indicators, attention to power, and the ability to record outcomes that resist monetary aggregation.

Value circulation also has a temporal structure. A dataset dictionary contributed during one project may not be reused until after the project concludes. A protocol may travel through several adaptations, each performed by a different participant under different authorizations. A negative result may prevent duplication and thereby become valuable precisely because an anticipated product never materializes. Recognition may emerge late or be revised when a forgotten contributor supplies missing evidence. A shared resource can generate new capacities without generating a transferable artifact or financial income. These possibilities give the proposed historical analysis its object: contributions, artifacts, rules, and subsequent interpretations can be connected through traceable events while leaving some relations uncertain, disputed, or inaccessible. The paper's reference to *circulation* therefore denotes a family of historically realized or possible transformations. It does not imply that value behaves according to a physically conserved quantity or that longer chains necessarily yield greater justice.

The braid-theoretic research developed elsewhere in the series supplies a limited descriptive resource for such historical processes. Within a declared strand-identification regime, selected trajectories of contributors, artifacts, permissions, institutions, and transformations may be represented using comparative trajectory descriptors. The resulting representation is always relative to choices about what constitutes a strand, which events are observed, how uncertainty is registered, and which mathematical distinctions remain stable under admissible reconstruction. Nothing in the present research requires a braid group to possess an intrinsic ethical meaning. A trajectory may retain a chosen descriptor while its normative significance changes; conversely, a significant ethical change may lack a distinctive braid-theoretic signature at the selected resolution. Historical reconstruction, institutional explanation, and normative judgment must therefore be performed as related but separate operations. The proposed commons analysis can proceed through archival and institutional methods even where braid modeling is inappropriate.

For the GR interpretation, the paper maintains three levels of reality. At the *ontological* level, the ultimate metaphysical status of subjects, capacities, values, and relational processes is suspended. Institutional actors are not asserted to be reducible to mathematical trajectories, and the ontology of value is not established by the availability of a formal model. At the level of *relational reality*, the analysis considers historically constituted arrangements whose sufficiently stable relationships, rules, and resource dependencies are candidates for causal or generative explanation. A contributor-recognition mechanism, a licensing condition, or a trusted translation practice may alter subsequent opportunities through its inter-

actions with other mechanisms. At the level of *manifestation reality*, the analyst studies records, artefacts, agreements, interviews, observed uses, published acknowledgements, metadata, and participant reports through which those relational arrangements become partially accessible and interpreted. The distinction prevents a public attribution label from being equated with the entire history of contribution, or an unrecorded participant from being assumed to have made no contribution.

The transition between levels is a research problem rather than an automatic inference. An interview reporting that a volunteer's method was used in a later project may be evidence of perceived influence, but its strength depends on recollection, alternative sources, contemporaneous records, access to the original method, and the possibility of independent development. Provenance metadata may increase traceability without capturing the reasons an institution privileged one contribution over another. A contributor's acknowledgement may be sincere yet fail to provide control over further use; a resource may generate public benefits even where individual recognition is ethically constrained by anonymity. The proposed framework thus keeps distinct the historical event, its manifestation in evidence, the institutionally recognized description, and the applicable claims or duties. Causal arguments require a declared evidentiary regime and plausible comparisons to ordinary institutional, technical, legal, and organizational explanations.

The phrase *non-extractive return* requires further care. In this paper it is a proposed ethical design objective: an arrangement should be evaluated in part by whether it enables value generators and affected communities to maintain meaningful capacities, receive appropriate recognition, and participate in decisions concerning consequential uses where a defensible basis for such participation exists. This objective has conceptual affinities with the established generative justice literature [17], while its application to governed documentation infrastructures remains a hypothesis for institutional evaluation. Non-extraction is not defined by payment alone, nor does every use of a public resource generate a compensatory obligation to all earlier participants. A volunteer may intentionally contribute to an unrestricted public resource; a scholar may prefer citation over remuneration; a patient may prioritize privacy over recognition; a community may require limits on third-party use; and an institution may owe a duty to allocate scarce capacity toward beneficiaries rather than toward provenance display. Ethical appraisal must therefore identify which affected positions matter, what was authorized, which resources are scarce, and which losses or benefits are plausibly attributable to the governance arrangement.

There is a related risk of administrative inflation. Recording every small interaction at maximal granularity would impose costs on contributors, generate false precision, and potentially displace the work the commons was established to support. Central registries may make contributions more visible while increasing the discretion of registry administrators, curators, funders, and evaluators. Citation and metadata practices can privilege actors with linguistic, technical, academic, or institutional advantages. An apparently neutral reputation or contribution score can create pressures to disclose personal information, exaggerate contributions, or divide collaborative work into strategically credited fragments. An arrangement that formally promises future benefits may also create expectations it lacks the capacity to satisfy. The present research therefore treats provenance completeness, recognition accuracy, documentation cost, confidentiality, and governance contestability as potentially conflicting objectives rather than as quantities that can simply be maximized together.

Table 1 distinguishes the operations that the rest of the study will investigate. The table is intended as an analytical guide for constructing institution-specific records, not as a universal allocation of legal rights or a requirement that all projects adopt identical databases.

The six operations in Table 1 can occur in different sequences. A decision about permission may precede the documentation of a resource, and a dispute over attribution may arise only after a downstream use becomes visible. Some institutions may have strong rules for access but few durable records of contributions. Others may have detailed metadata without a fair process for contesting inaccurate credit. There may be legitimate reasons to leave a contribution anonymous or to delay publication of a method. These observations motivate an institutional rather than merely technical conception of the commons. The design of an identifiable record is useful only insofar as it serves the governed relationships of participation, care, research, and responsibility.

Table 1: Distinct governance operations in a proposed generative commons for assistance-related research.

Governance operation	Primary research question	Potential limit or failure mode
Contribution identification	Which events, actors, and resources warrant a recorded relation?	Omitted tacit work, false attribution, surveillance burden
Historical provenance	Which transformations and dependencies can be evidenced over time?	Ambiguous causation, incomplete records, contested origins
Permission and access	Who may obtain, adapt, or redistribute which resources and under what conditions?	Licensing ambiguity, confidentiality breaches, mandate confusion
Attribution and recognition	Which scholarly, organizational, or social forms of credit are appropriate?	Role inflation, unequal visibility, conflation with legal authorship
Value creation and conversion	Which heterogeneous capacities or outcomes become possible through reuse?	Unsupported causal claims, imposed commensurability, hidden costs
Return and institutional revision	Which benefits, safeguards, and decision opportunities may circulate back, and how are disputes corrected?	Unsupported entitlements, capture, nonreturn, weak contestability

A possible explanatory claim concerns *cross-interface return attrition*. Under specified conditions, an institution may preserve contributions at the documentation interface, permit downstream reuse at the licensing interface, and nevertheless lose the ability to connect later outcomes to an accountable recognition or benefit-return process. The term denotes an investigable disconnection among distinct operations, not a presumed universal obligation to pay or credit each upstream actor. The empirically relevant contrast is between otherwise comparable arrangements with demonstrably different continuity across those operations, while accounting for record completeness, staffing, and external spillovers. This proposed mechanism remains unestablished. Similar observations may arise from ordinary data incompleteness, independent reinvention, legitimately anonymous work, changes in contributor preferences, restricted budgets, weak management, or existing scholarly and professional norms. The distinctive claim, if borne out, would require showing that particular discontinuities among governance operations explain differences in recognition, participation, or generative opportunity beyond the explanatory power of those rival accounts. The research will seek negative cases in which simple local practices achieve satisfactory outcomes, as well as cases in which elaborate provenance systems intensify power asymmetries rather than reduce them.

The paper also distinguishes design feasibility from collective legitimacy. A shared repository may be inexpensive to establish, and a licence can sometimes be attached through a short administrative procedure. Neither fact answers whether affected persons had adequate participation in the rules governing their contributions, whether the resources were acquired under appropriate conditions, or whether downstream beneficiaries face new risks. Governance questions arise from the plurality of institutional roles: contributor, subject of documentation, steward, user, beneficiary, funder, professional, volunteer, regulator, and potential claimant. These roles can overlap, diverge, or change through time. Someone may contribute a useful document while being exposed to a risk that others do not bear. Someone receiving services may possess rights that remain independent of the preferences of contributing volunteers. An organization may hold contractual responsibilities even when the creators of a shared method work outside its employment relationships. The relevant duties and competences require source-specific legal and organizational examination.

Humanitarian and care-related settings sharpen these distinctions without exhausting the scope of the theory. Questions about relief access, professional responsibility, participation of affected people, secure handling of health information, and conflict-sensitive research have independent legal and ethical foundations. An analytical commons can include restricted collections, protected access channels, anonymized educational derivatives, and relationships based on controlled or revocable participation where applicable; a commons need not be a public dump of sensitive data. In contexts of heightened vulnerability, the appropriate value return may consist in better service quality, protection from unwanted

reuse, translation access, or meaningful participation in institutional decisions rather than a published acknowledgement. A research programme that cannot distinguish the subject of care from the contributor to research risks using the language of reciprocity to obscure existing protective obligations.

Methodologically, the paper combines conceptual analysis, institutional comparison, provenance-oriented historical reconstruction, and a proposed empirical programme. Its observational unit can be a documented contribution event, an ethically governed artifact, a permission change, a recognition decision, a downstream adaptation, or an institutional revision. Prospective studies could compare arrangements with similar resources but different consent procedures, metadata practices, dispute mechanisms, or return pathways. Retrospective studies could follow traceable records while marking unobserved relations and attribution uncertainty. Interviews, governance texts, repository metadata, programme records, and longitudinal observations would need to be handled through independent ethics review and the rules applicable to each context. Indicators might include provenance correction latency, participant comprehension of reuse conditions, rates of contested credit, accessibility of non-sensitive derivatives, and evidence of new capabilities. These are candidate indicators; no empirical dataset has yet been assembled for the present manuscript.

The normative inquiry is similarly bounded. Institutional rules may offer legitimate reasons to prioritize safety, confidentiality, professional oversight, community authority, or operational continuity over maximal reuse. Attribution duties arising under licences should be distinguished from disciplinary authorship conventions, employee or volunteer agreements, research ethics, and the still more demanding justification of a distributive or decision-making entitlement. The framework should remain capable of recording conflicting reasons and partial compromises. In some cases, widespread free reuse may be beneficial even when contributor return is weak; in others, restricted control may be essential to the continuing generativity of the participating community. Neither a high reuse count nor a high degree of access control can function as an unconditional measure of justice.

The study is organized around these distinctions. Section 2 addresses the resources and institutions that make assistance-related research commons possible. Section 3 investigates the evidence of contribution and historical provenance; Section 4 examines permissions and access constraints; and Section 5 separates attribution, recognition, and authorship. Sections 6 and 7 consider heterogeneous value, conversion, circulation, return pathways, and institutional memory. Sections 8 and 9 address power, participation, vulnerability, and the boundaries among volunteer, professional, and research relationships. Sections 10 and 11 develop governance and technical infrastructure. Sections 12 and 13 propose comparative cases and a falsifiable empirical evaluation programme. Section 14 examines adverse cases, research ethics, and the limits of the GR interpretation, followed by a conclusion in Section 15. Together these parts aim to clarify the institutional conditions under which contributions may support enduring shared generativity, while preserving the rights, plural values, and contextual limits through which a legitimate commons becomes possible.

2 Institutional Commons and Assistance-Related Research Resources

This section specifies the institutional object to which a generative-commons analysis may be applied. Its purpose is to distinguish the resources jointly governed in an assistance-related research commons from the events that generate them, the professional or humanitarian activities that surround them, and the rules through which participation and reuse become possible. The discussion first identifies resource and institutional boundaries, then examines membership, stewardship, rules in use, and the conditions for resource admission, preservation, and withdrawal. It concludes by locating those arrangements within the three reality levels of Generative Relational (GR) analysis and by stating criteria under which a proposed commons can be studied empirically. The mode of inquiry is conceptual and institutionally comparative. Examples involving educational services, universities, hospitals, and humanitarian organizations are constructed configurations, not accounts of adopted policies or verified operational performance.

2.1 Shared Resources and the Boundaries of the Commons

The defining institutional question concerns the scope of the shared arrangement. A research method may be copied freely while the computer system that runs it is controlled by a department; a glossary may be collectively edited while the original observations on which it is based remain confidential; and a training activity may be collaboratively designed while delivery remains subject to professional authorization. The term *commons* accordingly refers here to a governed arrangement surrounding identifiable resources and permitted practices. It does not denote a single repository, a legal person, the public domain, universal access, or undifferentiated common ownership. The existence of a resource available to several people is a potential starting condition for institutional analysis, not sufficient evidence of shared governance.

The knowledge-commons literature provides the relevant baseline. The Governing Knowledge Commons (GKC) framework examines background environments, resources and their attributes, community members, goals, institutional rules, action arenas, and outcomes [21, 67]. That framework is explicitly adapted from institutional analysis associated with Ostrom and is concerned with the concrete arrangements through which groups govern the production and sharing of information, knowledge, and related resources [47, 27]. The present paper takes these clusters as established analytical antecedents. Its more specific proposal is to investigate an interface among four distinguishable conditions: an identifiable history of contribution, governance of resource use, the distribution of opportunities to participate in transformation, and pathways by which heterogeneous benefits might later become available. Whether these interfaces introduce explanatory value over ordinary commons analysis remains an empirical question.

An *assistance-related research resource* is defined provisionally as an artifact, capacity, or organized relation that can support inquiry, learning, interpretation, or improvement relevant to assistance, volunteering, care, education, or humanitarian work. Relevance does not imply transferability, permission to access, or demonstrated benefit. A translation of a published instruction, an evaluation rubric, a reusable code module, a procedure for recording non-sensitive volunteer feedback, and a shared taxonomy can be candidate resources. An individual's clinical record, an identifying narrative about a service recipient, a confidential professional deliberation, or a security-sensitive location may instead belong wholly outside the proposed pool, even if it is useful for research. The category thus concerns potential function, while institutional admission requires an additional authorization and risk assessment.

The distinction between the *resource pool* and its *surrounding resource environment* is important. The pool includes objects and capabilities actually subjected to specified common rules. Its environment includes underlying infrastructure, sources and rights held by third parties, external professional expertise, funding, institutional obligations, and affected persons whose interests shape acceptable use. A hospital-related educational commons, for instance, might govern volunteer training materials and approved methodological documentation while the hospital retains control of care delivery, patient information, facilities, and clinical judgments. A university may contribute disciplinary expertise or students' research capacities while retaining its own research-ethics procedures and employment or intellectual-property arrangements. These boundaries establish distinct domains of authorization; proximity among organizations does not merge their mandates.

The resource is also historically variable. A workflow may begin as a private draft, be reviewed into a controlled training aid, acquire a multilingual version, and eventually become a public educational derivative. Each stage may differ in accuracy, authorship evidence, risk profile, permitted audience, stewardship burden, and prospects for future recombination. Treating every version as the same unqualified resource would conceal these differences. Section 1 distinguishes contribution events from records of them; the present section locates the resources made available through those events within institutional boundaries. Section 3 will examine the historical provenance of versions and transformations in greater detail.

Resource class	Possible research or educational use	Principal stewardship questions
Documented methods and teaching artifacts	Adapted instructions, rubrics, translations, training materials	Source accuracy, adaptation rights, version review
Software and metadata structures	Reusable analysis code, controlled vocabularies, provenance fields	Security, maintainability, dependency and licence checks
Restricted observations and contextual records	Interpretation, evaluation, service learning under authorization	Purpose limitation, confidentiality, reidentification risk
Embodied skills and interpretive competence	Mentoring, contextual explanation, expert review	Time, consent, qualification, fair recognition
Relational and organizational capacities	Trusted referrals, cross-disciplinary coordination, stewardship roles	Mandates, continuity, conflicts of interest, exclusion
Physical and operational infrastructure	Rooms, devices, secure storage, supervised access	Scheduling, maintenance costs, safety and institutional control

Table 2: Candidate resource classes and stewardship questions in assistance-related research commons. Categories identify analytical possibilities, not authorization to share.

2.2 Resource Heterogeneity and Reuse Conditions

Different classes of resource entail different collective-action problems. Digital files are frequently reproducible at low marginal cost, whereas professional attention, secure computing capacity, translation review, and qualified mentorship are time-constrained. Tacit competence may be shared through instruction without becoming fully externalized as a document. Trust can enable the interpretation of a resource and yet be damaged by coercive disclosure or careless attribution. Consequently, the rivalry of a file and the scarcity of the capacities required to use it must be assessed separately. Nor does non-rival digital reproducibility imply that accuracy checking, secure maintenance, or dispute resolution is costless.

Table 2 offers an initial classification for comparative inquiry. Its classes are analytical, potentially overlapping categories; the examples are constructed, and the table is not an inventory of materials held by any particular institution. A single documentation project may rely simultaneously on a publicly licensable text, restricted observations, volunteer experience, skilled review, and an organizational decision authorizing publication.

Two separations follow. First, *discoverability* and *accessibility* are institutionally distinct. A catalogue may disclose that a controlled method or dataset exists while limiting access to a qualified team, or may withhold even descriptive metadata when disclosure itself would threaten privacy or safety. Second, *access* and *authority to transform* need separate decisions. Reading an approved instruction may be permitted without permission to alter its official clinical content; adapting an openly licensed educational derivative may be allowed without authority to present the adaptation as institutional guidance. The FAIR principles provide a research-data stewardship vocabulary for findability and reuse, while their application remains subject to applicable permissions and contextual safeguards [66]. These distinctions should be modeled as properties of governed relations rather than assumed from file format.

The UNESCO Recommendation on Open Science specifies a policy orientation toward access that is as open as possible, with restrictions that are justified and proportionate where human rights, confidentiality, privacy, intellectual property, sensitive knowledge, or other protected interests require them; it also recognizes mediated access under defined criteria [56]. The OECD Recommendation on Enhancing Access to and Sharing of Data likewise addresses the joint promotion of data use and protection of legitimate public and private interests [46]. These are policy recommendations and analytical reference points, not universal licences and not substitutes for the law, consent arrangements, agreements, and in-

stitutional authority applicable in a particular case. In the humanitarian context, the ICRC's *Handbook on Data Protection in Humanitarian Action* places data handling in relation to affected persons' life, dignity, and integrity and discusses sector-specific risk management [38]. It supports a cautionary baseline for design, without establishing that every institution follows a single identical processing regime.

2.3 Relational Actors, Membership, and Affected Outsiders

The constituency of a commons depends on which decisions are made jointly and whose interests are affected. For analytical purposes, *participation* is any institutionally recognized involvement in the creation, interpretation, maintenance, governance, or authorized use of a pooled resource. *Membership* is a more specific status defined by applicable rules, and membership need not be universal or binary. A volunteer translator may have authority to correct a glossary but lack the competence to approve medical advice. A technical maintainer may decide how an identifier is stored while having no authority to disclose the source material it describes. A student may use approved teaching materials while having no power to grant broader licensing rights. A service recipient may be affected by a research record without joining the research commons and without losing any existing independent protections.

At least five positions warrant separate identification: contributor, resource steward, authorized user, decision-maker, and affected nonmember. These positions describe functions, may overlap in one person, and can change over time. Further relations may include a rights holder, funder, professional supervisor, researcher, data controller or processor where relevant law uses those categories, and representative of a participating community. The relevant normative incidents remain differentiated. Contribution alone does not confer institutional office; membership does not independently establish copyright or access to confidential files; and formal exclusion from a commons does not extinguish applicable rights or protections held by affected outsiders.

A particularly difficult case arises where the person who contributes valuable knowledge is simultaneously dependent on the institution. For example, an aid recipient may explain that a translated form is incomprehensible or that a registration practice causes avoidable harm. Such feedback can improve educational or analytical resources while the person remains vulnerable to pressure or retaliation. A governance arrangement should avoid turning dependence on services into implicit consent to research, publication, or long-term reuse. The normative rationale for adequate choice, protection, and contestation comes from relevant research ethics and legal requirements; the proposed commons mechanism merely asks how those protections can be implemented in shared-resource governance. The allocation of authority must be identified by case rather than inferred from the category of contribution.

Relevant groups may also act collectively. A professional association, community organization, volunteer network, or Indigenous nation may have interests and governance structures that cannot be reduced to a list of individual contributors. The CARE Principles arise specifically from Indigenous data-governance traditions and emphasize collective benefit, authority to control, responsibility, and ethics [5]. Their application requires respect for those histories, rights, and authorities. The present paper does not treat CARE as a generic grant of institutional power to unrelated organizations. It draws the narrower methodological lesson that the identity of an affected collective, and its legitimate decision-making process where applicable, cannot always be reconstructed by aggregating individual attribution fields.

The membership question is therefore coupled to the question of *legibility*. Institutions may find formal roles, named authors, and quantifiable deliverables easier to document than informal coordination, emotional labor, translation assistance, or repeated maintenance. An excessively narrow participant record can reproduce inequalities in the distribution of voice and credit. An excessively expansive record can create unwarranted surveillance and disclosure obligations. This tension motivates graduated participation procedures: participants may be able to contribute without publicity; authorized reviewers may verify the contribution privately; and a smaller public record, including an anonymous or collective designation where justified, may be produced only through separate decisions. The effectiveness and burden of such procedures remain to be studied.

2.4 Stewardship, Rules in Use, and Institutional Authority

A shared arrangement becomes governable through determinate decision procedures and actual practice. The GKC framework accordingly examines rules in use, the relevant background environment, actors who make decisions, and their effects on members and outsiders [67]. For a generative commons, *stewardship* means an assigned, reviewable responsibility for maintaining the integrity, availability, interpretability, and appropriately limited use of specified pooled resources. The definition is a proposal for analysis, not a claim that stewardship always constitutes a fiduciary or statutory duty. Its precise obligations depend on the applicable legal, contractual, professional, and organizational setting.

A useful analytical distinction concerns three loci of decision. *Constitutive decisions* establish the pool's purpose, scope, admission criteria, bodies, and mechanisms for changing the rules. *Collective governance decisions* set or revise procedures for review, access, use, retention, correction, dispute handling, and allocation of maintenance burdens. *Operational decisions* evaluate particular resource submissions, permissions, requests, corrections, and incidents. These categories are offered as a practical institutional decomposition informed by commons analysis rather than as purported universal tiers of law. A small voluntary arrangement may combine several functions in one steward, while a larger interorganizational project may allocate them across committees and contractual arrangements. Distinct functions still need intelligible authorization and review.

Formal documents alone cannot establish which rules actually operate. A policy may require review but be bypassed for urgent contributions; a nominally open collection may be practically accessible only to fluent speakers of one language; a volunteer may be entitled to decline a role in writing but encounter strong informal pressure to continue. Conversely, a small informal group may maintain reliable safeguards through stable, accountable practices without extensive documentation. A comparative study should therefore compare written rules, observed procedures, participants' accounts, decisions on contested cases, and changes over time. The difference between rules formally declared and rules effectively used is itself an object of inquiry, not immediate proof of illegitimacy.

Several stewardship functions recur across candidate arrangements. Intake examines source, purpose, possible owners or controllers, affected persons, and the suitability of a resource for shared handling. Review assesses quality and risks, including domain-specific professional oversight where required. Authorization specifies who may see, use, change, or redistribute versions. Preservation attends to version history, maintenance costs, correction, and deletion where justified. Governance review evaluates contested decisions and the cumulative effects of rules on participation. These functions may use lightweight procedures when the material is low risk and publicly licensed, while personal, clinical, security-sensitive, or confidential materials may require controlled channels or exclusion. The principle is proportional differentiation, not a presumption that more elaborate administration is always better.

A proposed commons may also operate alongside institutions whose authority it cannot supersede. Neither a volunteer coordinator nor a jointly edited repository ordinarily acquires an autonomous right to modify approved patient-facing instructions, transfer confidential records, or override professional judgment simply by declaring them common resources. The same constraint applies to organizational branding, copyright management, research ethics, and funding conditions, each requiring case-specific inquiry. A credible governance charter should identify the interfaces at which resource pooling stops and external permission is required. Failure to record those boundaries creates foreseeable ambiguity even when the underlying collaboration is well intentioned.

2.5 Resource Admission, Transformation, and Withdrawal

The scope of a commons is determined repeatedly during the life of a resource. A document may have an authorized source but an inaccurate translation; a method may be valid for training yet unsafe as independent operational guidance; a data-derived table may appear anonymous but become identifying when combined with local knowledge. The governance question at admission is therefore more specific than whether a contribution is valuable. It concerns which version of which object, under whose authority, for which purposes, and with which foreseeable effects can enter a governed pool.

A proposed minimal intake record can contain the resource type and version; its immediate purpose and intended audience; the source and degree of provenance confidence; the identity or role of the relevant decision authority; any known rights and contractual conditions; confidentiality and safety classification; review status; permissible transformations; the assigned steward; and a re-evaluation or retirement condition. Where names, affiliations, or sensitive facts should be withheld, the record may refer to a protected local identifier or deliberately omit public provenance while maintaining any legally required confidential audit information. These fields are candidate design features. They neither establish new rights nor imply that every resource warrants the administrative expense of a detailed form.

Admission should also separate *quality assurance* from *permission*. A scientifically unreliable method can be legally redistributable. An accurate research note can remain confidential. An educational document can be accurate within its source context yet misleading when reused elsewhere. Review therefore asks different questions: whether the material is adequately supported, whether the purported steward has authority, whether reuse is permitted, whether its limitations are intelligible, and whether proposed audiences have sufficient context or competence. A failed check may trigger editing, restricted access, referral to a responsible body, or nonadmission, rather than a single binary decision about openness.

Transformation creates new obligations. Translation changes interpretive possibilities; software updates change dependencies; a summary may remove context necessary for safe application; a redacted example may still expose a rare event. The institutional record should distinguish the authority to make a derivative, the evidence that a derivative preserves required meaning, and the scope in which it may be circulated. These questions intersect with technical provenance standards but are not solved by an identifier or version-control history alone [64]. Section 3 develops the event-level account; the present section establishes the point at which a transformed resource requires a new governance determination.

Withdrawal and retirement are equally important. The discoverable presence of a resource at one date does not make indefinite accessibility appropriate. New safety evidence, an expired institutional mandate, corrected scholarly findings, changed contractual conditions, or a credible objection from an affected person may require suspension, replacement, access revision, or deletion under applicable rules. Whether a particular withdrawal request must be honored is a source-specific legal and ethical question, especially when archival obligations or third-party rights apply. A generative commons should therefore be evaluated partly by its capacity to change previously granted access conditions lawfully and accountably, rather than by preservation volume alone.

2.6 Institutional Adjacency and Interdisciplinary Conversion

Some organizations are connected to multiple research and practice communities in ways that can lower the cost of discovering complementary resources. A university-linked service organization, for example, may be institutionally adjacent to researchers, students, educators, professional staff, and external community actors. Adjacency in the present sense refers to the existence of feasible channels for communication, review, learning, and legitimate cooperation. It is neither a measurement of physical distance nor a claim that every participant may freely move across professional and institutional boundaries. Its analytical importance lies in the possibility that a problem, document, or competence originating in one setting may be translated into a resource meaningful in another.

Consider a constructed configuration involving a university-affiliated assistance programme. Volunteers notice recurrent confusion in a publicly distributed orientation handout. A communication researcher helps redesign its readability; students in information science build an accessibility-checking tool; an educator develops a training exercise based on an authorized, non-identifying example; and professional staff review the materials before they are used in an institutional setting. The participating groups may recognize different kinds of value: improved accessibility, a reusable method, educational competence, an evaluated intervention, better coordination, or a publication where research standards and permissions are satisfied. No part of this hypothetical example asserts that an actual institution follows this arrangement or has approved its materials.

The common resource in this example is the selected, authorized set of educational artifacts, evaluation methods, and documentation relations. The original service interactions, personal records, professional duties, university approvals, and organizational decisions are separate institutional objects. A proposed research commons may make cross-disciplinary use easier by publishing appropriate metadata about a method or by providing a controlled channel for requesting expertise. It should not presume that a research contribution supplies authority over the underlying service. The opportunity to circulate value exists because the participants possess partially complementary competences and because their institutional rules permit some exchange. The same arrangement may fail if a review bottleneck absorbs all staff time, if students cannot obtain appropriate supervision, if the beneficiaries have no voice, or if translation introduces unsafe meanings.

This configuration also illustrates the limits of a simple exchange account. A volunteer's contribution might help another discipline formulate a useful question without generating an immediately exchangeable output. Recognition might take the form of training, access to a method, an opportunity to co-design subsequent work, or a decision channel through which the volunteer can correct a misinterpretation. In another case, the appropriate beneficiary may be the service-recipient community rather than the original contributor. In yet another, the contribution should remain unattributed publicly or should not be used further. These possibilities require a governance framework in which value return is situated, plural, and conditional, rather than a mechanical promise of deferred remuneration. Eglash and collaborators' work on generative justice remains a substantive antecedent for the analysis of value circulation [17]; this article's distinct hypothesis concerns the interaction of institutional interfaces through which such circulation may or may not become feasible.

2.7 Three Reality Levels of the Institutional Resource Arrangement

The GR interpretation treats its categories as an optional explanatory framework subject to ontological restraint. At the *ontological reality* level, this inquiry suspends claims about the ultimate nature of persons, values, institutions, and relations. The institutional analysis does not require a thesis that social space-time, a mathematical field, or a particular type of entity is metaphysically fundamental. Conventional legal, sociological, or administrative accounts can remain sufficient for many of the questions raised.

At the *relational reality* level, a commons is modeled as an evolving arrangement of participants, resources, permissions, expectations, stewardship practices, and effects on feasible action. A resource may be generatively significant because its use changes what a student, volunteer, professional, community member, or institution can intelligibly do next. The relevant relation can persist despite the departure of an original participant, provided that adequate authorized records, competent stewards, and interpretive capacities remain. These are hypotheses about the causal and historical organization of capacities, not assertions of experimentally established dynamics. They are also vulnerable to counterexamples where ordinary management, individual initiative, pre-existing expertise, or exogenous demand explains the observed development more parsimoniously.

At the *manifestation reality* level, the same arrangement becomes available through particular documents, repository permissions, meeting records, training sessions, interfaces, acknowledgements, access denials, and observed decisions. Such manifestations support inquiry but underdetermine their own origins. An empty audit log may reflect no relevant action, unrecorded action, poor instrumentation, intentional anonymity, or justified noncollection. A high download count may reflect useful reuse, casual inspection, automated retrieval, or an inappropriate disclosure. A successful training outcome may reflect many influences beyond the commons. Manifested indicators must accordingly be interpreted in conjunction with context, rival explanations, and constraints on what can ethically be observed.

Across the three levels, the proposed explanatory move is limited and testable. The investigation seeks to determine whether the configuration of governance interfaces helps explain durable opportunities for legitimate resource transformation and participation. The term *generative* identifies a possible capacity to enable further valuable action whose worth remains partly plural and historically situated. It does not mean that every resource produces value, that a documented contribution deserves an eco-

conomic return, or that the institution should maximize reuse regardless of the rights and welfare of affected people.

2.8 Boundary Criteria and Comparative Research Implications

The present paper provisionally treats an arrangement as a candidate research commons when four conditions can be investigated: (i) at least some resources are specifically identified as being governed for possible shared use; (ii) a discernible set of participants or decision authorities maintains rules for contribution, use, or revision; (iii) the arrangement has practices for maintaining, interpreting, restricting, or correcting those resources; and (iv) relevant consequences for members and affected outsiders can be described, even if the consequences cannot yet be evaluated causally. These are operational inclusion criteria for comparative research, not a universal legal definition. The additional *generative* qualification invites examination of how present resources condition subsequent creation, recognition, and feasible benefits, without predetermining that such effects are observed.

Several negative cases clarify the criteria. A publicly accessible folder containing unrelated documents but no intelligible common governance may be a collection rather than an institutional commons. A staff-only directory operated exclusively as a routine organizational archive may be a repository whose governing logic is managerial rather than collectively sustained, although joint governance could be present in a particular case. A mutual-help discussion group may possess substantial relational capacities without having sufficient enduring shared-resource procedures to fit this specific research design. A well-governed commons may also elect to pool very little public material because its members or affected people face exceptional vulnerability. The classification should therefore be tested against rules and practices, not inferred from publicity, membership count, technical sophistication, or institutional prestige.

For comparison, a researcher could begin with a bounded resource class—for example, approved training translations or non-sensitive methods for evaluating accessibility—and investigate who established the pool, who can propose changes, how versions are admitted, who may review or veto access, what costs each participant bears, how affected outsiders are represented, and how disputes are resolved. Comparable organizations might achieve satisfactory outcomes through different institutional architectures. Observation of such variation could reveal conditions under which elaborate provenance records are unnecessary, under which restrictive governance protects vulnerable participants, or under which resource reuse becomes extractive despite nominal openness. Those possibilities are integral to the proposed investigation rather than anomalies to be excluded.

The institutional object is thus a historically governed configuration of resources and relations, with boundaries that must be reconstructed in each case. Its characteristic research questions concern who may contribute, what can be pooled, which capacities are needed for responsible reuse, how institutional authority is distributed, and how changes in those conditions alter the feasibility of subsequent activity. The following sections examine the evidentiary problem of recognizing contribution events, the permission structures that constrain resource use, and the distinct conditions through which recognition and heterogeneous value return may become meaningful. This sequence keeps the institutionally specific commons as the object of inquiry while leaving its ultimate ontology, normative legitimacy, and claimed causal advantages open to further examination.

3 Contribution Events, Artifacts, and Historical Provenance

The analytical role of contribution provenance is to connect the historical production of shared resources to the records through which participants and institutions can later interpret, reuse, correct, and potentially recognize those resources. The present section distinguishes contribution events from their material or informational results; reconstructs transformations among artifact versions; separates provenance assertions from evidence supporting them; and examines the temporal, epistemic, and ethical limits of historical reconstruction. A minimal record model is then proposed to identify the kinds of claims a commons

might preserve without requiring unrestricted disclosure. The method is conceptual and comparative, informed by established provenance and contributorship standards; the institutional configurations are constructed examples, and the proposed Generative Relational (GR) interpretation is not an empirical finding.

3.1 Contribution Events and Their Situated Conditions

A *contribution event* is a situated occurrence, or a bounded interval of activity, through which a participant influences a resource, capacity, interpretation, or feasible course of collective work. The contribution may involve drafting, translation, field observation, correction, validation, mediation, maintenance, financial support, training, or the contextual explanation on which another person's interpretation depends. The analytic criterion concerns participation in the relevant historical change; it does not require that the result be novel, individually owned, publicly visible, or positively evaluated. A mistaken translation can be a contribution event in a descriptive account, although its correction or withdrawal may be necessary before reuse. A rejected proposal may reveal a safety risk or alter subsequent decisions without producing an admitted commons artifact.

Events have contexts that often condition their meaning. A statement made during a supervised training session differs from an authorized clinical instruction, even if the same sentence occurs in both. A volunteered translation completed with permission differs from a translation extracted from a confidential record. The observed act may be materially similar while the institutionally admissible consequences differ. A historical account should therefore identify, where supported, the activity's purpose, organizational setting, scope of authorization, source resources, relevant actors and roles, and the boundary within which the result was intended to operate. These are proposed descriptive dimensions; the specific permissions and obligations are determined through applicable arrangements rather than by the analyst's declaration.

Several persons and institutions may participate in a single event. One person may identify a difficulty, another create a draft, a third review terminology, and a coordinator determine that a version is suitable for controlled teaching. The event can be represented at different granularities: a project, a revision session, a single correction, or an authorization decision. The chosen granularity affects which contributions become identifiable. Excessive aggregation conceals small acts of maintenance and contextual labor; excessive decomposition produces costly records that may distort collaboration through surveillance or compulsory self-reporting. Granularity is consequently a governance decision with epistemic, practical, and distributive consequences.

The vocabulary of entities, activities, and agents in W3C PROV-DM supplies one interoperable way to represent portions of this history [63]. Its categories can describe the generation and use of entities, association of agents with activities, and relationships of derivation. These relations are useful for the present study because a trace of production differs from a claim about beneficial results. An activity can be recorded without establishing that it improved practice; a person may contribute to an activity without thereby gaining authorship, ownership, or a monetary entitlement. The normative implications of a contribution require additional, independently warranted reasoning.

3.2 Artifacts, Versions, and Derivation Histories

An *artifact* is a relatively identifiable result, representation, or stabilized resource that can be the subject of a governance decision. An artifact might be a written guide, glossary, software routine, protocol description, annotated dataset, pedagogical example, or approved translation. A generated artifact is distinguishable from the event or sequence of events that produced it. The resource pool described in Section 2 is composed partly of such identifiable artifacts and partly of capacities that resist complete reduction to files. In the latter case, training records and descriptions of competence may provide partial traces of activity, without becoming the embodied capacity itself.

Version distinctions are necessary whenever transformation changes the content, interpretive setting, intended audience, or permission profile of an artifact. Consider a constructed sequence in which a

volunteer drafts a public-language description of a nonclinical service, a researcher adds references, a professional reviewer corrects potentially misleading guidance, and an editor produces a multilingual version. The resulting documents may share a lineage while bearing different levels of validation, different contributors, and different permissible uses. A repository path or title that remains constant across revisions is an insufficient identifier for the reviewed state on which a later user relies.

The lineage may be branching and convergent. One source can support several translations or training adaptations; one later artifact may incorporate material from multiple independently developed sources. A correction may be propagated into selected derivatives while leaving others unrevised. Some influences are indirect, such as a critical comment that changed the research question or a mentor’s guidance that enabled a method. Their historical relevance may be substantial, while the degree to which they are documented or legally relevant remains variable. The W3C model includes derivation relations and qualified associations for some of these dependencies [63, 64]; DataCite’s versioned metadata schema offers established ways to express relationships among identifiable research outputs [16]. Neither specification requires the proposed commons to assign a persistent public identifier to every private draft or interpersonal exchange.

A version history should also distinguish *reproduction* from *transformation*. Exact copying can produce a new instance without changing substantive content. Translation, anonymization, aggregation, contextual adaptation, or revision may yield a new artifact whose adequacy depends on domain-specific judgment. A machine-generated summary may preserve recognizable wording while altering safety-critical qualifications. Consequently, a derivation edge alone does not attest to semantic fidelity, scientific reliability, or sufficient authorization. Institutions may record those assessments as additional qualified claims, each with its own evidence, reviewer, scope, and revision status.

Artifact continuity is a practical convention rather than a universal identity criterion. In some settings it is useful to treat successive versions as states of one document family; in others, material changes call for separate identifiers and new approval. A paper’s metadata, a translated volunteer-handbook excerpt, and an operational instruction may share a common historical source without sharing a valid use context. Preserving this distinction supports both accurate reuse and accountable withdrawal when a problematic predecessor has propagated to later versions.

3.3 Provenance Assertions and Evidentiary Records

Historical provenance reaches a commons through *assertions*: statements that an activity occurred, an artifact derived from another, an agent supplied an input, or a decision authorized a particular transformation. The assertion is distinct from the event it describes. It is also distinct from the evidence on which a reviewer relies. Examples of evidence include a signed approval, a version-control commit, a dated document, contemporaneous correspondence, a meeting record, a participant’s recollection, and a later institutional determination. Each has characteristic limitations. A commit may identify the account that submitted a change without identifying the person who conceived it. A sign-off may establish that a reviewer accepted a version for a specified purpose without proving every underlying factual claim. An oral recollection may preserve otherwise unrecorded support work while remaining incomplete or contested.

W3C PROV-DM explicitly accommodates *provenance of provenance*, including bundles through which one can describe the source and production of a provenance account [63]. This supplies an important conceptual safeguard: the statement that a person wrote a section is itself a recorded claim that may have a source, an issuer, a date, and a contestable evidentiary standing. A technical metadata field can faithfully reproduce an incorrect assertion. The credibility of the record requires procedures that connect descriptive syntax with actual observations, accessible corroboration where appropriate, and the possibility of correction.

For analytical purposes, provenance claims can be differentiated by evidentiary status. A contemporaneous, corroborated record may provide relatively strong support within its scope. A later recollection may provide meaningful but defeasible evidence. An assertion derived from another unverified record

inherits the latter's limitations. An explicit inference can be useful if the inferential step and assumptions remain visible. A constructed pedagogical example should be identified as constructed, even when it resembles a plausible institutional history. In some cases the appropriate status is simply *undetermined*: the contributor may be unknown, the original source missing, or the contested evidence insufficient to resolve the claim. The framework resists turning such uncertainty into a confident attribution merely because a database requires a name.

The analytical distinction has institutional implications. A commons may need an accountable process for accepting a provenance claim, challenging it, adding evidence, restricting its visibility, and recording the result of review. Corrections should preserve enough of the decision history to explain why a prior public claim was superseded, subject to privacy, security, and applicable erasure or retention requirements. The responsible reviewer might be a resource steward, an editorial committee, a research-integrity officer, or a designated institutional authority, depending on the claim and its consequences. A commons charter should identify the proper authority rather than create an unlimited jurisdiction over every historical dispute.

3.4 Temporal Ordering and Retrospective Reconstruction

Contribution histories have at least three analytically relevant times: the time or interval in which an event occurred, the time when a record was created or entered into the system, and the time at which the recorded claim was subsequently assessed. These moments can differ by days, years, or generations of institutional participants. A late discovery that an earlier contribution influenced a published output may improve reconstruction while changing neither the original event date nor the terms of an agreement then in force. A correction entered today should therefore not be misrepresented as knowledge already possessed by participants at the time of the earlier action.

Temporal ordering also affects the credibility of derivation assertions. Where a source document was created after the alleged derivative had been completed, the proposed lineage requires explanation. Some apparent contradictions arise from inaccurate clocks, backdated archival entry, or the distinction between drafting and formal release; others reflect errors in the claim. The *Constraints of the PROV Data Model* sets out uniqueness and event-ordering constraints intended to make formal provenance descriptions internally coherent [62]. Internal formal validity remains a narrower result than historical truth. A structurally well-formed graph may omit confidential discussions or misidentify responsibility, while a historically credible account may contain intervals and uncertainty that resist a single precise ordering.

The record may also experience a period of silence. A volunteer's early glossary might be reused years later after an organizational merger; a translator's notes might be preserved only in a private archive; a research method may move through several intermediaries before receiving a public citation. These cases introduce *historical discontinuities* in the trace, which may differ from discontinuities in actual influence. Absence of a logged relation is weak evidence of absence when the logging system covers only published files or formal transactions. Conversely, a long chain of mentions does not by itself establish that an upstream contributor causally enabled every later use. The argument requires modesty about both positive and negative inference.

For comparative research, a reconstruction should document its observational window, the kinds of records available, known periods of noncoverage, organizational changes affecting recordkeeping, and the possibility that missing records are systematically associated with low-power participants. This last possibility warrants examination because the capacity to document an event may be unequally distributed. Administrative staff, recognized authors, and technical maintainers may have accessible systems of record, whereas community participants or temporary volunteers may leave traces only indirectly. The resulting archive can overrepresent the already visible, creating an apparent concentration of generative agency even where collaboration was wider.

3.5 Distributed Contributions, Maintenance, and Collective Work

A commons may depend on recurring activities that lack a stable individual artifact: technical maintenance, repeated verification of links, oral explanation, informal mentoring, translation checking, mediation of disagreements, and correction of culturally inappropriate expressions. Their effects often appear as continuity of a service or a reduction in the likelihood of error. The labor is therefore easier to overlook than a named report or software release. Research on peer production provides an established account of distributed coordination beyond conventional firm or market hierarchies [3]; the present paper asks a narrower question about the records by which such work becomes legible within institutional commons.

A useful conceptual distinction is between *artifact-generating* and *artifact-sustaining* contributions. The former can often be associated with a new identifiable object; the latter may preserve the availability, validity, or safe interpretability of an existing resource. Sustaining activities can include preventing an erroneous document from being published, withdrawing obsolete guidance, maintaining access controls, or providing the contextual explanation that prevents inappropriate transfer. A system that rewards only newly published artifacts risks discouraging the very labor that makes downstream reuse trustworthy. This is a hypothesis about governance incentives, not an observed regularity in a specified organization.

The CRediT taxonomy offers established roles, including data curation, validation, supervision, project administration, and writing or editing functions, for scholarly outputs [42]. It may improve transparency for documented research projects, but the official account expressly separates contributor roles from decisions about authorship. Moreover, service-related community participation, clinical supervision, peer support, and certain forms of interpersonal trust may fall outside the taxonomy's primary disciplinary scope. A proposed commons might use locally justified descriptive categories alongside scholarly standards, provided that local extensions are explicitly identified and do not masquerade as official roles or enforceable entitlements.

Collective work may also resist exhaustive decomposition into individual shares. A group conversation can yield a framing insight without a determinate originator; participants may reasonably prefer collective acknowledgment, confidential recognition, or no public mention. The presence of a causal contribution does not decide the ethics of naming its source. Nor does common production entail that every benefit should be divided according to a calculable individual score. The difference between descriptive influence and distributive obligation is especially important when contributions have uneven visibility, unequal bargaining power, or incomparable forms of value. Subsequent sections consider recognition and value return explicitly; the present section identifies what the provenance record can responsibly establish before those normative choices are made.

3.6 Contested Histories, Redaction, and Safe Attribution

Provenance can itself create risk. Naming a person in a volunteer log may disclose sensitive participation, employment status, a referral route, community affiliation, or a relationship with a vulnerable beneficiary. Detailed time stamps and geographic metadata may allow reidentification even where names are omitted. An account of who facilitated assistance might expose confidential operational procedures or the identity of persons seeking protection. The *Handbook on Data Protection in Humanitarian Action* offers authoritative guidance for treating data practices as matters of life, dignity, risk, and contextual responsibility [38]. The particular rules applicable to a given processing operation still depend on its jurisdiction, institutional setting, legal basis, and purpose.

Accordingly, preservation, discoverability, attribution, and public disclosure should be managed as distinct decisions. A confidential steward might maintain evidence that a restricted research method was contributed under authorization while publishing only an aggregate acknowledgment of a team. A contributor may have a legitimate reason to contest attribution, seek correction, or request confidential treatment. A person affected by an artifact's derivation may also have interests at stake even though they did not create it. In a constructed educational case, an apparently anonymized training vignette may preserve a recognizable combination of events; recording increasingly detailed provenance could amplify rather than reduce that risk. The institution should evaluate whether the benefit of additional

Recorded dimension	Evidentiary question	Governance qualification
Event and context	Which bounded activity or interval is asserted?	Time and location precision may expose sensitive participation
Artifact and version	Which identifiable result or derivative is involved?	Version history does not establish reuse permission or quality
Agent and role	Who is said to have participated and in what capacity?	Consent, accuracy, collective credit, and confidential identities differ
Claim and source	What supports a generation, influence, or derivation assertion?	Evidence can be incomplete, indirect, disputed, or restricted
Review status	Who assessed the claim, when, and using which standard?	Review authority and scope require separate institutional grounding
Disclosure boundary	Which audiences may inspect which record fields?	Private verification can coexist with public metadata minimization
Correction history	Which assertion was amended or withdrawn and why?	Retention and redaction should respect applicable safeguards

Table 3: Candidate dimensions of contribution-provenance records and corresponding evidentiary and governance limitations. The entries are analytical design proposals, not a mandated metadata standard.

traceability justifies the potential exposure.

Table 3 separates common descriptive purposes from evidentiary and governance limits. The columns specify candidate fields rather than a compulsory template. Their inclusion in an internal system does not imply authorization to disclose the underlying evidence. In particular, the identity of an intermediary who handles sensitive material may be appropriately held in a restricted audit channel even when a derivative educational artifact is public.

The practical difficulty is that contesting an attribution can require examining evidence whose release would itself cause harm. Institutions may need a procedure in which a qualified reviewer inspects restricted evidence, communicates a reasoned outcome to relevant parties, and publishes an appropriately limited correction. This approach requires due attention to disagreement, power differences, accessibility of complaint mechanisms, and the risk of retaliation. It is a governance proposal rather than a claim that any single dispute process is legally adequate across settings. A challenge system that protects only the already recognized contributor would fail to address the structural imbalance that motivated the commons inquiry.

3.7 A Minimal Model of Historical Record Claims

A compact record model can clarify the separation between an event, the proposition asserted about it, and the evidence supporting that proposition. The present proposal treats a provenance record as a *claim-bearing object*, rather than as a direct copy of a past event. The absence of a claim is classified separately from a claim that an event did not occur; these states carry different evidentiary implications, particularly when recording was optional or disclosure was restricted. Its minimum conceptual structure is given in Equation 1.

$$r = (\kappa, \theta, s, v, q, d), \quad (1)$$

Here, κ is a proposition about a contribution, artifact, agent, or relation; θ records available event-time and record-time information, potentially as intervals or unknown values; s identifies the source or evidence class; v is a revisable verification status; q describes the authority or procedure by which the assertion was reviewed; and d specifies the permitted disclosure scope for the record and its supporting evidence. The model deliberately permits partial fields. Some historical claims have an unknown contributor, uncertain date, or restricted evidence. The tuple is a candidate *audit vocabulary*, not a formal implementation of PROV-DM or a proposed legal presumption.

For example, a record can assert that a particular glossary version derived from an earlier approved source, with the relevant repository diff as evidence and an editor’s review recorded separately. A different record can assert that a community participant supplied oral terminology that influenced the glossary. The second claim may rest on an interview with restricted access; a responsible commons could preserve a nonidentifying relationship while withholding the interviewee’s identity. The two records may be connected, but neither alone decides whether a public acknowledgment should name a participant or whether a specific licence permits the derivative’s redistribution. Those are separate decisions under the processes discussed in subsequent sections.

A system should also permit claims about *claims*. A reviewer may conclude that the original evidence was insufficient; a participant may dispute the recorded role; or a later archival source may contradict an accepted date. Retaining the amended assertion and an appropriate, access-controlled explanation allows the institution to distinguish a correction from the erasure of inconvenient history. The provenance-of-provenance facilities in PROV-DM are relevant antecedents for such an approach [63]. W3C’s formal constraints can help detect internally inconsistent timing or relations [62], while an institutional procedure remains responsible for assessing the truthfulness, relevance, and safety of the claims.

There is an important inferential limit. A network of recorded provenance statements is a network of *supported or asserted historical relations within a particular record system*. It need not be a complete causal representation of the underlying collaboration. The number of incoming derivation edges is neither a sufficient measure of human effort nor an indicator of a person’s entitlement to future returns. Likewise, the absence of a recorded edge may reflect nonobservation, confidentiality, aggregation, or a genuine absence of influence. For empirical research, the record’s observation process and selection biases therefore belong to the explanation of any results obtained from it.

3.8 Three GR Reality Levels and Comparative Research Implications

The proposed generative relational interpretation locates provenance within three analytically distinct levels of reality. At the *ontological* level, the inquiry suspends claims about the ultimate nature of agents, historical causation, information, or relations. Neither a provenance graph nor a persistent identifier is offered as proof that history consists fundamentally of graph objects. Formal and institutional representations are adopted because they support particular questions and interventions, and their adequacy remains contestable.

At the level of *relational reality*, contribution histories are investigated as historically constituted dependencies among persons, organizational positions, rules, resources, and capacities. A translation can change what a participant can understand; an approved correction can alter the future uses of a training document; and a trusted mediator can make interdisciplinary cooperation more feasible. These are candidate generative relations in the GR sense, subject to investigation of rival explanations and practical context. Relational effectiveness may persist after the initial event has disappeared from an accessible record, while a record can persist after the relation that gave it practical meaning has weakened or changed. This difference motivates the distinction between historical activity and archival visibility.

At the level of *manifestation reality*, relational histories become accessible through versions, metadata, testimonials, review decisions, licensing notices, acknowledgments, institutional records, and observed practices. The forms of manifestation are mediated by the rules of the particular commons and by the resources available for documentation. Two participants may have comparably important effects yet appear very differently in an institutional archive. A record can make a prior influence newly legible, enabling a later act of recognition or reuse, without retroactively creating the original event. Its practical effects therefore need to be studied as additional historical processes rather than presumed consequences of successful metadata capture.

This analysis suggests at least three comparative hypotheses for later empirical work. First, a resource pool with version-specific provenance and correction procedures may identify conflicting or obsolete derivatives more reliably than a comparable pool maintaining only undifferentiated file titles, assuming similar auditing effort. Second, an institution that permits confidential or collective recognition may

document some forms of relational and maintenance labor that would otherwise remain unrecorded, although mandatory documentation may also deter participation. Third, explicit differentiation between contribution history and reuse authority may reduce erroneous inferences that descriptive credit licenses disclosure or creates financial entitlements. These hypotheses require operational definitions, suitable comparison groups or longitudinal evidence, and attention to selection into the commons. They cannot be established by the conceptual distinctions alone.

Provenance thus provides a necessary possible *interface* for historical intelligibility without offering a comprehensive theory of social value. It can support attribution decisions, ethical contestation, and the study of delayed benefit pathways, but only when joined to independently justified permissions, appropriate evidentiary review, and a feasible governance process. A future return may depend on many contributions whose effects interact nonadditively or remain hidden; an accurate record should preserve these limits rather than promise an exhaustive allocation rule. The next analytical tasks concern the juridical and contractual structure of permissions, the appropriate forms of recognition, and the conditions through which heterogeneous values may be produced and circulated. The present section establishes the historical and evidentiary distinctions those tasks require.

4 Permission Structures, Licences, and Access Boundaries

A generative commons can preserve an accurate history of contributions while remaining unable to determine whether a particular actor may lawfully inspect, transform, distribute, or commercially exploit the resources associated with that history. The problem is especially consequential for assistance-related knowledge infrastructures, where a methodological note may be redistributable, its supporting testimony confidential, and its institutional use subject to a professional authorization. This section establishes an analytical vocabulary for these distinct permissions. It first identifies the rights and authorities that may attach to heterogeneous resources, then evaluates public licensing, personal-data protection, role-specific access, derivative works, and uncertainty in authorization. A bounded decision model and constructed cases distinguish legal analysis from proposed governance design. Finally, the section considers the three Generative Relational (GR) reality levels and specifies questions for comparative institutional research. The approach is conceptual and jurisdiction-sensitive: it is neither a declaration of applicable law for a particular organization nor a substitute for professional review of its agreements and data responsibilities.

4.1 Rights Holders, Resource Components, and Sources of Authority

The term *resource* covers heterogeneous objects rather than a homogeneous stock of material available for appropriation. A commons may contain original scholarly prose, software, diagrams, data compilations, independently collected observations, authorized translations, procedural routines, photographs, interviews, personal contact records, and records of institutional decisions. Different legal interests and institutional mandates may attach to each component. An individual might have contributed a corrected translation to a training document while possessing neither the economic rights in the underlying document nor authority to disclose the interview used to justify the correction. A record of that contribution can be historically accurate without expanding the contributor's legal powers.

For copyright-protected work, the relevant inquiry includes authorship, economic rights, moral rights where recognized, transfers or employment-related allocations, exceptions, and the rights actually controlled by the proposed licensor. The World Intellectual Property Organization's guidance distinguishes economic and moral rights and notes that initial ownership and employment-related allocation vary across jurisdictions [69]. This variation matters to an interdisciplinary project in which an employee, a student, an independent volunteer, and a collaborating professional may each produce parts of a reusable artifact. Institutional affiliation alone is insufficient to settle ownership; conversely, an individual's active involvement does not necessarily demonstrate that the individual controls all rights required for onward licensing. The same caution applies to databases, software components, trade secrets, contractual confidentiality, and other regimes that may apply independently of copyright.

The legal classification of an activity must also be kept separate from the institution's governance position. A librarian could be empowered to maintain a catalogue without owning its underlying works. A hospital employee could be permitted to consult a restricted operational record without authority to export it for publication. A voluntary contributor could retain rights in an original diagram while agreeing to an institutional review procedure governing its inclusion in an educational repository. The rights bundle, internal mandate, and ethical acceptability of a proposed use thus require distinct inquiries. Commons rules may coordinate these inquiries, but their authority is derived from recognized legal, contractual, and organizational arrangements; a model of relational value circulation cannot confer powers that those arrangements withhold.

A further distinction concerns *facts*, *expressions*, and *identifying information*. The legal protectability of facts, collections, and expressive selections varies by subject matter and jurisdiction. A catalogue entry's apparent availability does not imply that an associated narrative or image is freely licensable. Likewise, material consisting mostly of facts may contain personal information protected by privacy or data-protection law. A person who is the subject of a case record is not thereby its copyright holder, and the copyright holder is not thereby empowered to waive the person's protections. A responsible resource inventory therefore records at least the object, its component boundaries, the asserted rights holder or controller, the basis for that assertion, the applicable permissions, and outstanding uncertainties. Such a record is an auditable claim rather than a dispositive legal determination.

4.2 Public Licences, Scope of Grants, and Downstream Reuse

Public copyright licensing can reduce negotiation costs for specific protected uses when a rights holder has authority to grant the relevant rights. Creative Commons Attribution 4.0 International, for example, provides a public licence for certain acts of sharing and adaptation subject to conditions, including attribution and indications of modification [13]. Creative Commons Attribution–NonCommercial 4.0 International similarly permits specified sharing and adaptation for noncommercial purposes under its legal code [14]. In either case, the licence concerns the rights defined by the instrument and controlled by its licensor. It does not automatically authorize disclosure of confidential communications, processing of personal data, use of protected trademarks, or representation of an institution as endorsing a derivative. Accordingly, selecting a familiar licence identifier is one element of a permission assessment, not the assessment's conclusion.

The difference between *publication under an open licence* and *access within a governed research environment* is analytically substantial. Under a broad public copyright licence, recipients can acquire permissions that an institutional repository ordinarily cannot withdraw merely by later changing its own access controls. Creative Commons explains that its licences are generally irrevocable for a compliant licensee, even if the licensor ceases distributing a copy [15]. A controlled-access repository may, by contrast, grant narrowly defined rights to inspect or process a protected resource under an applicable legal ground or agreement, while retaining discretion over future access according to those conditions. These two arrangements may coexist for separate components, but they should not be conflated. In particular, a commons should avoid placing a publicly licensed source and a restricted confidential source under a single undifferentiated licence banner.

Licences also differ by the actions they authorize. Reading, storing, reproducing, translating, modifying, training a model on content, publishing a derivative, redistributing an archive, and seeking commercial advantage can implicate different rights and obligations. The familiar labels *BY*, *NC*, and *SA* should therefore be read through the governing legal text, not reduced to assumptions that every reuse by an educational entity is noncommercial or that attribution establishes permission. The legal meaning of a noncommercial condition is defined by the relevant licence, and the consequences of combining material under different terms require examination of the actual rights exercised, materials involved, and distribution proposal [14]. A scholarly institution, a nonprofit organization, or an unpaid contributor does not automatically bring all downstream activities within every noncommercial licence condition.

There are also limits to the commons' capacity to impose its preferred return arrangement on a work

already licensed to the public. The Attribution 4.0 and Attribution–NonCommercial 4.0 instruments contain terms restricting additional downstream limitations on recipients’ exercise of the licensed rights [13, 14]. If an infrastructure seeks to require payment, compulsory value-return accounting, or repository-specific permission for acts already authorized by an applicable public licence, it must distinguish voluntary reciprocity, independently agreed obligations, and claims that cannot be imposed on compliant licensees. Mechanisms for ethical recognition may be designed alongside licensing, but the desire for circulating value does not automatically amend a prior grant. This boundary is especially important for a theory that treats return pathways as desirable institutional possibilities rather than pre-existing property claims.

4.3 Confidentiality, Personal Data, and Humanitarian Safeguards

Assistance-related work often involves information about people whose ability to refuse collection, storage, or circulation may be constrained by need, institutional dependency, disability, displacement, or exposure to conflict. In those circumstances, public release can impose costs that are not reflected in a document’s intellectual-property status. A knowledge commons may legitimately preserve procedures or methodological insights derived from service contexts while withholding the underlying identifiable records. Its governance must address purpose, necessity, access, security, retention, and the possibility that several innocuous fields will identify an individual when combined. The ICRC’s *Handbook on Data Protection in Humanitarian Action* treats personal-data protection as integral to the protection of dignity and affected people, with special attention to humanitarian operations [38].

For settings where the European Union’s General Data Protection Regulation applies, the legal assessment includes the principles of lawful, fair, and transparent processing, purpose limitation, data minimization, and security; an appropriate ground for processing; and additional conditions for special categories such as health data [19]. Article 9 establishes a prohibition subject to specified exceptions, rather than a blanket permission whenever an organization characterizes an activity as research or assistance. Relevant research safeguards and the relationship between primary and further processing require their own analysis. The Regulation is cited here as a jurisdiction-specific illustration with identifiable legal provisions. Other settings may follow different statutes, confidentiality duties, humanitarian arrangements, or institutional standards, so the model below deliberately avoids treating the GDPR as a universal rule.

An ethical concern remains even where an organization can identify a legal ground. A person who supplied a narrative to obtain help may not reasonably expect the narrative, an inferred diagnosis, a location trace, or an identifiable quotation to be republished in order to reward an analyst’s contribution. Participation in assistance is not the same act as consenting to publication, and the existence of a research collaboration does not determine all permissible secondary uses. Consent, when relied upon, requires scrutiny of voluntariness and scope; other legally available grounds may apply under their specific conditions and safeguards. It would be equally mistaken to present explicit consent as the sole possible basis for all processing under every law [19]. Separate ethical review may call for limits stricter than the legal minimum, with reasons supplied in terms of the risks and purposes of the actual activity.

Technical measures such as pseudonymization, encryption, aggregation, and tiered disclosure can help implement appropriately determined restrictions, but their appropriateness depends on the threat model and residual re-identification risks. A dataset from a small volunteer population, for example, might identify a participant through timing, location, linguistic features, or combination with public accounts despite removing explicit names. A confidential provenance ledger can also disclose vulnerable relationships through its metadata alone. The proposed commons therefore distinguishes an internal evidence record, a restricted audit record, a public descriptive summary, and material whose existence should not be publicly disclosed. No universal sequence from restricted status to public status is implied; some information may remain restricted or subject to legally required deletion rather than being prepared for eventual release.

Review layer	Primary question	Typical evidentiary or practical limit
Rights and exceptions	Does the proposed act require consent from a relevant rights holder, or fall within a legally recognized exception?	Ownership, transfers, protected subject matter, and exceptions can remain disputed
Licences and agreements	What grant or restriction governs this component and version?	A licence grants only rights within its scope and the licensor’s authority
Personal-data safeguards	Is the particular processing lawful, necessary, and appropriately protected?	Re-identification, purpose changes, retention, and affected-person rights
Institutional mandate	Which role or body may authorize the action for this purpose?	Operational access authority may be narrower than a general licence
Professional and ethical duties	Which duties protect dependent, vulnerable, or otherwise affected persons?	Legally available action may still present ethically unacceptable risk
Evidence and review	Which records support the determination, and how may it be contested?	Missing documents, version changes, conflicting assertions, or inaccessible review

Table 4: Analytical layers for permission assessment in assistance-related knowledge commons. Their interaction depends on applicable law, agreements, and context; the proposed classification has no independent legal effect.

4.4 Role-Specific Authorization and Reviewable Decisions

Permission can be represented as an institutionally evaluated relation among a person or organization, a particular resource version, a proposed action, its purpose and surrounding context, and the time of decision. A role may be relevant because an authorized reviewer needs identifiable access to evidence, because an instructor may distribute an approved public document, or because a professional must maintain a restricted operational record. Roles alone are insufficient: an individual approved to examine one set of records for quality assurance is not automatically approved to use the same material for public demonstrations or unrestricted model training. A well-specified review identifies the authority making the decision and the record of what was actually cleared.

Table 4 distinguishes six layers commonly collapsed in informal descriptions of a commons. The table is a classification proposal, not a universal hierarchy of legal norms. In practice, statutory rights and exceptions, contractual conditions, specific confidentiality obligations, institutional mandates, and professional standards interact according to the relevant jurisdiction and factual setting. Their interaction should be interpreted by competent persons rather than by indiscriminately taking the strictest phrase from every document.

A minimal decision vocabulary can help prevent an uncertain authorization from being silently promoted to permission. Let $q = (a, x, u, c, t)$ describe a requested action a on a specified version of resource x , by actor u , in context c and at time t . The context includes purpose, relevant role, institutional arrangement, and jurisdictional assumptions. The proposed internal triage function is stated in Equation 2. Its categories are workflow dispositions for a fully specified request, and their use presupposes an identified competent reviewer and a recorded evidentiary basis.

$$\text{Triage}(q) = \begin{cases} \text{clear,} & \text{required checks are affirmatively satisfied,} \\ \text{restrict,} & \text{an applicable barrier is established,} \\ \text{review,} & \text{material authority or evidence remains unsettled.} \end{cases} \quad (2)$$

Here, *required checks* denotes the checks determined by the relevant legal and organizational decision process, not a fixed universal checklist. *Restrict* may mean that the proposed use lacks an essential authorization or conflicts with an established restriction; it does not automatically establish that the use is unlawful under every conceivable copyright exception, public-interest basis, or alternative arrangement. *Review* is a record of uncertainty rather than a denial of a legal right. *Clear* records bounded institutional

authorization to proceed under the evaluated conditions and is not a judicial determination of lawful conduct. A competent review may revise any of the three classifications when new facts, terms, or authoritative interpretations emerge.

The W3C's Open Digital Rights Language (ODRL) Information Model offers an antecedent vocabulary for describing permissions, prohibitions, conditions, duties, and relevant parties and assets [61]. Its usefulness here is representational: a machine-readable policy may encode a reviewed decision and support consistency checking, yet the policy expression itself cannot prove that the issuer controlled the necessary rights, that a data-processing basis exists, or that a vulnerable person was adequately protected. The proposal's practical value is therefore contingent on who reviews the request, what information the reviewer can obtain, and whether mistakes can be corrected without placing the burden of challenge entirely on people with the least institutional power.

4.5 Derivative Works, Mixed Provenance, and Version-Specific Release

Reusing a knowledge artifact is often a sequence of transformations rather than a single transfer. A public presentation can derive from an approved training leaflet; the leaflet can have incorporated a restricted interview; and an unrelated contributor can have improved the translation or accessibility of a later edition. The release question concerns the proposed object and use at the end of the derivation chain, together with the rights and confidentiality obligations that persist in its components. The existence of provenance links demonstrates an asserted historical connection, but those links do not decide whether the later artifact reproduces protected expression, reveals identifying information, or falls within a licence's grant. Such determinations require relevant legal and factual review.

The minimum design response is *component-aware, version-specific release review*. Its record should identify the intended audience, the precise version or output, its externally sourced components, the rights or legal exceptions relied upon, applicable data-processing conditions, review authority, unresolved risks, and a revision date. A changed version can create an additional use of protected material; it may require review even where the previous public version was properly released. Conversely, routine correction of an openly licensed item does not automatically make every derivative a fresh negotiation with the original copyright holder; the terms of the original grant and actual nature of the changes remain decisive [13, 14].

It is important to distinguish three operations that may occur at different times: *restricting a new release*, *removing an institutionally hosted copy*, and *altering the legal rights already granted to recipients*. An institution may reasonably suspend new dissemination pending an investigation, correct a public attribution record, or take down a file it controls. The legal consequences for copies previously licensed to the public depend on the original grant and other applicable rights and duties. An otherwise valid Creative Commons grant is not ordinarily withdrawn merely by deleting the original download link [15]. Other claims, such as privacy, confidentiality, or a court order, can require a distinct analysis. This temporal separation is material for a commons seeking both durable scholarly reuse and credible procedures to address harmful disclosure.

Contributors' expectations about *future benefit* must be documented separately from reuse permissions. A collaborator may expect citation, access to derived teaching tools, participation in a future research network, or a negotiated share in proceeds if commercialization occurs. These expectations can have ethical and organizational force and may, where specifically agreed and legally effective, be embodied in enforceable terms. A general claim that a participant helped generate value does not itself establish a royalty obligation for every later derivative. Nor does an attribution requirement in a public licence represent a comprehensive settlement of community recognition, intellectual authorship, institutional accountability, or distributive justice. That separation preserves room for both lawful open reuse and richer relations of reciprocity whose justification has to be developed in the later sections on recognition and value circulation.

4.6 Constructed Boundary Cases and Governance Failure Modes

Five constructed configurations illustrate why permission should be evaluated as an action-specific and version-specific relation. They are hypothetical stress tests of the analytical model, not descriptions of a named hospital, aid organization, university, or actual legal dispute.

Public method with restricted source records. A volunteer researcher develops a new educational method after observing service processes under an appropriate institutional arrangement. The method's independently written account may be eligible for publication, yet the notes identifying service recipients and staff require a separate determination. Removing names alone does not necessarily make the notes safe to release. A permission record that says merely "author approved publication" inadequately specifies which object and which information was approved. A release process can preserve public methodological knowledge while keeping evidentiary access limited to authorized review.

Openly licensed diagram and contested authorship. A contributor draws a diagram included in a public resource under a valid licence. Another participant subsequently contests the accuracy of the published credit. A historical inquiry can be opened, evidence reviewed, and a correction or apology issued where warranted. The change in credit does not, by itself, prove that previously granted copyright permissions have been extinguished; the legal effect of the dispute depends on actual ownership, the grant, and relevant law. The case separates factual correction, normative recognition, and legal authority.

Mixed-language derivative across institutional boundaries. A translation team combines a publicly licensed glossary, an internally restricted protocol, and original commentary. Whether the resulting file may be distributed depends on the composition of the final artifact and the permissions applicable to each protected element. The visibility of one source cannot be used to infer redistribution rights in another. The team can consider producing a public derivative consisting only of authorized components, while preserving a restricted internal working version where lawful and appropriate.

Emergency use and subsequent research publication. During an urgent assistance operation, a competent body may authorize a data use under a legal ground and protective arrangements suited to the emergency. A later research team proposes to reuse the same records for model development or open teaching material. The second use requires its own purpose-specific assessment; the urgency of the first operation does not automatically determine the legitimacy of the second. Applicable law may allow compatible further processing or safeguarded research in defined circumstances, but such permissibility must be shown rather than presumed [19, 38].

Delayed value return after an open release. Several years after a commons publishes an instructional resource under an applicable public licence, a third party adapts it in a setting the original contributors had not anticipated. The public grant may authorize that use without an additional negotiation. The commons may still invite voluntary support, document an attribution chain, establish new reciprocal agreements for additional services, or strengthen its own support for contributors. It cannot assume a new retrospective fee or restriction over uses already permitted merely because the later activity produces high value. The case exposes a tension between durable openness and designed value-return pathways that the framework must confront directly rather than dissolve terminologically.

These cases point to governance failures with distinct mechanisms. *Permission inflation* treats any recorded contribution as evidence of transferable authority. *Licence laundering* marks a mixed artifact with a licence that its distributor lacks power to apply to all components. *Disclosure by metadata* reveals protected relations through otherwise unobtrusive event fields. *Authorization drift* extends a legitimate role-bound activity to an unrelated purpose. *Retrospective restriction* mistakes an institution's decision to cease hosting material for the withdrawal of previously effective public grants. The associated remedies differ: claim correction, scoped component review, access minimization, renewed authorization, risk

mitigation, or renegotiated future arrangements. No single technical access-control measure substitutes for those institutional judgments.

4.7 Three GR Reality Levels and the Epistemic Limits of Permission Records

At the *ontological level*, the inquiry suspends conclusions about the ultimate nature of rights, agency, ownership, normativity, or the objects to which permissions attach. The use of a typed permission relation is a pragmatic representation of decisions made within an institutionally situated legal and normative order. It does not establish that juridical relations are reducible to computational predicates. Such suspension is relevant where the actors themselves recognize different accounts of community entitlement, intellectual contribution, customary authority, institutional responsibility, or the social significance of a resource. A shared record can support practical coordination without requiring those differences to be metaphysically erased.

At the level of *relational reality*, permissions are examined as historically constituted and causally relevant arrangements among actors, resources, institutional positions, agreements, and material infrastructures. An authorized laboratory transfer may enable the creation of a genuinely reusable method; a governance review may preserve a dependent person's trust by preventing a risky release; an exclusive intermediary may prevent a contributor from learning that a derivative exists. These are candidate relational mechanisms to be investigated. Permission structures may expand or constrain generativity, but the direction and distribution of their effects depend on power, costs, available alternatives, and the lived situation of participants. A restrictive rule can protect one person's future agency while limiting another person's immediate capacity to collaborate. Evaluation requires attention to both effects.

At the level of *manifestation reality*, permissions become visible as contract clauses, licence notices, role assignments, repository settings, access logs, ethics approvals, publication pages, redaction marks, complaints, and actual patterns of use. Such manifestations are fallible evidence of the underlying arrangement. A "CC BY" tag can be technically present despite defective rights clearance. An access-control log can prove that a user retrieved a file but not that every use of its contents was authorized. A decision register may show institutional approval without demonstrating that all affected people were consulted or protected. Conversely, a lawful exception may permit some uses even if a repository's metadata field fails to describe it. Observational research should therefore distinguish the existence, correctness, visibility, and practical enforcement of each recorded permission.

For empirical investigation, several hypotheses follow. Commons that maintain explicit component-level permission reviews may show fewer unauthorized disclosures or avoidable release reversals than otherwise similar commons that use uniform labels, holding relevant project characteristics and review intensity reasonably comparable. Permission records that include an unresolved status may reduce premature publication, but they could also delay legitimate reuse and amplify institutional gatekeeping. Accessible appeal procedures may mitigate such delay, provided affected contributors and data subjects can meaningfully use them without retaliation or excessive administrative cost. These are competing possibilities, not demonstrated results; comparative evaluation should measure both prevented harms and foregone legitimate opportunities. A GR explanation would need to identify relational mechanisms with added explanatory value beyond ordinary legal compliance, organizational competence, and information-system quality.

4.8 Institutional Design Interfaces and the Transition to Recognition

The preceding analysis supports a limited governance design for an assistance-related commons. First, the institution can maintain a resource inventory that specifies components and versions without exposing confidential evidence to general members. Second, it can record the asserted authority behind each grant, together with any unresolved ownership or third-party rights. Third, it can evaluate requested actions by purpose, actor, context, and time, including applicable exceptions and safeguards. Fourth, it can separate public licences from restricted access decisions, documenting the legal and practical consequences of each. Fifth, it can offer a proportionate route for correction, review, or challenge, particularly when a

decision affects a contributor's credit or an affected person's safety. These five functions are proposed analytical interfaces, not an automatically sufficient legal compliance programme.

A workable interface also requires a decision about *who bears the cost of uncertainty*. A vulnerable participant may be unable to provide extensive evidence about a disclosure risk, while a contributor may be unable to hire counsel to contest an erroneous restriction. A design that places evidentiary burdens entirely on such participants could preserve formally correct records while reproducing severe asymmetry. Institutions may therefore consider accessible assistance, protected reporting, documented reasons, review by appropriately independent persons, and timely reconsideration, balanced against confidentiality and lawful restrictions on disclosure. The feasibility of those procedures depends on staffing, authority, funding, and organizational scale; the framework does not presume that every commons can sustain the same apparatus.

Permissions, finally, create *conditions of possible circulation*; they do not quantify the value of a contribution or determine whose role merits scholarly authorship or social recognition. A person may lawfully grant extensive reuse rights while receiving inadequate credit. Another person may be accurately named as a contributor without holding rights in the finished work. A patient or beneficiary may retain powerful privacy interests despite contributing no licensable expression. Preserving these distinctions prevents the proposed generative commons from equating openness with distributive justice or from treating access restriction as necessarily opposed to value creation. The subsequent analysis of attribution, recognition, and scholarly credit must therefore begin with the permission boundaries established here, while examining independent normative reasons for acknowledging both visible production and less visible sustaining work.

5 Attribution, Recognition, and Scholarly Credit

A contribution may be historically identifiable, lawfully reusable, and important to an assistance-related research infrastructure while remaining poorly recognized in the scholarly or institutional record. Conversely, a contributor may be prominently credited for a published output whose underlying data, methodological work, or operational maintenance was performed by persons who have little control over how the result is presented. These differences raise a governance question distinct from both provenance reconstruction and permission to reuse: under which conditions should a historically situated contribution acquire a particular form of descriptive, scholarly, professional, or community recognition? This section develops a bounded account of attribution and recognition for heterogeneous knowledge commons. It distinguishes recorded activity from justified credit, identifies the disciplinary and institutional conventions governing scholarly authorship, considers protected and collective forms of acknowledgement, proposes contestable recognition procedures, and examines delayed and derivative contributions. The analysis uses existing research-integrity guidance and contributor standards as antecedents and treats its additional Generative Relational (GR) vocabulary as a provisional interpretation rather than an independent authority for assigning authorship, legal entitlements, or academic rank.

5.1 Descriptive Attribution and Normative Recognition

Descriptive attribution identifies a person, group, or institution as having performed, supplied, revised, maintained, or made possible some specified activity or artifact. *Recognition* is a further act through which an institution, scholarly community, or affected population assigns significance to that contribution under a declared practice. A data-curation credit might record a verifiable activity; coauthorship adds a publication-specific status that carries responsibilities; an acknowledgement expresses appreciation while potentially implying association with the work; a community benefit agreement may establish a quite different set of claims. Each position relies on partly distinct facts and standards. A functioning provenance record can support recognition decisions without deciding them in advance.

The principal distinction can be illustrated by a methodological repository maintained for volunteer education. A contributor may correct a multilingual questionnaire, a second person may facilitate a diffi-

cult conversation between volunteers and researchers, and a third may develop the statistical design of a subsequently published analysis. An activity log might accurately record all three contributions. Whether any person qualifies for the manuscript byline depends on the applicable scholarly criteria, the participant's opportunity to assume publication responsibilities, and the actual contribution to that manuscript. Whether each person should appear in an acknowledgement, a contributor appendix, an internal professional record, or a protected community account requires a separate assessment of relevance, consent, privacy, and local practice. Accurate logs are necessary evidence for some decisions, but the inference from *was involved* to *is entitled to this particular credit* requires additional premises.

A further distinction concerns *recognition as evidence* and *recognition as reward*. A citation may enable a reader to recover a method's origin; a named acknowledgement may enhance professional opportunities; an authorship designation can affect careers and accountability; a collective acknowledgement can support the visibility of long-term institutional labor. These effects may coexist, yet their meaning differs among fields and locations. A researcher might prefer an accurate, non-public record to a prestigious public attribution because a humanitarian location or personal affiliation creates risk. Accordingly, more visible credit does not invariably constitute better recognition. The question is whether the offered form matches the contribution, the applicable rules, the person's legitimate preferences, and the possible consequences for other people.

It is helpful to distinguish an additional *moral claim of fair treatment* from a *legally enforceable entitlement*. Copyright-related attribution conditions, where applicable, follow the actual licence or legal regime; academic authorship is commonly governed by journal and disciplinary policies; employment-based appraisal depends on institutional arrangements; restitution or payment can depend on independent agreements. WIPO's account of economic and moral rights cautions that these categories vary by jurisdiction [69]. A commons' aspiration to recognize every generative contribution therefore does not itself create a uniform legal right to coauthorship, attribution in every derivative, or monetary return. The proposed framework instead asks whether these distinct pathways can be mapped, reviewed, and revised without concealing the governing source of each claim.

5.2 Contributor Roles and the Limits of Role Taxonomies

The Contributor Roles Taxonomy (CRediT), published as ANSI/NISO Z39.104-2022, provides a useful established vocabulary for classifying contributions to research outputs. Its fourteen roles include conceptualization, data curation, formal analysis, funding acquisition, investigation, methodology, project administration, resources, software, supervision, validation, visualization, original-draft writing, and review or editing [42]. The taxonomy explicitly distinguishes the description of roles from determination of authorship; several roles may attach to one person, while several people may perform a role. Consequently, role metadata can make distributed labor legible without solving the normative question of who belongs on a particular byline.

An assistance-related commons could adopt these categories as a *translation layer* for scholarly artifacts while retaining a richer local vocabulary. Some relevant activities fit CRediT relatively well: data curators maintain usable metadata, translators may participate in substantive drafting or adaptations, researchers validate analytical results, and project administrators coordinate workflows. Other activities fit only imperfectly. Mediating a disagreement between service users and analysts, keeping volunteers safe during a sensitive encounter, maintaining the continuity of a fragile local relationship, or identifying an exclusion introduced by a research instrument may constitute significant forms of situated work. Such activities should not be forced into a scholarly taxonomy if the forced translation would misdescribe them. A local role description may remain distinct, with an optional mapped CRediT role when the research output and actual activity warrant it.

The granularity of a role matters. Recording that a person performed *validation* says relatively little about the object validated, the time period, the evidence examined, or the limits of that validation. A credit-bearing claim is more informative when attached to a bounded artifact version or event: for example, validation of an anonymized codebook against a named specification, or translation review of

a particular training document. This boundedness avoids misleading inferences in which an individual who reviewed a small component appears to have endorsed every downstream analysis or an institution is represented as supporting an external publication merely because it once supplied equipment. Provenance relations and artifact versions can provide the relevant referents, while the credit review adds a separately justified decision [63, 16].

Standards for persistent identifiers make some of these descriptive links technically portable. The DataCite metadata schema distinguishes creators from contributors and provides role-related metadata; ORCID supports contribution-related information in its works metadata [16, 45]. These are useful affordances for discovery, interoperability, and correction. They are limited by the completeness and accuracy of the information submitted. An identifier confirms a referential link under a registry's conventions; it does not independently establish the amount of labor undertaken, the voluntariness of participation, the validity of a rights claim, or the fairness of a credit decision. Registry metadata should therefore remain inspectable as a claim with an attributable source and revision history, not as an unchallengeable record of merit.

5.3 Scholarly Authorship, Accountability, and Participation Opportunities

In scholarly publication, authorship is a particularly consequential category because it combines recognition with public responsibility for the work. The International Committee of Medical Journal Editors (ICMJE) recommends four conjunctive criteria concerning substantive intellectual contribution, drafting or critical review, approval of the version published, and accountability for the work [30]. These criteria govern a defined professional recommendation in medical publishing; journals and disciplines may apply different policies. An interdisciplinary commons that produces both biomedical and non-biomedical outputs should identify the policy governing the particular publication, rather than mechanically extending a single journal's rules to all artifacts.

The criteria also imply procedural duties for those controlling publication. The ICMJE advises that those satisfying the substantive-contribution criterion be given an opportunity to participate in drafting or review and final approval, rather than excluded through denial of those opportunities [30]. This is important under institutional asymmetry. A local collaborator may acquire or interpret field data while a distant academic team controls manuscript access, submission schedules, language, and communication with editors. Merely announcing a neutral authorship rule after excluding that collaborator from review can disguise an unequal opportunity structure. The relevant assessment should therefore examine both contributions actually performed and institutional conditions that facilitated or obstructed the remaining publication responsibilities.

The byline cannot serve as an exhaustive inventory of everyone who made the research possible. Research subjects, service users, field interpreters, technical maintenance personnel, community representatives, funders, and operational coordinators occupy distinct relationships to the research. Some may qualify for authorship on the relevant criteria; others may merit acknowledgement, an independently citable artifact, a professional contribution record, or benefits governed by a separate arrangement. A participant's disclosure of personal information or experience should not be reclassified as authorship merely because it was causally important to an analysis. Equally, a person whose sustained interpretation or design work satisfies the applicable authorship criteria should not be relegated to a generic acknowledgement solely because they lack an academic title, receive no salary, or belong to an external organization.

The relation between credit and accountability is also bounded. When a byline implies responsibility for the integrity of the publication, it would be misleading to extend the same form of responsibility to a volunteer who supplied a limited translation or to a community representative who reviewed the comprehensibility of a questionnaire. A detailed contributor statement can specify the component for which a person was responsible, while coauthors remain subject to the publication's actual accountability policy. The corresponding author and sponsoring institution may carry distinct procedural responsibilities. These distinctions allow accurate recognition without distributing liability by analogy or treating profes-

sional hierarchy as a substitute for assessing contribution.

The Committee on Publication Ethics (COPE) discusses authorship disputes, including problems involving multiple individuals or institutions and the responsibilities of editorial and institutional processes [10]. In the commons framework, the relevant implication is procedural: preserve an identifiable path for challenging proposed credit, allow competing evidence to be evaluated, and separate a question about authorship from a question about the reliability of scientific findings. Neither an open repository administrator nor a journal editor should be treated as an omniscient arbiter of contested historical work. Jurisdiction, the publisher's policy, institutional responsibility, and the limits of available evidence shape the appropriate route for resolution.

5.4 Acknowledgements, Visibility, and Protective Recognition

Recognition can itself generate exposure. In humanitarian, medical, educational, and volunteer settings, linking a name to an activity may disclose disability, service use, migration status, employment conditions, location, personal beliefs, or involvement in politically sensitive work. Acknowledgement can also imply that a named person endorses a publication's interpretations. The ICMJE consequently advises written permission before naming non-author contributors in acknowledgements in the medical-journal setting [30]. This does not settle every jurisdiction's consent requirement, but it illustrates a practical ethical distinction between verifying participation and securing permission to publish the participant's association with a particular output.

The proposed infrastructure should therefore support several modes of visibility: named public attribution, role-based public description without personal identification, group attribution where appropriate, restricted institutional recognition, delayed disclosure subject to renewed review, and withholding of identifying information when public association would be unsafe or unauthorized. The chosen form should be sensitive to purpose, disclosure risks, and any applicable privacy, employment, confidentiality, or licensing obligations. An individual's preference for anonymity can sometimes coexist with an internally verifiable contribution record, although the feasibility and retention of that record must itself be justified. In a setting where even an internal listing creates danger, minimization or non-retention may be preferable.

Consent to attribution should be treated as contextual rather than an indefinitely reusable blank cheque. Agreement to appear in an internal training handbook does not necessarily authorize naming in a public study, publicity material, commercial product, or controversy over humanitarian operations. Nor should a contributor's refusal to be publicly named be misinterpreted as a waiver of a copyright-related right where that right exists. The correct inquiry distinguishes legal obligations, an organization's documentation practices, ethical preferences, and the actual information being disclosed. Especially when power is unequal, a person may agree to public recognition because they believe an employer, programme coordinator, or researcher expects it. An ethically defensible procedure offers meaningful alternatives and avoids making exposure an undisclosed condition of participation.

Collective credit raises a related question. Communities, teams, and locally constituted groups may contribute knowledge whose historical production cannot be accurately attributed to a single named individual. Under some practices, a collective title, governance body, or institution may be the appropriate public referent. Such arrangements require care: a collective designation should not allow a powerful representative to appropriate the work of members whose recognition preferences differ. The CARE Principles for Indigenous Data Governance emphasize collective benefit, authority to control, responsibility, and ethics in the specific context of Indigenous data governance [5]. Their provenance and substantive claims should be respected rather than generalized into an assertion that an arbitrary research consortium may control all community knowledge by invoking the word *collective*. The proposed framework can learn from this literature while retaining the particularity of communities, authorities, and data-governance relationships.

5.5 Maintenance Work, Intermediaries, and Recognition Asymmetries

Many reusable research artifacts depend on work that remains causally important after the original contributor has left. Documentation maintenance, software dependency updates, transcription correction, safety review, participant liaison, bibliographic verification, and multilingual interpretation may influence what later researchers can know and accomplish. The visibility of this work often depends on the interface through which a final output is published. A person who designs a conceptual framework may be readily identified in a paper’s text, whereas a contributor who preserves the integrity of a data pipeline or who facilitates a safe consent procedure may appear only in an internal log. This difference need not imply deliberate misconduct; publication formats, organizational roles, and disciplinary conventions also structure visibility. Nevertheless, it can create patterned recognition asymmetries that warrant scrutiny.

The framework identifies three analytically distinguishable processes. *Selection* concerns which activities are recorded in the first place. *Translation* concerns how recorded activities are represented in scholarly vocabulary, such as CRediT roles or acknowledgement statements. *Allocation* concerns the procedures through which a publication, award, employment record, or derivative repository confers particular recognition. A contributor can be overlooked at any of these interfaces. For instance, an activity may never enter the institutional record; it may be recorded as a generic administrative task despite a substantive intellectual component; or it may be correctly described but discounted when authorship or resource-allocation decisions are made. The three processes call for different remedies, and their effects should not be collapsed into a single allegation of misattribution.

A situated intermediary is especially vulnerable to such translation loss. Imagine a coordinator who understands the needs of a service community and translates those needs into research-design constraints. Part of the contribution consists of creating or sustaining the relationship that makes later research possible. A subsequent manuscript may report only the instrument or dataset produced through that relationship. Evaluating the intermediary’s contribution requires evidence about the actual intellectual, operational, and relational activities performed. The existence of relational mediation does not by itself meet authorship criteria; conversely, the inability of a standard role label to capture its significance is not evidence of insignificance. A separate, context-sensitive contribution statement can preserve the record until an authorized reviewer determines the appropriate recognition.

The San Francisco Declaration on Research Assessment (DORA) advocates evaluation practices that consider research outputs such as data and software and that avoid using journal-level indicators as proxies for the significance of individual contributions [52]. This orientation supports attention to research infrastructures and maintenance work, although DORA does not establish the particular recognition-allocation rules proposed here. A commons might accordingly make independently produced documentation, datasets, training materials, protocols, or maintained software citable and reviewable when disclosure is legitimate. Crediting an artifact directly can sometimes provide a more faithful account than attempting to convert all contributions into additional names on a paper byline. Such recognition remains incomplete if the artifact’s authorship, permissions, evidence, and links to subsequent uses are unreliable.

Power also operates through access to the recognition system itself. Senior researchers may control publication schedules, grant narratives, reporting categories, and professional recommendations; administrators may define allowable metadata; funders may decide which outputs qualify for assessment. Conversely, junior researchers and volunteers may possess vital evidence about what occurred without having an accepted channel through which to present it. A bounded recognition framework should therefore identify who can submit or contest a credit claim, who evaluates the evidence, which conflicts require recusal, how decisions are recorded, and how a contributor can seek review. These are institutional design proposals for later empirical testing, not an assumption that all organizations can implement them at equal cost.

5.6 Temporal Attribution in Derived and Distributed Outputs

Attribution problems become more difficult when the value of a contribution becomes apparent only after a succession of transformations. A volunteer may document an approach to communicating with

patients; another collaborator may generalize it into a training method; a research group may adapt that method into an evaluation instrument; and a later team may incorporate the instrument into a study. The initial activity could be traceable, but the credit appropriate for each derivative depends on the actual degree and nature of dependence, applicable licensing conditions, relevant scholarly conventions, and the extent to which the person participated in the later intellectual work. A historical causal chain is therefore more inclusive than a chain of enforceable attribution or authorship obligations.

Three timescales should remain visible. At the *contribution time*, participants act under particular expectations, permissions, and institutional conditions. At the *transformation time*, later actors modify, interpret, or combine resources, potentially producing new independent contributions. At the *recognition time*, an institution or publication assigns a credit designation, sometimes with substantially incomplete evidence of earlier events. These times can diverge by years. A later claim that a source was important may warrant historical acknowledgement or citation; it does not automatically establish retroactive coauthorship of an unrelated publication. Likewise, a newly valuable reuse does not amend a compliant recipient’s already granted Creative Commons licence merely because the contributor’s economic prospects subsequently changed [13, 15].

The proposed infrastructure can preserve relations between artifact versions and recognition decisions without pretending to settle all downstream questions at the outset. A contribution to version one can be linked to a modified version two, then to a later output with an evidence-qualified relationship. The relationship could be direct incorporation, adaptation, methodological dependence, inspiration, or an unresolved claim of influence. Each relation should have a source and a scope. The credit decision for the later output can then indicate which parts of that relation were considered and which claims remain contested. This approach reduces the risk that a single early log is treated as a perpetual ownership ledger of all subsequent intellectual activity.

Delayed recognition presents a further equity question. People who later leave academia, change employers, lose contact, or face insecurity may be less able to defend their place in a scholarly record. A governance proposal could permit retrospective contribution claims supported by contemporaneous evidence and subject to proportionate review, while preserving other parties’ procedural rights and the integrity of an established publication. The practical route may be a corrected contributor statement, an amended repository record, an acknowledgement in a later version, or institutional adjudication under a relevant policy. The ICMJE’s publication guidance on correction and version control calls for documented corrections and prior-version preservation in its domain [29]. A knowledge commons may learn from that versioning practice without implying that a repository maintainer has the same jurisdiction or editorial powers as a scholarly journal.

5.7 A Contestable Recognition Record and Decision Procedure

A workable framework requires a decision object more specific than a list of names and less ambitious than a universal calculus of merit. For a contribution event e associated with an output o at a review time t , the proposed *recognition record* is represented in Equation 3. The notation is a design vocabulary for auditable institutional decisions; it is not an empirical law or a formula for comparing persons.

$$\mathcal{R}_t(e, o) = (\rho_t, \beta_t, \delta_t, \sigma_t)_{e,o}. \quad (3)$$

Here ρ_t identifies the bounded activity or role description and its evidential link to the output; β_t records the basis under which a particular kind of credit is assigned, such as a journal policy, licence condition, agreed repository procedure, or independently articulated ethical rationale; δ_t denotes the approved disclosure mode and its relevant conditions; and σ_t denotes review status, including substantiated, provisional, contested, corrected, or withdrawn as locally defined. A full record also needs the responsible reviewer, decision date, applicable policy version, and link to preserved evidence. These fields are omitted from Equation 3 for legibility but remain necessary to evaluate an implementation.

The four components have distinct functions. A role description without a normative basis is a descriptive record, not an authorship award. A formally granted credit designation with no approved

Table 5: Proposed credit pathways for assistance-related research commons. Entries are illustrative and depend on applicable policies, evidence, rights, and privacy requirements.

Recognition form	Primary decision question	Relevant safeguards
Publication authorship	Does the participant satisfy the publication’s criteria and responsibilities?	Participation opportunity, approval, accountability, dispute review.
Role statement	Which bounded activities contributed to a specified output?	Evidence, role-definition scope, contributor review.
Citation or source credit	Which identifiable prior artifact or method was used?	Correct source, version, attribution obligations, reproducibility.
Acknowledgement	Is acknowledgement appropriate, accurate, and safe to publish?	Permission to name, avoidance of implied endorsement, contextual privacy.
Protected institutional credit	Can contribution be recognized without public disclosure?	Access control, purpose limitation, retention review, correction channel.
Collective recognition	What group relationship and authority justify a collective designation?	Member voice, community governance, non-appropriation, safe visibility.

disclosure mode may need to remain in a restricted record until the participant and organization resolve publication safety. A status label with no evidence trail can obscure an arbitrary decision. A policy basis without a bounded activity can produce automatic or honorary allocation. The record is therefore intentionally typed and non-scalar. It has no operation that adds role counts into a merit score or converts them mechanically into author order, payment, ownership, or a numerical contribution share.

Table 5 distinguishes common recognition outputs and the reviews they may require. Its categories can overlap: a coauthor may also have CRediT roles; a cited method may also carry a copyright attribution condition; a protected contributor may have an internal role record and no public name. Where fields and jurisdictions impose additional requirements, the table’s entries are only starting points for local analysis.

An institution considering this model would begin by delimiting the output and identifying candidate contributions through participant accounts, artifact histories, and other proportionate evidence. It would next identify the external and internal rules governing each proposed recognition form. The responsible reviewer would then assess the claim, identify missing information and competing accounts, offer an appropriate opportunity to respond, decide on the disclosure mode, and create a dated determination capable of correction. Claims implicating authorship, ownership, research integrity, or protected data should be routed to the body with actual competence under applicable arrangements. A commons steward may maintain the records and facilitate a process without assuming an adjudicative power the institution has not granted.

Contestation should be meaningful even where a claim cannot be publicly adjudicated. A contributor may need to challenge a role assignment, a deceased or uncontactable contributor may have no opportunity to consent, or several witnesses may offer incompatible histories. The record may preserve qualified evidence and a provisional status while protecting personal information. Appeals and corrections should be proportionate to the consequences of the decision, and highly sensitive facts need not be displayed to demonstrate that an authorized process occurred. Reviewers should separate disagreement about a credit claim from allegations of misconduct and avoid publishing unverified accusations. Such safeguards make the recognition infrastructure more accountable while acknowledging the limits of reconstructing historical activities.

5.8 Generative Relational Interpretation and Research Limits

The GR interpretation locates recognition within a historically developing network of relations among persons, artifacts, institutions, classifications, and future opportunities. At the level of *ontological reality*, this analysis suspends judgment about the ultimate existence or essence of generative value, credit, and collective agency. The vocabulary of relational beings and generative processes does not establish a

metaphysical truth about authorship or create independent rights. Questions concerning the ontology of creativity, moral agency, or scholarly responsibility remain open to further investigation and to disagreement among philosophical traditions.

At the level of *relational reality*, recognition practices may be treated as historically constituted structures with causal or generative effects under identifiable circumstances. A role taxonomy can condition which work an organization notices; an authorship review can affect professional opportunities; a consent practice can change whether contributors trust a knowledge infrastructure; and persistent identifiers may enable later rediscovery of a method. Such effects are mediated by power, disciplinary conventions, available resources, and participants' interpretations. The framework proposes that recording, translating, and allocating recognition are partially independent interfaces whose misalignment can obstruct value circulation. This remains an explanatory hypothesis. Rival accounts include ordinary publication conventions, labor-market stratification, disciplinary prestige, administrative capacity, and differences in project scope; their contributions must be examined rather than assumed away.

At the level of *manifestation reality*, recognition is encountered through bylines, role tables, metadata, acknowledgements, institutional correspondence, repository versions, professional evaluations, or the deliberate absence of identifying information. These traces provide uneven evidence of the underlying relationships. A missing acknowledgement may reflect exclusion, a legitimate preference for anonymity, a narrow journal policy, or a simple mistake; the visible absence alone does not distinguish them. Similarly, a detailed contribution statement may represent careful governance or a formalistic process that participants could not meaningfully contest. The interpretation therefore requires both document analysis and appropriately consented accounts of participants' experiences before claims about fairness or generativity can be made.

Several hypotheses become amenable to comparative evaluation. One concerns whether version-linked role descriptions reduce disputes about the origin and scope of a contribution relative to undifferentiated acknowledgement lists, conditional on project size and disciplinary practice. Another concerns whether participants offered meaningful credit review and safe visibility alternatives report greater confidence in the institution's recognition procedures than otherwise similar participants without those options. A third concerns whether repeated recognition of less visible maintenance and mediation activities improves the continued availability and quality of shared research resources. These hypotheses require specified samples, baseline comparisons, longitudinal observations where appropriate, and protection against social-desirability bias, retaliation risk, and selective participation. None follows merely from a relational vocabulary.

The section's result is a bounded institutional proposition. A generative commons can be studied through the interfaces connecting historical evidence, descriptive contribution, justified recognition, permissible disclosure, and revision. The arrangements that emerge may support fairer opportunities for recognition and future circulation of heterogeneous value, but the inference must be made through the applicable normative and legal rules and evidence of real institutional practices. The recognition record in Equation 3 and the alternatives in Table 5 provide a starting vocabulary for such inquiry, leaving the actual distribution, conversion, and possible return of value to subsequent analysis.

6 Heterogeneous Value and Conversion Conditions

The institutional significance of a contribution cannot be inferred directly from its recorded provenance, legal reusability, or scholarly recognition. A volunteer's revised translation, for example, may improve the accessibility of a training method, make subsequent research possible, support the translator's learning, and impose new review demands on other participants. These consequences concern distinct beneficiaries, evaluative standards, and temporal horizons. This section develops a vocabulary for heterogeneous value in assistance-related knowledge commons and specifies the conditions under which one form of value may enable another. The argument first separates value types, claimants, and evaluative contexts; then examines the capacities required for generation and recognition, the institutional organization of conversion, constraints on commensuration, and the burdens that may accompany apparent

gains. A limited relational representation clarifies the proposed analytical interface without postulating a common unit of value. Constructed configurations and a three-level Generative Relational (GR) interpretation conclude the analysis. Its aim is to supply hypotheses for research rather than an accounting rule, legal doctrine, or empirically established theory of welfare.

6.1 Value Types, Bearers, and Evaluative Positions

For the present study, *value* designates an attributed significance of an activity, capacity, resource, relation, or consequence under a specified evaluative position. The relevant position includes whose circumstances are considered, what can count as an improvement or injury, the time at which the judgment is made, and the standards under which it is justified. This working definition is deliberately relational and epistemically limited. It does not presuppose that value is reducible to preference satisfaction, market exchange, productivity, institutional reputation, or a single moral theory. Nor does it settle whether a particular nonhuman entity has an independent evaluative standing. These matters depend on arguments and evidence beyond the scope of the present operational vocabulary.

Several useful types can be distinguished without treating the distinctions as exhaustive. *Epistemic value* may consist in more reliable evidence, a reusable analytic procedure, an important correction, or knowledge made accessible to additional researchers. *Capability value* concerns acquired skills, the ability to act with greater independence, and the practical opportunity to use a competence under feasible conditions. *Relational value* involves the importance that participants attach to respectful cooperation, credible commitments, recognition, trust, or continuity of supportive relations. *Institutional value* concerns the ability of organizations to make accountable decisions, preserve appropriate records, distribute responsibility, or maintain a service under legitimate arrangements. *Material value* includes time saved, access to facilities, equipment, income, and other resources with economic or practical uses. *Protective value* may be associated with reduced exposure to avoidable harm or improved access to justified safeguards. These categories overlap in observed activities while retaining different criteria of interpretation.

The point of this classification is not to declare that one set of goods has greater intrinsic worth than another. Sen's account of development through substantive freedoms illustrates the importance of evaluating what persons can actually do and become, while remaining distinct from a simple income metric [53]. Work on shared and social values likewise provides developed methods for distinguishing the objects, participants, intentions, scales, and procedures of valuation [36]. The IPBES assessment concerns values of nature rather than volunteer institutions, yet its methodological treatment of plural evaluative approaches is relevant as a carefully limited analogy [28]. A generative commons should therefore begin with an explicit account of the evaluative question, not with a presumption that all useful consequences can be entered as comparable benefits in a single ledger.

An *evaluation bearer* is the person, group, institution, or other relevant entity whose situation is being assessed. This term does not automatically confer legal personhood, authorship, contractual standing, or the authority to speak for a community. The *evaluator* is the party authorized or otherwise positioned to make a particular assessment. A volunteer may judge that an activity was educationally meaningful; a community group may value the same activity for its accessibility; a university may evaluate its methodological reliability; and a service institution may judge it by safety and continuity requirements. These assessments may agree, diverge, or remain partly inaccessible to one another. An institution's ability to publish a quantified performance indicator does not give its indicator priority over a participant's safely expressed assessment of a loss of agency.

6.2 Generative Capacities and Conditions of Value Production

The production of a potentially valuable artifact is conditioned by the capacities of contributors, the resources to which they have legitimate access, and the relationships through which their work becomes possible. An individual can possess substantive expertise yet lack time, supervision, translation support, adequate equipment, or permission to use a necessary dataset. Another contributor may have little formal disciplinary status but provide essential situated knowledge that changes the adequacy of a research

method. These differences matter because observable outputs are jointly conditioned by abilities, enabling arrangements, and constraints. Treating a publication count or repository download as the total contribution of one named participant can conceal the supporting relations that made the output feasible.

Within an aid-related infrastructure, feasible production requires at least a bounded object of work, an ethically and legally permissible purpose, sufficient competencies, material support, and a procedure capable of responding to errors or changed circumstances. Each condition is context sensitive. A public teaching diagram may need little more than permission, review, and appropriate attribution. A methodological resource derived from patient-related or humanitarian experience may need professional oversight, privacy assessment, careful translation, and meaningful consultation with affected persons before even an abstracted description can be circulated. Absence of an established permission may be a legitimate stopping condition, not a deficiency that greater technical efficiency should overcome.

Generation is also distributed through time. A maintenance correction may prevent future errors without producing a conspicuous new artifact; early educational work may make an individual's later research contribution possible; a participant's refusal to disclose sensitive material may preserve trust and dignity despite reducing the quantity of available data. In each case, the important consequence may take the form of sustained capacity, avoided harm, or a protected option. Such value is difficult to infer from the immediate quantity of outputs. The research programme should examine both newly created capabilities and the preservation of valued conditions that might otherwise be lost.

Eglash and colleagues' account of generative justice is an important antecedent. Their analysis foregrounds the capacity of value generators to retain control over productive processes and to participate in beneficial circular flows, including in contexts of historical extraction [17]. The present paper inherits that concern rather than claiming it as a GR invention. Its narrower proposal asks how contribution documentation, permission systems, institutional recognition, and later transformations may condition distinct kinds of gain and loss in voluntary or assistance-related research. The connection to generative justice is an argumentative interface, not an assertion that a compliant provenance system by itself establishes just distribution.

6.3 Recognition of Value and Evaluation Uncertainty

A potentially beneficial consequence may remain unrecognized because the institution lacks an appropriate category, the relevant outcome has not yet appeared, the people able to explain it are excluded, or the evidence is inaccessible for good protective reasons. Conversely, a project may be judged valuable through a convenient metric while participants experience little usable benefit. The distinction between value production and *recognition of value* is therefore essential to the interpretation of institutional reports. A recognized value is a supported assessment made under a particular procedure; the assessment can be provisional, contested, or subsequently corrected.

Recognition requires attention to counterfactual and temporal questions. A resource might be reused repeatedly because it is excellent, because alternatives are unavailable, because its institution controls distribution, or because its use is required by an established workflow. Repository traffic alone does not distinguish these causes. An educational intervention may appear successful through attendance while failing to provide a participant with the ability to apply what was taught. Similarly, a highly cited dataset may incorporate work from poorly credited contributors, and citation counts do not disclose whether those contributors obtained meaningful opportunities or consented to public identification. The relation between observed outputs and the evaluative predicate must be argued, not presumed.

The International Labour Organization provides established guidance for defining and measuring volunteer work and for producing statistical estimates of its economic value [34]. Such estimation can be appropriate for defined statistical questions, including the scale of volunteer labor. Its estimand should remain explicit. A replacement-cost proxy is not a measure of the volunteer's subjective flourishing, an ethical judgment of organizational fairness, or evidence that a specific activity produced a measurable health benefit. Similarly, time contributed is a quantity of labor input, not a sufficient measure of quality, agency, or the downstream effects of the work. A study may use several measures for several questions,

with separate uncertainty and source statements.

Where different stakeholders employ unlike value concepts, a justified assessment process may combine qualitative accounts, performance indicators, deliberation, protected testimony, and evidence of actual use. Kenter and colleagues show why shared and social values require attention to who articulates them and through which elicitation processes [36]. Their work addresses environmental valuation, so the direct implication for volunteer commons is methodological: record the evaluative standpoint and procedure alongside the reported result. A community member’s reported benefit cannot be replaced by an institution’s estimate without stating what relation between the two claims is being proposed and who has standing to contest it.

6.4 Conversion Interfaces and Partial Relational Correspondence

The term *conversion* refers here to a situated process through which an existing resource, capacity, relation, or recognized contribution helps make a differently typed benefit or evaluative possibility available. For example, a carefully documented translation may facilitate teaching, teaching may improve a participant’s methodological competence, and competence may make subsequent employment or research collaboration possible. The later outcomes may depend on numerous intervening conditions. Conversion does not require the original contributor to lose the first value, nor does it establish that the recipient’s benefit is equivalent to the initial activity. It is therefore analytically distinct from a price exchange, a rights transfer, and an automatically enforceable claim of compensation.

An *interface* specifies the institutional and practical conditions under which a proposed conversion can be attempted and evaluated. Relevant conditions can include a verified contribution history, actual legal permission, safe access, interpretable documentation, availability of intermediary expertise, trust adequate to sustain participation, material capacity, and an accountable means of revision. A provenance relation may help a learner locate an appropriate method; an approved translation may make that method intelligible; a supervisory arrangement may enable its responsible application. None of these interfaces independently proves that the hoped-for outcome occurred. The conditions also differ across actors: a resource usable by an experienced researcher may be inaccessible to a volunteer without training, and a permission granted for internal teaching may be insufficient for commercial publication.

A minimal representation treats values as typed sets of context-dependent assessments rather than commensurable numerical stocks. Let $\mathcal{V}_{a,t}^\tau$ denote candidate value assessments of type τ concerning bearer a at time t ; let σ be a potentially different type, b another bearer, and t' a later evaluation time. The proposed conversion correspondence is shown in Equation 4. Its set-theoretic form states a typing constraint; a substantive instance of the relation must additionally specify an observed or defensibly hypothesized transformation, a governance context, and evidence connecting the assessments.

$$\mathcal{C}_{a,b;t,t'}^{\tau,\sigma} \subseteq \mathcal{V}_{a,t}^\tau \times \mathcal{V}_{b,t'}^\sigma, \quad \text{Dom}\left(\mathcal{C}_{a,b;t,t'}^{\tau,\sigma}\right) \subseteq \mathcal{V}_{a,t}^\tau. \quad (4)$$

Here $\mathcal{C}$ is a context-specific relation connecting selected source assessments and candidate downstream assessments under independently examined conditions; it may have an empty or partial domain and can associate a source with several possible outcomes. Membership in the relation is an empirical or interpretative claim requiring a stated evidential basis, not a theorem that the first assessment causes the second. Types identify evaluative domains, not units automatically comparable across subjects. The second inclusion simply records that the domain contains only source assessments for which a relevant correspondence is proposed. The representation deliberately provides no additive total, exchange rate, conversion efficiency coefficient, or universal ordering. Its purpose is to make the burden of identifying a conversion pathway visible.

The institutional explanation of a particular $\mathcal{C}$ would need to specify the transforming activities, supporting infrastructure, eligibility and permission rules, alternative possible mechanisms, temporal lag, and outcomes whose meaning could be checked with the bearers concerned. Where evidence is unavailable, the relation should remain hypothetical rather than being populated by inferred benefits. Where conversion requires access to protected information, a legitimate prohibition or restriction can leave the

relation undefined for that activity even if a possible material gain is foreseeable. Where conversion produces gains for one party but costs for another, the relation must be studied together with those distinct consequences; it should not silently represent a net gain for the entire commons.

6.5 Commensuration, Ordering, and Legitimate Comparisons

Institutional decisions sometimes require comparison among competing uses of scarce resources. A steward may need to select a translation project, allocate supervised access to a laboratory, or decide which methodological error merits urgent review. Comparison in those settings need not imply that every value is assigned an exact common magnitude. One alternative is a constrained decision procedure: identify minimum safety and legal conditions, preserve protected opportunities for participation, record which considerations are relevant, and deliberate among the remaining feasible options. Another is a partially ordered assessment in which one option clearly improves a stated dimension without worsening others, while some pairs remain indeterminate or require an accountable institutional judgment.

The sociology of commensuration cautions that creating a common metric is itself a social process with cognitive and political effects. Espeland and Stevens specifically identify the transformation of unlike qualities into comparable quantities and its relation to power [18]. Applied to assistance-related commons, this raises the possibility that convenient indicators can favor already visible outputs over quiet maintenance, emotional labor, meaningful refusal, or culturally embedded expertise. A standardized metric may be useful for budgeting while still being inadequate for assessing dignity, trust, or intellectual contribution. The relevant question concerns what a metric measures, who defined it, which decisions it governs, and what it leaves unrepresented.

The distinction can be made precise without assuming that all comparisons are impossible. Two competing translation procedures may be compared for documented error rates on a defined corpus when the corpus, annotator process, and benchmark are appropriate. They may also be assessed for accessibility, staff burden, and respect for affected people's terminology. A procedure with lower measured error might be ethically unsuitable if it relies on unauthorized disclosures. A procedure preferred by one affected community may create additional learning costs for others. Evidence of one benefit does not settle a decision over different kinds of interests. Some comparisons warrant quantitative estimation, others structured qualitative judgment, and some call for negotiation or the preservation of legitimate plural alternatives.

A common unit may nevertheless be used for a carefully bounded domain. Monetary accounting can be relevant to operating costs, procurement, reimbursement, and the opportunity cost of volunteer time when the method and assumptions are specified. That bounded utility does not establish that knowledge, dignity, protective obligations, cultural relations, and economic savings share an exchange rate. It is especially important to distinguish a hypothetical compensatory payment from its legal basis and from the contributor's own evaluation of what would constitute fair recognition. A volunteer's choice to give time cannot be taken as conclusive evidence that their activity imposes no cost or that a subsequent commercial user owes a particular percentage of revenue.

6.6 Resource Costs, Depletion, and Adverse Conversions

Productive cooperation consumes resources and can redistribute burdens. A reusable dataset may require continuing annotation, security review, software maintenance, equipment replacement, or the attention of staff whose primary obligation is patient care or another protected activity. A training resource may be inexpensive to copy but expensive to explain, audit, or responsibly adapt. Where a commons counts visible outputs without the cost of sustaining these conditions, it may mistake the temporary use of accumulated institutional capacity for a self-regenerating contribution flow. Cost accounting should therefore distinguish initial creation, continued stewardship, safe access, modification, dispute resolution, and eventual retirement.

Some conversions can degrade the conditions that made generation possible. A volunteer's local knowledge might enable a publishable method while the publication exposes a person to identification

or makes further local participation less safe. A community-developed glossary might be repackaged as proprietary training content in a legally permitted way that nevertheless weakens the originating group's practical control. A standardized reporting template may increase managerial visibility while displacing time formerly spent on substantive assistance. These are possible mechanisms and constructed risks, not findings about particular institutions. They show why value generated for one beneficiary and measured under one criterion cannot be assumed to constitute an improvement for all affected parties.

It is useful to distinguish *foregone possibilities* from demonstrated harms. A contributor who receives no job offer after participating in a research commons has not necessarily been wronged or deprived of an entitlement. An institution that claims enhanced professional opportunity, however, should identify whether any such opportunity was actually made available and what conditions governed access. Likewise, the existence of revenue from a derivative can prompt an inquiry into licensing, attribution, employment terms, and voluntarily agreed benefit sharing; it does not by itself determine that the original participant holds a revenue claim. Legal obligations, contractual commitments, scholarly conventions, and proposed reciprocity arrangements retain separate authority.

Extraction is a further concern when an actor controls the conditions of recognition or the interfaces by which others can access value. The generative-justice literature emphasizes production control and unalienated value circulation [17]. The current proposal translates that concern into researchable questions about who can define eligibility, remove information from circulation, withhold the means of conversion, or appropriate credit for derived outputs. A small institution may lack funds to support all potential returns even while acting responsibly; a powerful intermediary may appear highly productive because it captures the visible outputs of labor performed elsewhere. These possibilities require evidence, attention to legitimate constraints, and comparison with explanations such as capacity scarcity and professional responsibility, rather than an automatic presumption of exploitation.

6.7 Comparative Conversion Configurations

Table 6 provides constructed configurations to separate source contributions, proposed conversion interfaces, possible benefits, and limitations. They are hypothetical research devices, not reports of observed hospital, university, humanitarian, or nonprofit practices. In particular, the cases do not presume permission to disclose records, approve interventions, or represent an institution. Their role is to clarify what evidence a later empirical study would need in order to distinguish a feasible pathway from a speculative narrative.

The glossary example demonstrates several distinct evaluation positions. The translator may value professional learning, the learner may value better access to instruction, and the institution may value fewer misunderstandings. Those gains require different evidence and may emerge at different times. A recorded improvement in test performance would not establish that the translator received an equivalent return. A privacy-preserving correction record might be more beneficial than public naming where the source language came from sensitive interactions. The choice among credit, payment, further participation, or private recognition therefore belongs to a separate institutional process.

The maintenance example emphasizes the dependence of future value on continued support. An artifact's initial release can generate opportunities for many users, while its maintenance may become concentrated on a small number of unpaid contributors. The number of downstream derivatives may grow at the same time as the maintainers' capacity declines. A theory concerned with generativity should thus examine stock and flow analogies cautiously: usage and output metrics are informative about certain observed activities, but an expanding volume of reuse neither guarantees regenerative support nor establishes a balanced circulation of benefits. Longitudinal data on staff time, correction rates, funding, participation, and declined requests would be more informative than a static diagram of successful derivatives.

The constructed cases also help specify plausible failures. A resource may be useful but legally unreleasable; a contributor may receive accurate credit without an opportunity to exercise it; a financial return may be paid while the cultural or protective costs remain unaddressed; or a project may succeed

Table 6: Constructed heterogeneous-value pathways in assistance-related knowledge commons. The pathways are hypotheses; identifiable benefits, lawful permissions, and participant judgments require independent assessment.

Initial contribution	Possible conversion and observable trace	Boundary or rival explanation
Reviewed multilingual glossary	Accessible training; supervised comprehension tests and subsequent corrections.	Privacy and copyright review; greater uptake may arise from mandatory use.
Documented data-cleaning routine	More reproducible analysis; versioned scripts and independent validation.	Dataset legality; improved results may reflect sampling changes.
Volunteer mentoring activity	Enhanced participant capability; consented follow-up accounts and demonstrated practice.	Selection bias, unequal opportunities, and unrecorded staff support.
Community terminology consultation	Better contextual adequacy; documented revision plus appropriately protected feedback.	Consent, collective voice, contested meanings, unsafe public naming.
Maintenance of a shared method	Continued usability; audited failures, repair records, and user reports.	High maintenance costs, invisible work, downstream institutional capture.
Authorized reuse by a new team	New educational or research opportunity; reuse record and independently assessed outcome.	Licence scope, access inequality, missing return arrangements.

with little attributable intervention by the proposed commons. The last possibility is important: an effective collaboration may be explained by pre-existing professional networks, established institutional workflows, individual mentorship, and ordinary budget support. The additional explanatory value of the proposed framework would need to be demonstrated by identifying what its interface analysis captures that these accounts leave insufficiently understood.

6.8 Three GR Reality Levels and Evaluation Design

At the level of *ontological reality*, the study leaves suspended the ultimate status of value, generativity, social relations, and collective being. The proposed categories are tools for inquiry rather than a metaphysical demonstration that different types of value exist as separate substances. Relational descriptions may help identify the conditions through which particular goods become significant, but they do not resolve whether value is ultimately subjective, objective, intersubjective, capability-based, or otherwise constituted. The framework also does not establish the moral status of artificial or nonhuman entities by including them as candidate evaluation bearers in a hypothetical configuration.

At the level of *relational reality*, organizations, roles, methods, resources, histories, permissions, and recognitive practices can be studied as historically constituted arrangements whose configurations may influence available actions and outcomes. The proposed mechanism is that distinctions among producing, recognizing, enabling conversion, and distributing burdens can make otherwise obscure institutional dependencies more legible. A documented contribution may supply an evidential condition for credit; credit may influence access to research opportunities; access may enable new competence; and the corresponding effects may be mediated by disciplinary status, material resources, and gatekeeping. These are candidate causal relations under conditions requiring specification. Rival accounts include selection into volunteering, pre-existing educational attainment, project funding, professional norms, organizational capacity, and changing external circumstances.

At the level of *manifestation reality*, value becomes accessible through situated expressions such as a learned skill, a dated review decision, observed reuse, a participant's account of recognition, successful error correction, resource expenditures, an authorized payment, or a documented refusal. These manifestations are neither exhaustive nor neutral mirrors of the underlying relations. They are conditioned by

what institutions record, what participants can safely reveal, and what evaluators are trained or authorized to notice. A missing public attribution may indicate exclusion or legitimate confidentiality; an apparent absence of return may reflect delayed development or a genuine failure of reciprocity. Manifestation-level evidence therefore requires reconstruction of its observation and protection conditions.

An empirically responsible programme could begin with bounded, consented comparisons among different governance arrangements for similar artifacts. It might examine whether source-linked contribution records increase verified reuse while tracking the additional time required for documentation; whether allowing protected recognition changes participation or correction behavior; and whether supervised training produces demonstrable capability gains for volunteers whose starting opportunities differ. Such studies should predefine outcomes, time horizons, relevant alternative explanations, and safeguards for participants who cannot safely be identified. The proposed conversion correspondences in Equation 4 and the configurations in Table 6 organize candidate questions. They do not establish that the correspondences exist in a given case.

The section yields a limited but consequential conclusion for the institutional theory. A commons' capacity to sustain generative activity cannot be evaluated solely through a count of outputs, formally valid licences, or successful credit records. Relevant evaluations also concern whether contributors and affected communities have usable capabilities, whether the conditions of reuse and conversion are justified and feasible, whether participants can contest the classifications applied to them, and whether gains are accompanied by hidden costs or capture. None of these dimensions needs to be translated into one universal score to become researchable. Their situated connections provide the object of the subsequent inquiry into value circulation, delayed return paths, and institutional memory.

7 Value Circulation, Return Paths, and Institutional Memory

The temporal organization of a knowledge commons affects whether a contribution can enable subsequent work, become meaningfully accessible to a beneficiary, or support a later return to those who helped make the work possible. A provenance record can identify a contribution without demonstrating its subsequent influence; a permitted reuse can generate an output without providing an identifiable benefit to its source community; and an observed benefit need not establish an enforceable entitlement to a particular distribution. This section develops a bounded vocabulary for such trajectories in aid- and volunteer-related research infrastructures. It distinguishes circulation events from retrospective descriptions of circulation, analyzes direct and indirect returns, studies temporally extended and nested pathways, and examines how institutional memory conditions the survival and interpretation of connections. A minimal time-indexed representation is offered for comparative research, followed by constructed configurations and a three-level Generative Relational (GR) interpretation. The proposed language does not presume conserved quantities of social value, a universal price system, or a causal connection established simply by a chain of archived documents.

7.1 Circulation Events, Transformation Relations, and Beneficiary Positions

A *circulation event*, as used here, is a situated occurrence in which the availability, usability, interpretation, control, or recognized significance of a contribution changes for a specified actor or set of actors. Examples include the authorized adaptation of a teaching module, the incorporation of a corrected procedure into training, the translation of a research method for another community, the reclassification of a document from restricted to shareable, or the creation of a new educational opportunity through earlier collaborative work. The working term marks an object for historical inquiry. It does not mean that a measurable substance has passed between participants. Events involving a common artifact may have different consequences for the originator, adapter, affected community, host institution, and a future learner.

A *transformation relation* is an evidentially supported or provisionally hypothesized connection between an earlier contribution and a later event. Such a relation may involve copying, correction, transla-

tion, recombination, dependency, teaching, referral, or changed institutional practice. Each mode calls for its own evidence. The existence of a digital identifier can support the identification of a version, yet may leave substantial uncertainty about whether that version influenced a decision. A participant's testimony can establish an experienced benefit while leaving its attribution to one recorded contribution unsettled. W3C provenance representations are useful for recording entities, activities, and agents, but the proposed historical judgments must still be justified by independent evidence, including the possibility of mistaken or conflicting accounts [63, 62].

The *originator*, *intermediate steward*, *downstream user*, and *beneficiary* are analytical positions rather than fixed kinds of persons. An originator may later become a downstream user of another contribution, and an intermediate steward may bear substantial costs without obtaining a named authorship position. A beneficiary may be an individual contributor, a collective, a public service, or an affected person outside formal commons membership. A rights holder may be different from all of them. These distinctions preserve the separation among historical participation, normative recognition, lawful access, and benefit developed in Sections 4, 5, and 6. In particular, an institution's capacity to reuse an artifact is neither evidence of a participant's consent to a new role nor proof that downstream gains have been distributed appropriately.

Circulation may take the form of enabling conditions whose practical consequences are not immediately visible. A maintained glossary can lower the cost of later translation; a carefully documented failure can prevent repetition; a participant's correction can improve a protocol through a revision that the future user never sees. Conversely, a formal acknowledgment may produce little feasible opportunity for the credited contributor. A useful account therefore specifies the activity, the transformation, the identified parties, the relevant time, the evaluative standard, and the evidential status of each proposed connection. A positive valuation of a transformation should remain separated from a statement that the transformation occurred.

7.2 Direct Returns, Mediated Reciprocity, and Collective Benefits

A *return path* is a historically organized sequence through which an earlier contribution is connected to a later benefit, opportunity, recognition, or capacity available to a specified participant or community. This definition describes a possible pattern of relations. Whether the sequence justifies a duty to distribute money, provide access, make an acknowledgment, or maintain a service is a further legal and normative question. The term *return* should not silently import the logic of an investment contract into volunteering, care, or public-interest research.

A direct return may occur when a contributor gains access to a revised method, receives appropriate authorship or acknowledgment for an output, is offered supervised learning connected to earlier work, or can reuse a derivative under a valid licence. Directness refers to a relatively short and identifiable historical relation, not necessarily a cash exchange. A mediated return occurs when an intermediary transforms or combines contributions before a benefit becomes available. For example, volunteers may help assemble a multilingual resource; educators later adapt the resource; a community organization subsequently receives improved access to instructional materials. The original volunteers may benefit through collective provision or new learning opportunities, although an individual return may never occur. These forms can be valuable without being fungible.

A collective return concerns circumstances in which value becomes available through a community resource, safer practice, maintained commons infrastructure, or wider accessibility. Collective availability does not imply equitable individual access. Membership restrictions, disability, language, scheduling, professional credentials, and institutional priorities can determine who can actually use the result. Following the emphasis on substantive capabilities in Sen's work, an empirical inquiry should ask whether people are positioned to exercise an option, alongside whether the option formally exists [53]. A public archive can expand availability while remaining difficult to use for people without training, devices, or practical authority. Similarly, a collective benefit reported by a governing body may diverge from affected participants' assessments of its adequacy.

The vocabulary must also differentiate *reciprocity*, *compensation*, *entitlement*, and *benefit*. Reciprocity can describe a pattern of mutually supportive action or a publicly adopted governance expectation. Compensation typically refers to a response to a defined loss or contribution under a particular norm or agreement. Entitlement identifies a claim grounded in an applicable legal, contractual, or institutional rule; its existence and scope require source-specific analysis. Benefit describes an evaluatively supported positive consequence for a bearer. A contributor may receive a benefit without having possessed a claim to it; a person may hold an enforceable entitlement even when the promised benefit has not materialized; and a commons may legitimately pursue diffuse public benefits without promising proportionate individual returns. Treating all four as a single circulation quantity would conceal precisely the questions of institutional justice that the paper seeks to make researchable.

Generative justice provides an important normative antecedent in its attention to the ability of value generators to retain agency over production and participate in beneficial circular flows [17]. The present analysis takes this concern as motivation for assessing return arrangements, without attributing the idea of value circulation to GR. The proposed contribution is a more limited interface between historical provenance, usable permissions, credit practices, and evidenced opportunities to benefit in assistance-related knowledge commons.

7.3 Delayed Pathways, Nested Circuits, and Fragile Dependencies

Return pathways may cross multiple periods of research, education, organizational change, and personnel turnover. The interval between an early correction and its eventual contribution to an educational result may be measured in months or years. During that time, the artifact can be superseded, its licence or access conditions can change, a maintenance role can disappear, and a participant may leave the institution. A retrospective account that identifies a later outcome should accordingly distinguish a continuous evidential chain from a plausible narrative constructed after the outcome is known. Long delays provide opportunities for cumulative transformation and for loss of historical information.

Several smaller circuits can coexist within a larger pathway. A methods group may exchange feedback with a volunteer team in a recurring short cycle while the resulting resource travels through an educational institution toward a community-facing application. That application may generate later learning which informs renewed methods development. The larger history can include a local reciprocal exchange, a broader diffusion, and a community return, without forming a perfectly closed graph. Treating the system as nested circuits is useful only where feedback, renewed enabling conditions, or revisable dependency relations can be identified. A sequence ending in a benefit to a different party should not be redrawn as a return to the originator merely to complete an appealing circle.

Long paths can become fragile because they contain contingent interfaces. A translation may depend on continued terminology stewardship; the next use may require an accessible repository; a derivative may require continuing lawful access to a source; a benefit may depend on local adoption rather than publication alone. The failure of one indispensable interface can interrupt a path even when all preceding events were successful. However, greater path length is not a general proof of greater fragility. Redundant routes, stable standards, diverse stewards, and adaptable institutions can make some longer pathways more robust than shorter ones. The relevant comparison concerns dependency structure, failure correlations, repair capacity, and the cost of maintaining viable interfaces, not solely the number of steps.

Pierson's treatment of timing, sequence, increasing returns, and path dependence in political processes offers an established framework for distinguishing plausible historical mechanisms from loose invocations of history [49]. In the present context, a standard or repository format may become consequential because successive users organize their work around it. The resulting continuity can make later reuse easier, but may also make corrections, exits, or alternative methods more costly. Accumulated adoption thus warrants examination for both generative capacity and institutional lock-in. Likewise, longitudinal analysis of knowledge initiatives has identified interacting processes capable of producing virtuous and vicious circles [23]. Those findings concern particular organizational cases and should be

used as comparative theory, not direct evidence that the proposed volunteer commons will exhibit the same dynamics.

A second asymmetry arises when costs and gains operate on different clocks. Contributors may bear immediate unpaid costs while institutions receive delayed reputation, improved data, or grant opportunities. Conversely, an institution may invest in long-term preservation for benefits that are uncertain and dispersed across users. A defensible account requires separate documentation of temporal exposure, expectations made at entry, relevant permissions, and outcomes that were actually available. Retrospective visibility should not become an excuse for imposing previously undisclosed duties upon those who helped produce an artifact.

7.4 Institutional Memory, Retrieval, and Historical Interpretation

Circulation through time depends partly on whether relevant histories can be retained and responsibly retrieved. Walsh and Ungson's work on organizational memory distinguishes acquisition, retention, and retrieval while also examining possible misuses of organizational memory [65]. For a generative commons, this literature suggests several concrete research questions: which contribution events are recorded; which records remain intelligible after personnel change; which participants can retrieve them; how corrections become attached to earlier decisions; and whether a later steward can distinguish an original event from a subsequent institutional interpretation. Neither a digital repository nor a lengthy audit log, by itself, answers these questions.

The present framework proposes four analytically distinct memory functions. *Preservation* maintains appropriate evidence of an event or artifact under legitimate retention rules. *Retrieval* allows an authorized actor to locate relevant evidence. *Interpretive continuity* enables a later reader to recover the definitions, uncertainty, context, and limitations associated with the evidence. *Corrective accountability* preserves the ability to challenge or amend a mistaken account without silently rewriting its history. Different repositories can perform these functions unevenly. A timestamped record may preserve that a file existed while failing to identify whether a community consultant's contribution was adequately represented. A detailed account may be inaccessible because it includes sensitive information; in such a case, an appropriately restricted record can serve accountability better than unrestricted publication.

Institutional memory also depends on classification. Bowker and Star demonstrate how categorization systems and standards organize what becomes visible in information infrastructures and how those classifications carry social consequences [4]. In a volunteer commons, categories such as "author," "assistant," "community reviewer," "service user," or "maintenance contributor" can shape whose work is retrievable and whose expertise is considered credible. Historical data organized under a narrow authorship taxonomy may omit the conditions through which the published output became feasible. Conversely, a deliberately expansive credit register can expose persons who contributed under confidentiality expectations. Classification should therefore include appropriately scoped role descriptions, sources of the descriptions, disclosure limitations, and mechanisms for correction.

Institutional forgetting can be protective as well as harmful. Retention limits, selective deletion, minimization of personal identifiers, and suspension of public access may protect vulnerable participants. The normative question is not how to accumulate the largest memory store. It is how to maintain enough appropriately governed historical context to support legitimate accountability, correction, and permitted reuse without producing new exposure or dependence. Rights to erasure, duties to preserve records, research-ethics obligations, contractual restrictions, and professional responsibilities may interact differently across jurisdictions and institutions. General privacy principles provide constraints for inquiry, while any concrete retention decision needs applicable local authority and fact-specific review [19, 38].

Memory has an opportunity cost. Stewardship requires training, maintenance, data governance, archival migration, access-review procedures, and a process for responding to disputes. An institution might make excellent records but underfund their interpretation, leaving contributors unable to find or correct the information that concerns them. For this reason, records should be evaluated by their con-

tribution to actual governance capabilities, including correction and safe use, rather than treated as an automatic proxy for institutional responsibility.

7.5 Discontinuities, Missing Links, and Power over Return Interfaces

Not every contribution yields a traceable downstream benefit, and not every interruption represents misconduct. A teaching resource may be retired because its content became inaccurate; a data-access request may properly be refused; an institution may decline to reuse a contribution after discovering a methodological flaw. Other interruptions may reflect avoidable neglect, preventable dependence on one steward, poorly defined permission boundaries, or a decision to appropriate the results of another’s work without suitable recognition. Explanation requires identifying the applicable rule, the participants’ expectations, and the reason a proposed pathway became unavailable.

A *missing link* has at least three distinct meanings. First, the relationship may have existed but its evidence is lost or unavailable. Second, the available evidence may be insufficient to decide whether the relationship existed. Third, the relationship may never have occurred despite an expectation that it would. These possibilities have different implications for empirical reconstruction and institutional repair. Missing provenance evidence does not demonstrate an absence of contribution; an undocumented promise does not thereby acquire a legal force; and a missing return may reveal a broken distribution arrangement only when a relevant arrangement actually existed. Researchers should record evidentiary confidence and the applicable criteria of obligation separately.

The parties controlling interfaces can influence which trajectories remain feasible. A host institution may select which derivatives appear in a catalogue; a journal may shape which contributions receive formal scholarly credit; a technology provider may control export formats; and an intermediary may control contact between contributors and downstream users. These positions create possible power asymmetries without establishing that power was misused. A governance inquiry should examine decision rights, reasonable opportunities for appeal, the ability to leave or change intermediaries, and the distribution of the costs of continued participation. The broader analysis of participation, vulnerability, and interface power is reserved for Section 8.

Several protective arrangements can be considered as design hypotheses: maintain portable provenance with appropriate access controls; specify recognition and reuse expectations at entry; preserve a revision history for material changes; provide legitimate means to request correction or restricted withdrawal; and document responsibility for maintaining the resources on which later reuse depends. Such measures can improve governance only when they are adequately resourced and accepted under applicable institutional rules. Portability is constrained where data should remain restricted, and an opt-out request cannot necessarily undo previously lawful downstream uses. An ethically defensible model consequently distinguishes conditions that can be changed prospectively from rights or uses already established by law or agreement [14, 15].

7.6 A Minimal Time-Indexed Representation of Return Feasibility

A limited formal device can help specify which empirical claims are being made about a proposed return. Let a temporally indexed, typed relational multigraph contain contribution events, artifacts, transformative activities, persons or collectives, and institutional access decisions. A documented relation has a recorded time, source, type, disclosure status, and confidence assessment; an inferred relation is explicitly marked as such. Let $\mathcal{P}_{c,b}[t_0, T]$ denote the set of candidate historically ordered relational paths from a contribution event c to an identified beneficiary position b during an interval $[t_0, T]$. Candidate paths may include different kinds of relations and need not themselves form closed cycles. The analytic subset of paths for which a supported and lawful benefit claim can presently be made is defined in Equation 5.

$$\mathcal{R}_{c,b}[t_0, T] := \{p \in \mathcal{P}_{c,b}[t_0, T] \mid H(p) \succeq \theta_H, \quad L(p) = 1, \quad \text{BenefitSupported}_b(p; T) = 1\}. \quad (5)$$

Here $H(p)$ is an evidence-quality assessment for the proposed historical links, with a locally specified adequacy criterion θ_H ; the ordering symbol $\succeq$ represents that criterion and does not imply a univer-

Table 7: Constructed return-path configurations and discriminating evidence. All cases are hypothetical.

Configuration	Possible circulation or return	Uncertainty or discriminating evidence
Volunteer method revision	Corrected method reused in training; new learning becomes accessible to contributors	Version history, teaching adoption, participant-access evidence; contribution alone does not show uptake
Translation and community review	Adapted materials gain wider reach; later community group develops another resource	Permissions, contextual review, records of uptake, and community account of usefulness
Long-lived documentation	Early repair enables a later derivative through several institutions	Continuity of identifiers, stewardship, changing access rules, independent transformation evidence
Confidential assistance experience	A restricted description supports safer analysis without publicizing participants	Applicable authority, minimization decisions, restricted audit trail; public absence is not proof of no contribution
Collective return with uneven access	A new training resource benefits an institution while some volunteers cannot use it	Access criteria, languages, time availability, participant accounts of feasibility
Apparent virtuous cycle	Successive uses increase visibility and resources while maintenance labor becomes concentrated	Time-series comparison, workload records, alternative explanations and burdens by actor

sal scalar score. $L(p) = 1$ means that the specific acts or uses necessary to make the asserted path available satisfy the applicable legal and institutional permissions, as assessed for the relevant facts. $\text{BenefitSupported}_b(p; T) = 1$ means that a bearer-specific assessment supports an actual benefit associated with the proposed path, using a stated evidence set and a declared evaluative procedure. This indicator is an assessment status, not a measurement of the amount of value received. The notation is a research classification rather than an automated legal test or welfare equation. Where uncertainty remains, the path stays in the larger candidate set with its uncertainty disclosed. A path may be historically supported yet prohibited for future reuse; it may be lawful but yield no evidenced benefit; and a benefit may be real while its connection to c remains unidentified.

For different beneficiaries, the sets $\mathcal{E}_b$ and criteria of evaluation can differ. Neither the membership nor the cardinality of $\mathcal{R}_{c,b}$ measures the magnitude of social value. Multiple paths can depend on the same event, so summing them can double-count consequences. The representation also does not justify equating an evidenced benefit with payment, legal standing, reciprocal credit, or moral desert. Those questions require additional institutional, normative, and jurisdiction-specific analysis. The analytic utility of Equation 5 is to expose the sources and eligibility conditions that a putative return explanation must supply; its empirical adequacy remains to be tested.

7.7 Constructed Configurations of Circulation and Institutional Memory

Table 7 compares six constructed configurations, each designed to isolate a source of circulation or return uncertainty. They are hypothetical analytical probes, not reports of university, hospital, humanitarian, or volunteer programme outcomes. The evidence column identifies observations that could discriminate between an actual historical trajectory and an appealing retrospective story; it does not authorize collecting or releasing protected personal records.

The configurations show why indicators of reuse and return should be evaluated jointly but reported separately. A study could record that a derivative was published, that a licence permitted the publication, that a participant was credited, that a later institution adopted the derivative, and that some intended beneficiaries could use it. Each proposition has a different evidentiary basis and may remain unsettled while others are established. Failure to observe a benefit should trigger a question about temporal horizon, access, and data limitations before a judgment that the contribution was valueless. Conversely, an

institution's report of a "virtuous cycle" should be checked against maintenance burdens, displacement, unequal access, and whether the claimed feedback loop actually produced renewed generative capacity.

7.8 Three GR Reality Levels and Comparative Evaluation

The present framework distinguishes three GR levels while suspending claims about ultimate ontology. At the *ontological level*, the analysis makes no assertion that social value is fundamentally a conserved fluid, that an institutional memory has the metaphysical status of a subject, or that a path reconstructed by an investigator is the uniquely real history. Network and circulation language is a model chosen for specific explanatory questions. A description of an absent or successful loop does not prove the existence of a corresponding physical flow or fundamental social law.

At the *relational-reality level*, historically constituted relations can have causally and generatively significant consequences when they are sufficiently stable and situated to support inquiry. Stewardship arrangements, permissions, role classifications, institutional incentives, and maintained resources may make some future connections feasible while inhibiting others. GR proposes to study their coupled evolution, particularly where an early contribution conditions later access and the resulting practices alter future possibilities. A plausible GR mechanism would require process evidence that the relational configuration made a difference, alongside serious comparison with administrative continuity, resource scarcity, technical standards, professional regulation, organizational learning, and other established explanations. A diagrammatic network is not itself such evidence.

At the *manifestation-reality level*, investigators encounter repository records, accounts of contribution, licences, training documents, meeting decisions, participant testimony, access logs, and observed uses. These are context-dependent manifestations of an underlying historical question, not exhaustive access to every relation that mattered. Missing records, protected identities, conflicting narratives, and selective observability can alter what is reconstructable. A project should identify when manifestations concern reported experiences, documentary facts, administrative interpretations, or independently evidenced downstream results. Such distinctions are particularly important when a participant's confidentiality would be compromised by public credit or a researcher's attempt to complete a historical chain.

Comparative evaluation can begin with ethically authorized histories of a modest number of resources followed through multiple transformations. Investigators should predefine how they classify contribution events, what evidence is required for a link, which benefits are relevant to which bearers, and which reasons justify discontinuing a path. A longitudinal study could compare pathways with different stewardship arrangements, examining continuity, correction capacity, latency, user accessibility, and distribution of maintenance costs. It should actively consider counterexamples: a very short path with weak returns, a long path sustained through redundancy, a documented contribution whose reuse was properly refused, and an apparently successful circulation narrative that conceals shifted burdens. Consent, minimization, and review appropriate to the setting remain preconditions of data collection, not variables to trade against research convenience.

The bounded conclusion of this section is that *value circulation* identifies a historically investigable set of enabling, transformative, evaluative, and governance relations. Its return paths are subject to delays, distributed beneficiaries, interpretation, permissions, and institutional memory. The principal analytical task is to determine which relationships existed, which uses were lawful and feasible, whose benefit can be supported, and which institutional decisions shaped those results. GR may provide an integrative hypothesis about the mutual conditioning of these elements; the explanatory advantage of that hypothesis remains open to empirical comparison. Its normative desirability also depends on protecting the autonomy, safety, and legitimate expectations of participants rather than maximizing documented circulation as an end in itself.

8 Participation, Vulnerability, and Power over Interfaces

The practical accessibility of an assistance-related knowledge commons depends on arrangements that determine who may enter, contribute, interpret resources, contest a decision, and benefit from subsequent work. Those arrangements are often mediated by institutional interfaces: eligibility criteria, supervisory roles, submission systems, translation channels, professional review, licensing checkpoints, and restrictions imposed to protect people or information. This section investigates how such interfaces distribute opportunities and vulnerabilities among contributors, affected communities, and professional stewards. It first differentiates participation from decision authority and examines the mechanisms of gatekeeping. It then considers situated dependence, epistemic credibility, protective boundaries, interdisciplinary mediation, and the effects of delayed value circulation on bargaining positions. A minimal participation-feasibility relation and comparative configurations support an empirically revisable account. The discussion draws on established participation and power scholarship while keeping the proposed Generative Relational (GR) interpretation distinct from evidence of actual institutional conduct.

8.1 Participation Positions and Decision Authority

Participation denotes a situated relation between an actor and an activity governed by identifiable procedures. The activity might be attending a meeting, identifying a research question, contributing a method, editing documentation, assessing an output, approving a release, or challenging the conditions of reuse. Participation in one activity does not necessarily confer authority in another. A volunteer who records an accessibility barrier may possess first-hand knowledge of a user interaction while lacking authority to access related clinical records or approve an institutional policy. An affected community may be consulted about an educational resource while having no effective influence over the allocation of funds used to maintain it. The relevant inquiry therefore specifies the particular activity, its decision consequences, and the actor's capacity to participate under those conditions.

Arnstein's account of citizen participation emphasized the relationship between involvement and the distribution of decision power, and warned against describing symbolic or managed involvement as substantive control [2]. Cornwall subsequently argued for specificity concerning participants, activities, and beneficiaries, while Gaventa examined power through differentiated spaces, levels, and forms of participation [11, 24]. These analyses offer established critical vocabularies. Their typologies do not mechanically classify every instance of university-linked volunteering or humanitarian knowledge production. A research commons may combine a legitimate division of professional responsibility with genuine, though bounded, authority delegated to contributors. The question is what authority was promised, what authority was exercised, and which differences were justified to those affected.

For analytical purposes, five participation positions can be distinguished. *Presence* concerns access to an activity or forum. *Expression* concerns opportunities to state experience, raise concerns, or propose changes. *Interpretive influence* concerns whether such inputs can shape how evidence and categories are assessed. *Decision authority* concerns defined powers to approve, refuse, allocate, or revise an institutional outcome. *Review standing* concerns practical access to a procedure for requesting reasons and challenging an exclusion or classification. A participant may occupy some positions without occupying others, and the distribution can change over time. These positions are analytic dimensions rather than a universal ascending scale; for some protected activities, independent review may be more valuable than wider access to the underlying confidential data.

A credible assessment documents the promised role alongside actual practices. Meeting invitations, contribution logs, records of design changes, anonymized accounts of objections, and the published remit of an oversight body can support different propositions. A participant's attendance proves neither influence nor absence of influence. Conversely, a professional's final decision authority does not by itself demonstrate suppression of contributors. Where safety, fiduciary, clinical, or statutory responsibilities are implicated, a suitable evaluation should ask whether the distinction was within the relevant mandate, communicated, appropriately reviewable, and accompanied by alternative modes of meaningful participation.

8.2 Gatekeeping, Interface Control, and Institutional Dependencies

An *interface* is a recurrent condition or procedure through which an actor's attempt to interact with a commons resource or governing process is evaluated, translated, approved, delayed, or refused. The term refers to institutional arrangements as well as software. It can designate a credential requirement for accessing restricted research material, a professional review of an aid-related training document, the operator of a multilingual submission channel, or the administrator who decides which external resources are listed in a shared repository. Some interfaces are explicitly defined by policy; others persist through informal practice, specialized knowledge, or limited staffing.

Interface power is the situated capacity to influence another actor's feasible access, interpretation, visibility, or downstream opportunities through such arrangements. The concept is a proposed analytic category, closely related to existing theories of agenda-setting, participation, and institutional power [24]. Power in this sense may be exercised by creating an entry route as well as by restricting one. Its occurrence need not imply an abusive intention. A data steward can exert considerable interface power while using it to prevent unauthorized disclosure; a translation coordinator can make a previously inaccessible contribution intelligible; a platform maintainer can determine which version of a record is visible to downstream users. Whether these actions are appropriate is a question about mandate, proportionality, alternatives, accountability, and consequences.

Several dimensions of control warrant separate inquiry. *Admission control* determines who can become a contributor or user. *Classification control* determines which activities count as contributions and how their significance is described. *Evidence control* concerns the retention, selection, and accessibility of records relevant to a disputed claim. *Permission control* addresses the lawful circulation of restricted artifacts. *Conversion control* conditions whether a contribution can become publication credit, training access, reusable methods, material support, or other values. *Recourse control* concerns the practical means of correcting a classification or contesting a decision. A single role may control several dimensions, while authority may be distributed across departments, community representatives, professional bodies, and technical administrators.

Interdependence complicates the evaluation. A university department may possess the secure infrastructure needed by a volunteer group; the group may possess linguistic or community knowledge absent from the department; a supervisor may certify training opportunities; and an affected community may bear the consequences of how a repository represents its experience. Dependence becomes relevant to justice when the capacity to refuse, correct, or exit is materially weakened by asymmetric control over a needed interface. A delayed benefit can intensify this condition: an early contributor may have little capacity to monitor a later derivative or to participate in decisions made after leaving the organization. These are hypotheses about possible configurations, not assertions concerning a named institution.

8.3 Vulnerability, Capabilities, and Situated Agency

Vulnerability in a generative commons can arise through exposure to harm, insufficient resources to exercise an option, unequal bargaining positions, dependence on an intermediary, or the potential disclosure of information supplied in confidence. It is relational and context-specific for the present analysis. A person's need for assistance should not be treated as a complete description of that person's judgment, preferences, or capacity to act. Similarly, a temporary contributor may have considerable expertise while remaining institutionally dependent on a supervisor for access, evaluation, or endorsement.

Sen's capability-oriented distinction between formal provisions and substantive opportunities is useful here [53]. A technically open contribution platform can be practically unavailable to people without compatible devices, sufficient time, language support, or safe working conditions. An invitation to a meeting may have limited significance for a caregiver whose obligations make attendance infeasible. A formal mechanism for disputing authorship may be ineffective for a contributor who reasonably fears losing access to training or employment prospects. The existence of an option and the person's realistic freedom to use it therefore form separate research questions.

Protective limits can enable participation. Restricting access to identifiable patient records, imposing review before disseminating potentially harmful advice, and requiring professional authorization for high-risk actions may preserve safety and legitimate institutional responsibilities. The relevant distinction is between protection whose grounds can be explained and evaluated and a restriction whose asserted protective purpose is unsupported or disproportionately broad. Neither unrestricted access nor maximal exposure is an adequate default objective for a humanitarian knowledge commons. The 2024 Core Humanitarian Standard articulates expectations concerning people-centred quality, accountability, and the role of communities; it offers a relevant sectoral reference but should not be presented as automatically binding law or as a certification that a proposed research institution has adopted its commitments [8].

Agency also concerns the practical possibility of declining participation. When an invitation is connected to a person's access to services, recommendations, professional opportunities, or needed resources, consent and refusal may be conditioned by those dependencies. A volunteer may be able to resign formally yet face substantial sunk costs, reputational concerns, or uncertainty about use of an earlier contribution. A beneficiary may consent to be heard about service quality without consenting to the publication of an identifiable narrative. Accordingly, projects should distinguish agreement to a particular task, authorization to use specific information, permissions for named recognition, and later requests for modification or withdrawal. Applicable rights and limits must be evaluated in their respective legal and institutional regimes; the proposed framework does not presume a general power to revoke every earlier lawful licence or completed public distribution.

8.4 Epistemic Credibility and Control of Interpretive Categories

The recognition of contributions depends partly on whose descriptions are considered credible and which institutional vocabularies make those descriptions intelligible. A professional reviewer may appropriately scrutinize an unfamiliar empirical claim, yet a process can also discount testimony because its speaker holds a volunteer role or lacks disciplinary credentials. Fricker's account of testimonial and hermeneutical injustice distinguishes credibility deficits connected to prejudice from disadvantages arising through inadequacies in shared interpretive resources [20]. These concepts help identify possible epistemic mechanisms without establishing that a specific instance of disagreement constitutes injustice.

Assistance-related knowledge infrastructures combine forms of evidence that are not interchangeable. Clinical expertise, service-user experience, multilingual mediation, archival documentation, statistical inference, and situated community observation can address different questions. A contributor's lived experience of an access barrier may be decisive evidence of that reported experience while remaining insufficient on its own to establish the safety of a treatment protocol. Professional credentials may be relevant to approving clinical content while providing little reason to disregard a local expert's account of a translation failure. An accountable interface specifies which type of evidence bears on the decision and how disagreements can be investigated.

Classification systems also shape the visibility of work. If a platform offers only authorship, data collection, and analysis as contributor categories, the people who sustain relationships, interpret institutional terminology, maintain safe access, and correct misleading translations may remain difficult to recognize. Bowker and Star's scholarship on classification supports treating categories as consequential social infrastructure [4]. The proposed response is a governed vocabulary that admits context-specific roles and records contested or provisional classifications. Additional categories should be evaluated for practical legibility and administrative cost; an indefinitely expanding taxonomy can become difficult to maintain and may undermine the accessibility it was designed to support.

The right to contest a classification is analytically distinct from the right to have the contested classification replaced. A credible procedure can retain conflicting accounts, record evidence and reasoning, and provide an appeal where warranted. Recognition must also respect confidentiality, safety, and a contributor's informed preference concerning naming. Some participants may prefer collective acknowledgment or nonpublic recording, particularly when publication of the connection between a person and a humanitarian activity creates risk. The resulting evidentiary record should document its limits without

converting the commons’ interest in provenance into authority to disclose confidential participation.

8.5 Cross-Disciplinary Intermediation and Boundary Roles

Intermediaries become especially significant when a commons connects research, education, professional services, community organizations, and volunteer activity. A boundary role may translate disciplinary assumptions, check whether a dataset can be shared, reconcile incompatible documentation formats, or make a methods resource usable for people outside its originating specialty. The generative contribution can lie in connecting independently valuable bodies of knowledge, preserving the conditions under which each can be interpreted appropriately. Such work may create new opportunities without making the relevant disciplines interchangeable.

Intermediation confers power as well as responsibility. A coordinator can determine which contributions are brought to a research group, which explanations are sent back to community partners, and how a complex institutional requirement is summarized for new participants. Selective communication may be necessary for confidentiality or relevance. It can also distort the record if alternatives and disagreement are systematically excluded. The proposed governance concern therefore has two aspects: enabling translation across differing practices and preserving an auditable account of consequential filtering decisions. Auditable need not mean publicly accessible; sensitive explanations may be confined to an authorized reviewer.

Cross-disciplinary mediation also exposes unequal transaction costs. A volunteer may be asked to transform informal experiential knowledge into academically recognizable language; a clinician may spend scarce time assessing safety and applicability; a technical steward may bear maintenance duties after a project formally ends. Treating mediation as costless can lead to apparent value creation supported by unrecorded labor. Appropriate recognition and possible compensation depend on the arrangement, its applicable rules, and the contribution actually undertaken. Existing peer-production and commons research can inform the institutional analysis, but the present manuscript does not infer that every intermediary should hold authorship or receive an individualized payment [3, 21].

A useful design option is a reciprocal explanation duty adopted through a relevant governance process: when an intermediary materially changes, suppresses, or redirects a contribution, the contributor may receive an understandable explanation of the decision, subject to lawful confidentiality and safety restrictions. Such a duty would have to be specified by the institution, including exceptions, a correction procedure, reasonable response times, and the allocation of staff responsibility. In this paper it is a normative design proposal, not an existing universal legal obligation. Its value would be evaluated by whether it improves informed agency and correction while remaining feasible for those who maintain the infrastructure.

8.6 Participation Feasibility and Power-Sensitive Evaluation

To support comparative inquiry, consider a participant p , an institutional activity a , a time t , and a specified mode of participation m (for example, proposing an edit, attending a review, accessing a record, or contesting an attribution decision). A *candidate participation opportunity* is described by the institutional procedure that purports to admit that mode. Whether the opportunity is practically feasible depends on several independently evidenced conditions. Equation 6 introduces a deliberately minimal conjunctive representation.

$$\text{Feasible}(p, a, m, t) := \text{Authorized}(p, a, m, t) \wedge \text{Accessible}(p, a, m, t) \wedge \text{SafeEnough}(p, a, m, t). \quad (6)$$

Here, *Authorized* records the presence of an applicable permission or role entitlement under the activity’s rules; *Accessible* records whether the mode is realistically usable given the person’s circumstances and the available support; and *SafeEnough* records a context-sensitive assessment that exercising the option does not impose an unacceptable risk on the participant or affected third parties. Each predicate requires an explicit evidentiary basis and a stated decision-maker or evaluative procedure. The formula

Table 8: Hypothetical interface configurations and the questions required for power-sensitive evaluation.

Configuration	Control or dependency	Necessary evaluative inquiry
Community translation	A coordinator accepts selected language corrections	Selection criteria, contextual accuracy, and protected correction route
Volunteer research access	A laboratory restricts records to credentialed staff	Legal basis, alternative contributions, supervision, and training opportunity
Service-user feedback	An aid programme collects feedback through one channel	Accessibility, safe refusal, response practice, and influence on revisions
Delayed attribution	A contributor has left before a derivative is published	Evidence of contribution, contact feasibility, privacy, and correction mechanisms
Safeguarded case material	A steward denies public access to sensitive records	Confidentiality obligation, proportional scope, safe summaries, and independent review
Interdisciplinary review	Professional and community assessments diverge	Decision competence, source-specific reasons, and nonretaliatory challenge

is a research classification for a specified activity, not a theorem about subjective welfare, a quantitative measure of power, or a legal test for consent. In empirical coding each constituent judgment may be *satisfied*, *unsatisfied*, or *undetermined*. An undetermined condition must not silently be coded as unsatisfied; under a conservative three-valued conjunction, feasibility is established only when all three conditions have affirmative support, infeasibility is established when a relevant condition is demonstrably absent, and otherwise the result remains undetermined. Even a negative result does not identify its underlying cause without additional inquiry. In particular, the framework does not authorize treating a participant's vulnerability as a blanket presumption of incapacity.

A related *interface-power audit* records who can set the admission rule, supply accommodations, decide acceptable risk, interpret evidence, and hear a challenge. These control positions can be held by different actors. The analysis should ask whether the affected people can influence at least the decisions that concern their participation, whether a refusal has an accessible rationale, and whether a feasible review route exists. The word *feasible* has a deliberately local referent. The model does not imply that each actor should be able to take part in each activity; it asks whether the specified opportunities and restrictions are intelligible and subject to proportional scrutiny.

Equation 6 can support a longitudinal research design when the sources allow investigators to distinguish formal roles, resource availability, actual attempts to participate, and outcomes. An interface revision may increase accessible modes while leaving formal rules unchanged; a new safeguarding protocol may restrict one access route while creating a safer channel for contribution; and an additional appeal route may shift decision influence without broadening direct data access. These trajectories cannot be collapsed into a single count of registered participants. Causal claims about power require stronger evidence, including comparisons with changes in staffing, workloads, technology, professional obligations, and the composition of the participant population.

8.7 Constructed Configurations of Access, Dependence, and Protection

Table 8 compares six constructed configurations. They are hypothetical devices for examining rival interpretations. None describes a verified incident at a particular hospital, university, humanitarian organization, or volunteer programme. The column on evaluative inquiry identifies relevant questions; it does not prejudge the outcome of a legal or ethical review.

In the community-translation configuration, the presence of a designated mediator can expand participation by creating a usable submission route. The same role may concentrate interpretive discretion. Investigation should compare available language options, documented correction outcomes, and participants' independent assessments. An observed difference between the number of submitted and adopted

suggestions would not by itself establish unfair exclusion because suggestions vary in accuracy and relevance. Repeated rejection of well-supported corrections without intelligible reasons, however, would warrant closer inquiry into the evaluation process.

The volunteer-access configuration concerns the relation between professional responsibility and learning opportunity. Restricted records may require accredited authorization, supervision, or consent. A fair arrangement could offer non-sensitive methods development, simulation material, or curated teaching examples without transferring protected information. The presence or absence of those alternatives affects the participant's actual opportunity for generative contribution. Nonetheless, a lack of alternatives may reflect cost or infrastructure limits as well as discretionary exclusion; an empirical evaluation should examine both possibilities.

The remaining configurations distinguish accessible feedback from symbolic consultation, historical credit from later contactability, confidentiality from unjustified opacity, and accountable professional review from credential-based dismissal of situated experience. Each requires a specified beneficiary and evidence about consequences. Practical safeguards should include proportional data minimization, risk assessment, and routes for protected feedback when the research process itself could expose participants to retaliation or stigma.

8.8 Three GR Reality Levels, Rival Mechanisms, and Research Limits

At the *ontological reality level*, the analysis suspends claims about whether social power, agency, or value has a particular ultimate metaphysical substance. The vocabulary of interfaces is a historically situated research construction. Its utility in describing permission systems or mediation does not prove that social relations possess the ontology of networks, fields, or mathematical gates. Existing theories of participatory governance and epistemic injustice already provide important explanations for several phenomena discussed here. GR is not claimed as their source.

At the *relational reality level*, relatively persistent arrangements of credentials, rules, trust, dependence, material support, professional mandates, and interpretive practices can condition how people interact and which trajectories become feasible. Interface power is investigated as the potential effect of these historically constituted arrangements on access, recognition, and later benefit. Such effects can be distributed and mutually conditioning. A restriction may preserve the security of a commons on which participation depends; a credential requirement can protect against unsafe actions while also reproducing an avoidable barrier to learning; and a channel for community critique can change how an institution interprets its own records. The proposed analytical relation therefore remains conditional on the actual configuration.

At the *manifestation reality level*, researchers examine observable procedures and accounts: participation invitations, accessible interfaces, credential criteria, version histories, safeguarded feedback, documented reasons, correction outcomes, and anonymized reports from affected people. These manifestations are partial. Formal policies may diverge from practice, archival silence may conceal unrecorded participation, and a participant's account can be accurate about experienced effects without establishing a complete causal explanation of an institutional decision. Privacy can justify gaps in public evidence; authorized confidential review may be necessary before forming evaluative conclusions.

Competing mechanisms include legitimate legal restrictions, shortages of staff or interpretation capacity, budget constraints, professional jurisdiction, technical incompatibility, incentives to standardize outputs, and ordinary disagreements about evidential quality. The contribution of a GR interface analysis would be to show, with independently checked evidence, how combinations of these mechanisms alter feasible participation and the subsequent circulation of value. An empirical test might compare the same governance rule before and after a supported translation channel is introduced, investigate whether reason-giving affects correction outcomes, or trace how departing contributors can revise a disputed credit record. Designs should account for confounding changes and avoid inferring institutional injustice from a single disparity.

The next research problem concerns the differing mandates and obligations of volunteers, employed

professionals, researchers, and care providers within a shared infrastructure. These positions can cooperate while remaining subject to distinct labour, ethical, professional, and institutional constraints. The differentiation provides the analytical starting point for the subsequent section on volunteer and professional relations.

9 Volunteer and Professional Relations in Shared Knowledge Infrastructures

The organization of assistance-related knowledge commons depends on relations among people who enter an activity under different professional, contractual, voluntary, educational, research, and community positions. An artifact may be produced jointly even when its contributors hold different permissions, duties of care, rights to refuse work, obligations to supervise, and authority to release the resulting material. This section examines those differentiated positions and the institutional conditions under which cooperation can enlarge generative capacities while preserving professional accountability and the agency of those receiving assistance. It first distinguishes the relevant statuses and mandates, then analyzes delegation and supervision, care and research interfaces, interdisciplinary translation, and the distribution of costs and opportunities. A role–activity compatibility framework and constructed configurations identify propositions that could be examined empirically. Existing labour-statistical, professional, research-ethics, and humanitarian standards provide antecedents; the Generative Relational (GR) interpretation remains a provisional, bounded reconstruction.

9.1 Voluntary Participation, Employment, Professional Standing, and Affected Positions

The category *volunteer* refers to a mode of participation, not to a complete description of a person’s skills, social standing, or responsibilities. The International Labour Organization defines volunteer work for statistical purposes in terms of unpaid, non-compulsory activity carried out to produce goods or services for others outside the worker’s own household or family. Its classification distinguishes organization-based from direct volunteering and acknowledges that expense reimbursement or modest support may accompany voluntary work [34, 35]. These are statistical descriptions. Whether a particular relationship constitutes employment, creates insurance obligations, or is governed by occupational rules depends on the applicable legal and institutional context. Neither a self-description nor an unpaid title conclusively resolves those separate questions.

Employment refers here to a relation in which work is performed under arrangements of remuneration and organizational responsibility whose legal incidents vary by jurisdiction. *Professional standing* denotes the qualifications, recognized competencies, practice standards, or legally conditioned powers relevant to a particular activity. A salaried employee may lack authority to make a clinical judgment outside their competence; a retired licensed professional serving voluntarily may still be subject to professional restrictions; a postgraduate student may be trained to analyze material without being authorized to obtain it; and a person receiving support may possess indispensable experiential knowledge while holding no formal organizational office. Accordingly, volunteering, pay, qualification, and institutional authorization should be represented as distinguishable attributes rather than as mutually exclusive social types.

This separation matters for the attribution of contributions. The archival record of a volunteer’s translated glossary may support a descriptive claim of participation without documenting professional certification or scientific authorship. A clinician’s approval of a public-facing aid protocol may establish a review event within a defined mandate, but it need not imply ownership of the draft or a claim to every subsequently derived result. A community advocate can provide a decisive correction to an assumption while declining public acknowledgement. An institution should therefore describe the actual activity and its governance setting before assigning status-based credit, authority, or presumed consent. The distinctions in Sections 8 and 3 are particularly relevant: a participation record is evidence concerning a situated activity, not a complete record of a person’s legal or ethical relations.

A useful relational unit is the *role episode*: a person performing a specific activity, for a specified purpose, within a particular mandate and time interval. One person may occupy several episodes in a project. For example, an employee might contribute to a voluntary scientific reading group outside their work assignment while later evaluating a derivative as part of paid duties. The episodes can have different institutional owners, review requirements, compensation arrangements, confidentiality obligations, and attribution rules. The proposed commons should avoid treating a contributor's presence in one episode as indefinite authorization for further episodes. Conversely, it should preserve continuity of provenance where the same person's earlier contribution genuinely informs a later resource, subject to lawful disclosure and evidence sufficiency.

9.2 Institutional Mandates and Differentiated Accountability

A shared knowledge infrastructure can be jointly maintained while participating organizations retain distinct mandates. A volunteer association may organize training and assist with non-clinical navigation; a health institution may exercise professional and institutional responsibility for patient services; a university may govern access to research infrastructure; and a community organization may control the conditions for representing experiences supplied by its members. The legal and operational relationships among these bodies require institutional verification. For analytical purposes, a mandate is a documented or otherwise supportable allocation of authority and responsibility for a bounded activity, rather than a general claim to moral superiority or ownership of the commons.

Accountability can be differentiated into several connected questions. Who is permitted to act? Who is competent to act? Who can delegate or approve the activity? Who bears the duty to supervise, maintain, and correct its output? Who may receive reports, request explanations, or contest a consequence? These questions may have different answers. They also evolve over time when personnel, contractual arrangements, institutional policies, or applicable rules change. An authorization map should therefore record its source and period of validity, preserving uncertainty where no current documentary basis is available. A contribution that was permitted as internal educational work in one period may require a new review before public redistribution under another institution's name.

The IFRC Volunteering Policy provides a concrete policy example of organizational commitments to supporting volunteer participation and of responsibilities located within the IFRC network; it is not a general statute for universities or hospitals [33]. The ICRC Professional Standards for Protection Work likewise articulate professional principles for humanitarian and human-rights actors engaged in protection activities, including complementarity, professional capacity, and information management in relevant contexts [31]. These instruments illuminate why cooperation needs accountable institutional structure, but their institutional reach differs from domestic employment, professional-licensing, medical-confidentiality, and research-governance rules. The present framework retains these differences rather than merging them into a single generic obligation of "good governance."

The boundary of institutional authority is especially important where the commons develops reusable educational or analytical materials. A volunteer may properly document that a wayfinding poster is difficult to understand, while the service operator retains responsibility for deciding which directions may be presented as official. A researcher may evaluate how users interpret the poster under an authorized study, while neither volunteer status nor research training permits unreviewed access to identifiable service records. A knowledge commons can hold independent commentary, drafts, and authorized resources together, provided the provenance, endorsement status, and applicable access rules remain legible. Such differentiation can protect the contributors' intellectual independence as well as the institution's legitimate accountability.

9.3 Delegation, Competence, Supervision, and Safe Referral

Cooperation often depends on the delegation or coordination of activities across different levels of experience. Delegation is analytically distinguishable from unrestricted transfer of professional judgment.

The relevant design problem is to specify a task's foreseeable consequences, required knowledge, authorization source, preparation, conditions of performance, supervision, escalation routes, and withdrawal procedures. An educational translation exercise, a navigation task, an administrative classification, and advice that may influence care decisions differ in the kind and degree of review they warrant. Professional regulation and site-specific instructions can impose additional constraints; they require verification before a concrete organizational protocol is proposed.

The WHO guideline on community health worker programmes identifies training, supportive supervision, integration into health systems, and remuneration among relevant policy dimensions [68]. Its recommendations concern defined community health worker programmes. Community health workers can be employed or otherwise situated; the guideline cannot simply be converted into a universal protocol for volunteer navigators. Nevertheless, it offers a carefully bounded comparison: when tasks have implications for well-being or access to services, competence and supervisory support may be critical conditions of reliable performance. In some settings, formal role definitions and periodic review can make cooperation safer and more sustainable than relying on informal expectations of willingness and altruism.

The proposed commons distinguishes *task preparation*, *authorization*, *operational support*, and *professional validation*. Preparation concerns the knowledge and skills a person has acquired; authorization concerns their permitted activity in the relevant institutional setting; operational support covers access to advice, equipment, and escalation; validation concerns whether a result can be adopted for a specified use. Evidence of one dimension is insufficient to establish the others. For example, a technically skilled volunteer may develop a reliable computational script using permitted synthetic data. Its use in a protected care workflow would still require appropriate review of assumptions, accuracy, information security, and the operating institution's responsibilities. The volunteer's technical competence should be recognized without transferring an unrelated institutional authority by implication.

Safe referral is a further boundary mechanism. A participant who encounters a request outside an authorized task needs a feasible channel for referral and, where relevant, an option to stop. The channel should be comprehensible and available in the setting where a request occurs. This point affects the analysis of power: the ability to refuse an unsafe assignment may depend on the volunteer's relationship to a supervisor, future access to training, reputation, or eligibility for reference letters. A nominal right of refusal is therefore usefully studied alongside actual dependence and available alternatives. Such dependence does not establish coercion in itself; it identifies circumstances where credible consent and non-retaliatory review deserve closer examination.

9.4 Care Encounters, Research Activities, and Information Boundaries

An assistance-related commons may arise near activities in which people disclose intimate, health-related, legal, or otherwise sensitive information. The institution's reason for collecting such information can be tightly connected to the provision of support. A later research or repository purpose constitutes a distinct use that requires its own lawful basis, permissions, ethical consideration, and security arrangements where applicable. A volunteer's encounter with a person receiving assistance is consequently different from an authorization to create a longitudinal research record about that person. An observer's good intentions and scientific interests do not eliminate this distinction.

The CIOMS International Ethical Guidelines for Health-related Research Involving Humans emphasize meaningful community engagement in the design, conduct, monitoring, and dissemination of relevant research, while assigning research institutions and ethics review processes continuing responsibilities [12]. Engagement can improve the relevance of proposed research and the legitimacy of how its benefits and burdens are considered. It does not substitute for participant protections, research review when required, or the conditions governing identifiable data. Equally, affected persons may decline research participation while continuing to receive services to which they are otherwise entitled. Research participation, care, volunteering, and the decision to make a public contribution should therefore remain separate, even where they share actors or a physical location.

The ICRC’s humanitarian data-protection guidance emphasizes the close connection between handling personal data and protecting dignity, integrity, and safety in humanitarian operations [32]. In the present framework, a resource’s classification should reflect the foreseeable harm of disclosure and its actual permissions, rather than an assumption that all material located in a commons is publicly reusable. Three resource layers are analytically useful: *publicly shareable methods and educational artifacts*; *restricted working materials governed by stated purposes and roles*; and *information retained outside the commons because safe or authorized inclusion has not been established*. The second layer may require secure systems and independent governance; the third can be represented by a limited metadata record that states only an admissible fact of exclusion, without revealing the protected content.

The separation of care and research also affects claims about value production. A research output might depend on a service activity, but a participant’s need for assistance does not create an obligation to contribute to research. A volunteer might gain educational value through supervised observation, yet such opportunities can be constrained by confidentiality, dignity, institutional workload, and the wishes of the people concerned. A repository design that counts every assistance encounter as a potential data source risks recasting care as compulsory research infrastructure. The ethical adequacy of a commons should therefore be assessed partly through the conditions under which people may decline, withdraw, or limit secondary uses without suffering unrelated disadvantages.

9.5 Interdisciplinary Translation, Boundary Objects, and Invisible Work

Volunteer–professional cooperation generates an epistemic problem as well as an organizational one. Different participants may use different categories, standards of evidence, vocabulary, tools, and notions of a successful outcome. A social scientist may interpret a field note as evidence of an interaction pattern; a clinician may see an unverified clinical claim requiring caution; a translator may recognize a linguistic ambiguity; and a community member may identify a context missing from the research categories. A shared artifact can support cooperation only insofar as participants can establish what its terms mean for their respective activities, and where its translation between domains may fail.

Star and Griesemer’s historical analysis of Berkeley’s Museum of Vertebrate Zoology examined cooperation among amateurs, professionals, and other actors through standardized methods and *boundary objects* capable of serving multiple social worlds without eliminating their differences [54]. Their historical case is an established antecedent for the present paper’s treatment of interdisciplinary interfaces. A jointly revised glossary, a versioned training template, or a carefully limited contribution record may function as a boundary object in an assistance-related commons. Whether it actually does so must be demonstrated through its use by particular actors; merely calling a document a boundary object would add little explanatory value.

Translation work has several distinct objects. *Lexical translation* concerns languages and terminology. *Methodological translation* concerns how a question or dataset is represented across disciplines. *Normative translation* concerns whether a proposed use is acceptable under the relevant professional and ethical rules. *Operational translation* concerns whether a resource can be deployed, supported, and revised in practice. These transformations may be performed by different people and need not succeed simultaneously. A technically fluent translation can remain normatively unacceptable; an ethically attractive proposal may remain impossible to maintain; a locally successful practice may resist transformation into generalizable evidence.

Much of this labour may be difficult to recognize in conventional outputs. Volunteer mentors, accessibility specialists, administrative coordinators, bilingual intermediaries, community reviewers, and software maintainers can reduce the cost of collaboration or make it feasible in the first place. The descriptive contributor records developed in Section 5 can support evidence-based acknowledgement, subject to consent and disclosure restrictions. However, technical contribution statements do not settle authorship or financial entitlements. The ICMJE recommendations, for example, distinguish scientific authorship criteria from non-author contributions in biomedical publishing [30]. A mediation contribution may be academically substantive in one study and appropriately acknowledged in another. A fair

process should make the criteria and opportunities for substantive contribution intelligible, including to participants whose initial roles were not framed as research appointments.

Institutional independence remains significant. A volunteer or community organization can contribute a general method while retaining its own priorities and refusing an unsuitable implementation. A professional can explain a safety constraint without having authority to determine the community's cultural interpretation of the problem. The proposed model treats mediation as an accountable practice of making differences intelligible, recording unresolved disagreements where material, and identifying which institution can decide a particular issue. It does not require theoretical unification or the absorption of community judgment into professional terminology.

9.6 Unpaid Labour, Institutional Costs, and Conditions of Reciprocity

Volunteer cooperation involves real expenditure of time, attention, mobility, equipment, emotional effort, and sometimes personal risk. The absence of wages or the presence of altruistic motives does not show that these costs are negligible. Nor does the opportunity to learn justify imposing tasks outside a safe and agreed scope. Conversely, economic remuneration may be absent by the participant's deliberate preference, while the participant receives other legitimate forms of value such as skill development, social connection, or participation in a public purpose. The relevant question is how the terms of participation distribute capabilities and burdens, and how those distributions can be evaluated without reducing motivations to a single monetary scale.

For program design, the sustainability of volunteer work is coupled to the sustainability of professional oversight. Supervision consumes scarce staff time, and the work of reviewing derivative resources can compete with institutional functions whose beneficiaries are less visible within the commons. The IFRC policy explicitly treats volunteer engagement as requiring resources and institutional attention [33]. An optimistic account that counts volunteer hours as "free capacity" while omitting coordination, preparation, safety, insurance, correction, and exit costs may therefore overestimate net institutional value. Accounting should distinguish these costs from claims that volunteers ought to be remunerated as employees in every case, a legal and policy question that cannot be resolved at the level of general theory.

A potential adverse configuration is the substitution of unpaid activity for work that requires stable employment, formal training, or statutory accountability. This can occur without malicious intention: an institution under resource pressure may expand informal responsibilities more rapidly than its supervisory infrastructure. Another adverse configuration arises when volunteers are invited to produce reusable methods while paid intermediaries acquire disproportionate control over recognition and later commercialization. Neither scenario can be inferred from the presence of volunteers alone. A responsible empirical inquiry would examine task descriptions over time, actual supervisory arrangements, recorded hours and expenses, the terms governing reuse, opportunities to decline, and the treatment of comparable paid work. Rival explanations include resource scarcity, administrative delay, specialization, differences in risk and evidence standards, and genuine participant preferences.

Reciprocity should therefore be designed as a set of feasible, communicated possibilities rather than as a presumption of equal financial distribution. These may include reimbursement of legitimate expenses, training access, jointly governed educational outputs, acknowledgement according to disciplinary conventions, a role in revising reusable resources, and community benefits negotiated before a project begins. Future royalty or revenue-sharing arrangements may be appropriate in some settings where explicitly and lawfully constituted, but an attribution record or later success of a derivative does not create such an entitlement by itself. The proposal also admits cases in which safe, anonymous, or collective recognition is preferable to individual visibility, and cases where the cost of maintaining the commons requires curtailment or closure rather than unsupported promises of indefinite benefit return.

9.7 Role–Activity Compatibility and Comparative Configurations

The preceding distinctions can be represented with a minimal *role–activity compatibility record*. Let p be a person, a a proposed activity, m a stated mandate or institutional context, and t the time of the

Constructed activity	Distinct role or interface issue	Evidence and safeguard to examine
Volunteer translates a public training glossary	Linguistic competence and editorial validation differ from institutional endorsement	Contribution provenance, permitted source licence, quality review, and credit preferences
Professional reviews a volunteer-produced accessibility guide	Approval may be limited to a particular institutional purpose	Review mandate, approved version, distribution scope, and correction channel
Student researcher joins an aid-related project	Research opportunity differs from service entitlement and access to records	Research-ethics determination, data permissions, supervision, and participant choice
Community intermediary reports a culturally misleading category	Experiential authority may exceed formal decision authority	Recorded objection, interpretive review, protected disclosure, and recourse
Volunteer is asked to respond to a potentially clinical question	Willingness and general training do not establish a professional mandate	Clear task scope, safe referral, available supervisor, and ability to decline
A derivative resource later generates institutional income	Historical contribution, licence scope, and benefit-sharing claims may diverge	Original permissions, attribution record, express agreements, and downstream accounting

Table 9: Constructed volunteer–professional configurations and the separate questions required for responsible institutional analysis. The examples do not describe observed cases or confer authority.

proposed episode. Equation 7 records five separable dimensions relevant to evaluation. It is a descriptive record for a competent role review and neither authorizes a regulated activity nor replaces supervision, escalation, or profession-specific judgment.

$$\mathcal{K}(p, a, m, t) = (\Pi(p, a, m, t), C(p, a, t), D(p, a, m, t), S(p, a, m, t), E(p, a, m, t)). \quad (7)$$

Here Π denotes the evidence of permission or authorization; C denotes task-relevant competence and its evidential basis; D denotes identified accountability or delegation; S denotes available supervision, safeguarding and escalation; and E denotes the record of the activity’s purpose and applicable evidentiary restrictions. A dimension may be documented, disputed, limited, or unknown. The tuple is a descriptive audit structure, not a numerical score. It carries no assumption that these attributes are interchangeable, that a single institution controls them, or that sufficient entries produce a legally valid authorization. Which entries are required depends on the specific activity and the applicable rules. For a low-risk, publicly available glossary, the relevant record may be light; a proposed use of identifiable health data would involve materially different authorizations and safeguards.

Table 9 offers six constructed configurations. The examples are deliberately abstract, do not describe a named hospital or aid organization, and do not infer legal wrongdoing. Their purpose is to show how identical language about collaboration may conceal different institutional questions.

A compatibility record could be assembled through publicly available task descriptions, consented interviews, institutional rules, version logs, audit decisions, and appropriately protected observations. Some documents may remain inaccessible for legitimate reasons; their absence should be represented as missing evidence rather than treated as proof of either compliance or misconduct. Comparative inquiry can then ask whether explicitly differentiated roles correlate with fewer unauthorized uses, improved correction capacity, lower supervisory burden, or stronger contributor agency. Such questions are empirical and may produce mixed findings. A formal record without staff resources, genuine opportunities to raise concerns, or trustworthy review may produce administrative visibility without effective governance.

9.8 Generative Relational Interpretation, Alternatives, and Research Limits

The three Generative Relational reality levels provide a disciplined interpretation of the preceding institutional account. At the level of *ontological reality*, the ultimate status of professional roles, values, intentions, and social institutions remains suspended: the analytical record is not offered as proof that relational structures exhaust what exists. At the level of *relational reality*, role episodes, permissions, dependencies, mandates, boundary objects, histories of supervision, and return pathways can be investigated as historically constituted structures with consequences for what participants can do together. At the level of *manifestation reality*, these relations become available through role descriptions, conversations, versioned artifacts, reports of disagreement, observed service interactions, and records of approval or refusal. Manifestations may be incomplete, strategically framed, or legally unavailable; the inferential limits of such evidence must remain visible.

The proposed GR-specific hypothesis is that the sustainability of joint value generation may depend on the *coupling* among differentiated role authorization, trustworthy translation of knowledge, mechanisms for correcting outputs, and possibilities for contributor or community return. This is a provisional mechanism, not an empirical law. Its value is conditional on whether it can distinguish cases that established theories of professional jurisdiction, organizational learning, commons governance, research ethics, and volunteer management explain equally well or better. A project may perform successfully through simple, stable rules and experienced supervision without elaborate provenance infrastructure. Another may maintain meticulous contributor records yet fail because its tasks are unsafe, its employment arrangements are unjust, or its public resources are irrelevant. These counterexamples would limit claims for the proposed framework.

Empirical tests could compare activities with similar purposes and resource constraints but different governance arrangements, while controlling for institutional size, regulatory burden, contributor experience, and exposure to sensitive information. Process tracing could investigate whether a particular documented correction depended on an interdisciplinary mediator, a professional review, a participant's protected objection, or ordinary administrative workflow. Longitudinal studies could examine whether participants retain access to meaningful learning or recognition after leaving a project, whether oversight costs grow with expanding volunteer scope, and whether communities can revise artifacts that continue to represent their experience. Such investigations require authorized access, appropriate ethics oversight, and care in interpreting self-reported benefit or dependency. The absence of a public record cannot license speculative attributions of blame.

The institutional implication is limited but substantive. A generative commons can make room for voluntary initiative, professional judgment, disciplinary autonomy, and affected persons' agency through arrangements that make their connections and boundaries intelligible, revisable, and appropriately protected. The design task is to support co-creation while retaining the distinct legal and ethical authority of each role and the real costs of stewardship. This role-sensitive account prepares the subsequent analysis of collective rule revision and contestation while preserving the different purposes of volunteering, care, and research.

10 Collective Governance, Dispute Resolution, and Institutional Revision

The sustained operation of an assistance-related knowledge commons requires decisions about who may contribute, transform, validate, access, contest, or retire shared resources. These decisions occur across organizations whose duties, legal permissions, professional responsibilities, and constituencies may differ. The objective of this section is to specify a governance architecture in which collective participation has a determinate relation to institutional authority, disputes can be addressed without unnecessary disclosure or retaliation, and inherited rules remain open to accountable revision. The analysis proceeds through decision domains, locally legitimate rule formation, stewardship, complaint and remedy procedures, temporal revision, and a minimal decision-record model. It draws on established commons and collaborative-governance research, humanitarian accountability standards, and prior distinctions con-

cerning provenance, permissions, credit, heterogeneous value, and professional mandates. The proposed Generative Relational (GR) interpretation is presented as a testable account of connections among these operations, not as an alternative source of legal validity.

10.1 Decision Domains, Constituent Positions, and Accountable Authority

A governance arrangement becomes analytically recognizable when its decisions can be associated with identifiable domains, authorized actors, procedures, and possibilities of challenge. For a shared knowledge infrastructure, relevant domains include admitting a resource, classifying its sensitivity, determining permissible reuse, specifying review requirements, assigning an attribution record, approving outward-facing representations, allocating maintenance resources, and retiring an outdated artifact. A choice concerning access to an identifiable case narrative is distinct from a choice about whether a contributor's work should be acknowledged; a determination of clinical correctness is distinct from the question of whether a collectively maintained glossary is clear to its intended readers. Each decision may involve several actors without conferring the same kind of authority upon each of them.

The institutional unit proposed here is a *governance domain*: a bounded class of decisions whose authority, affected parties, sources of constraint, and review arrangements can be made explicit. For a given domain, *rule-making authority* concerns who may establish prospective conditions; *operational authority* concerns who may act under those conditions; *review authority* concerns who may examine contested decisions; and *protective authority* concerns who may intervene when continuation presents a plausible safety risk. These positions may be distributed across an institution, a community group, and an independent reviewer. They may also intersect: for example, a data steward can restrict access immediately pending a review while lacking authority to adjudicate authorship or an employment grievance. The proposed distinctions organize empirical inquiry; they do not establish that an actor possesses a particular legal power without an identifiable legal or contractual basis.

Three categories of standing are helpful. *Contribution standing* marks a person's documented relation to an artifact or activity. *Affected-party standing* marks a person's or community's interests plausibly altered by a decision, including interests in safety, privacy, representation, or access. *Institutional standing* identifies the competence, delegation, or legally assigned function by which an organizational actor can decide or review. A volunteer may have contribution standing concerning a translation but limited authority over a hospital's public clinical communications. An affected community may have a strong reason to be heard about portrayals of its experience even where no member authored the resulting research paper. A professional supervisor may possess approval authority for a protected workflow while having no corresponding claim to original scholarly authorship. The separate record of each position reduces the risk that membership or prestige is mistaken for universal decision-making competence.

The design of a domain should also reveal whose interests are absent from an apparently inclusive meeting. An invitation limited to contributors who hold active accounts can overlook former participants, people whose experiences supplied the source material, unpaid maintainers, and communities that cannot safely appear publicly. Participation research identifies institutional design, the identity of participants, modes of communication, and connections to action as separate dimensions [22]. A forum with broad attendance can still offer limited practical influence where agenda control, technical vocabulary, document access, or final approval is concentrated elsewhere. As Section 8 argues, nominal eligibility and feasible participation should be examined independently. The relevant governance question is therefore not simply the number of persons invited but the kind of decision each group can shape, the information they may legitimately see, and the reason given when their input is not adopted.

10.2 Collective Choice, Polycentric Coordination, and Mandate Boundaries

Ostrom's studies of self-governing resource arrangements draw attention to local rule-making, monitoring, lower-cost conflict resolution, and nested organizational levels [47]. Subsequent work develops polycentric governance as a possible response to problems that span multiple centers of partially autonomous decision making [48]. These are important antecedents, although empirical results concerning

common-pool resources should not be treated as direct proof that the same configuration will succeed with knowledge artifacts, clinical responsibilities, or humanitarian records. Shared knowledge is often technically replicable while its collection, interpretation, verification, stewardship, and secure distribution remain scarce or costly. Likewise, the persons exposed to risk from a document's release may differ from those who benefit from its circulation. The institutional adaptation requires attention to these differences rather than a literal transplant of resource-management rules.

A *polycentric arrangement* in the present proposal means that specified decisions are made by multiple centers whose authority is bounded and whose interactions are governed. A contributors' group could shape terminology and maintenance conventions; an institutional data controller could decide whether a confidential source may be processed or disclosed under applicable rules; a professional office could review a safety-sensitive educational statement; and an independent appeal route could consider an allegation of retaliatory exclusion. The arrangement benefits from local knowledge when those closest to the work can identify errors and feasible improvements. It also requires escalation when the effects exceed the domain of local competence. Neither majority support nor a putative commons rule should be presumed to override individual data-protection rights, professional duties, contractual limitations, or other binding constraints.

Collaborative-governance scholarship identifies power and resource asymmetries, prior histories of cooperation or conflict, institutional design, and facilitative leadership as conditions that can influence collaborative processes [1]. This literature supports examination of how consensus or consultation is structured, rather than a general expectation that stakeholders will automatically reach equitable agreements. In a university-adjacent assistance commons, participants can have markedly different access to legal advice, computing infrastructure, research time, and organizational recognition. Where these differences matter, the framework suggests accessible explanations, independent advice or representation where feasible, translation support, protected channels for objections, and an explicit account of who retains final authority. Such measures would need funding and assigned responsibility. Calling an arrangement "participatory" would not itself supply either.

Decision rules may vary by domain. Consensus can be useful for designing a shared glossary or an agreed attribution convention; a documented expert review may be appropriate for technical safety judgments; a restricted safeguarding process may be required for allegations of misconduct; and an external statutory or professional route may govern legal complaints. A uniform voting rule would risk flattening the domain-specific significance of these decisions. The proposed architecture therefore seeks *procedurally differentiated participation*: participants receive reasons, relevant access, and a feasible form of influence proportionate to the decision and their relation to it, while final authority remains traceable to its proper source. This proposition is normative and institutional, not a claim that a particular allocation already exists at a named organization.

10.3 Rules in Use, Stewardship Duties, and Resource Maintenance

Formal policies may only partially describe the rules that govern daily collaboration. A platform can publish an open contribution policy while maintainers consistently decline certain languages, formats, or kinds of experiential evidence. A committee can adopt a consent rule while contributors learn that refusing a request makes future participation difficult. A document may be labelled "shared" while only one person controls its version history or cryptographic keys. These discrepancies should be studied as rules in use: repeated patterns of authorization, acceptance, delay, and sanction that participants encounter in practice. The knowledge-commons research framework is useful here because it invites analysis of resources, communities, governance arrangements, historical conditions, and outcomes without presupposing a single institutional solution [21].

Stewardship includes preserving interpretable records and the ability to correct them. A steward may need to verify that a resource has a legitimate basis for storage, that its current version is identifiable, that dependencies and licences are recorded, and that access restrictions can actually be enforced. Maintenance also includes routine tasks that are often invisible in celebratory accounts of collaboration:

migrating files when software changes, correcting broken identifiers, responding to withdrawal or correction requests, reassessing re-identification risks, and explaining why a previously usable resource has become restricted. These activities incur labour, technical expense, and opportunity costs. The contribution and value frameworks in Sections 3 and 7 suggest recording such work where appropriate, while avoiding the presumption that every act of stewardship creates an entitlement to future revenue.

A stewardship obligation should be attached to a function and an accountable role, with a plausible continuity arrangement. If a researcher who holds the only recovery key leaves a project, preservation may fail even where the nominal licence remains valid. If a moderator handles all disputes without support, a commons may maintain superficially responsive procedures until accumulated costs produce burnout or selective enforcement. If assistance beneficiaries are routinely asked to repeat accounts of traumatic events for successive reviews, procedural participation can itself become harmful. Consequently, a useful institutional record would include review intervals, substitutes for key personnel, permitted methods of recovery, budgets for accessibility and mediation, and safeguards against repeated unnecessary disclosure. These are suggested design dimensions requiring institutional feasibility testing.

Stewardship authority also needs limitations. An administrator with technical ability to delete a contribution may be subject to archival, contractual, or research-integrity requirements to preserve a restricted evidentiary record, even when public access is withdrawn. Conversely, a legal duty to retain some records does not imply permission to expose them within a public commons. A distinction among *public withdrawal*, *controlled retention*, and *complete deletion where appropriate and legally possible* avoids treating all requests as a single file-removal operation. The specific legal consequences depend on jurisdiction, data type, contractual arrangements, and governing policies. The permission analysis in Section 4 remains controlling for these questions; collective preference cannot by itself confer otherwise absent rights.

10.4 Complaint Standing and the Classification of Institutional Disputes

A dispute process begins with the possibility of being heard without requiring a claimant to accept the governing institution's description of the problem. A conflict over an omitted acknowledgement is not equivalent to a concern that an aid recipient's identity could be inferred from an ostensibly anonymized report. An allegation of discriminatory denial of participation is distinct from disagreement about a methodological interpretation. A participant may report several connected harms, and one record may require more than one competent process. Initial classification should therefore preserve the complainant's account, the implicated decisions, potential urgency, and the limits of the receiving office's authority.

The revised Core Humanitarian Standard (2024) describes commitments concerning the ability of people and communities to participate, report concerns safely, obtain responses to complaints, and receive support adapted through learning [8]. Its provisions concerning appropriate complaints mechanisms, protection of information, and survivor-centered handling of misconduct are relevant ethical and professional reference points for humanitarian organizations. The standard does not make the research commons into a humanitarian agency, nor does it displace applicable domestic laws or an organization's binding safeguarding arrangements. Its distinctive contribution here is the reminder that a complaint mechanism can itself increase harm if access is unsafe, explanations are inaccessible, or control over the complainant's information is inadequate.

At least five dispute classes deserve separate initial treatment. *Provenance disputes* concern whether an asserted contribution, transformation, or sequence of events is adequately supported. *Recognition disputes* concern the application of credit criteria, including authorship decisions that may be governed by journal rules or institutional research-integrity processes. *Permission disputes* concern ownership, licences, confidentiality, consent, or lawful data use. *Safety and conduct complaints* concern possible harm, retaliation, exploitation, or professional misconduct. *Distribution and participation disputes* concern access to resources, decision-making influence, or unequal allocation of costs and benefits. A single complaint may engage several classes, and an initial category should remain revisable. It is especially important that allegations of serious harm are not routed into informal mediation merely because disputants

share a commons membership.

A respondent also has interests in fair process. Preliminary concern, proven violation, good-faith disagreement, and deliberate misconduct should not be conflated. Notice, an opportunity to respond where compatible with safety and the governing process, protection against public pre-judgment, and suitably independent review can matter for legitimacy. There may be necessary exceptions to ordinary notice when immediate disclosure would endanger a complainant, compromise evidence, or interfere with a formal inquiry. Determining an actual legal duty to notify or disclose requires the relevant law and institutional policy. The paper proposes case-sensitive procedural safeguards rather than a universal adjudication code.

Standing for complaint should be broader than recognized intellectual ownership. Someone whose identifiable experience enters a training dataset might have a privacy or safety concern without being a contributor in the attribution sense. A volunteer whose name is publicly credited may seek removal of public identification without disputing that the activity occurred. An organization can ask for correction of a misrepresented endorsement. A community group may raise concerns about foreseeable group harm even when no particular member can prove individual economic loss. These situations illustrate why the capacity to raise a concern should not be made conditional upon agreement with the institution's preferred theory of value or authorship. They do not establish that every complainant possesses a legally enforceable remedy; the relevant grounds must be assessed separately.

10.5 Safe Resolution, Escalation, Remedy, and Explanation

The proposed procedure separates *receipt*, *protective triage*, *jurisdictional routing*, *fact-finding*, *reasoned disposition*, and *review or correction*. Receipt acknowledges that a concern was submitted and records the complainant's preferred safe contact method. Protective triage asks whether immediate restriction of a resource, preservation of evidence, or safeguarding referral is warranted while remaining neutral about ultimate responsibility. Routing identifies the decision-maker with competence over the relevant issue. Fact-finding tests a claim against available records, acknowledges gaps, and permits proportionate participation by relevant parties. Disposition explains what was decided, on which grounds, and what remains uncertain. Review identifies any appeal, external route, or future re-examination available under governing arrangements. This sequence is a proposed design heuristic and must be adapted to applicable professional, institutional, and legal procedures.

Safety may require a compartmentalized process. A complaint about data exposure should not circulate the exposed data as an attachment to an unrestricted committee mailing list. An alleged safeguarding violation may call for referral to specialist channels that are independent of the project leadership. When a complainant fears professional retaliation or loss of access to assistance, a single pathway controlled by the alleged decision-maker is unlikely to provide meaningful independence. Confidentiality arrangements should define who may view what evidence, for which purpose, and for how long, while preserving lawful obligations of reporting and appropriate disclosure. The objective is safe contestability, not secrecy without accountability. External legal, ethics, safeguarding, or regulatory processes may remain necessary regardless of whether the commons offers an internal discussion procedure.

Remedies are likewise heterogeneous. A verified provenance error may be repaired by a dated correction retaining earlier versions where appropriate. Misattributed credit may justify amendments to metadata, acknowledgements, or downstream notices, subject to the actual publisher's procedures. Improper release may require access restriction, notification, or deletion where legally appropriate. Unfair exclusion may call for a reasoned reconsideration of participation, restored access where lawful, or a change to the rules for future decisions. A systemic maintenance failure may require resources and an assigned accountable steward rather than punishment of an individual. The correct remedy depends on the violation, the authority and capacity to act, the interests of affected persons, and safeguards against creating further harm. The availability of a remedy inside the commons is not the same as its sufficiency under law.

Proportionality has a domain-specific meaning here. For correctable documentation mistakes, expla-

nation and correction may be more effective than punitive exclusion. For conduct presenting a credible threat, immediate protective restrictions or referral may be warranted while the allegation remains unproven. Ostrom's account of graduated sanctions and accessible conflict-resolution arrangements provides a comparative starting point, yet sanctions in a knowledge or assistance setting cannot be mechanically inferred from rules governing common-pool resource appropriation [47]. Formal safeguards, employment processes, and the rights of respondents and complainants may limit or replace informal disciplinary responses. Nor is mediation invariably suitable where power imbalances or allegations of abuse make voluntary participation doubtful.

Feedback to participants should close the procedural loop without promising outcomes beyond the institution's authority. The OECD's participation guidance emphasizes explaining what became of participants' input and giving reasons when proposals are not adopted [44]. For an assistance commons, a credible disposition might communicate that a requested modification was accepted, declined with reasons, referred to another body, or deferred pending evidence, while withholding protected case details. The recipient should be able to distinguish a substantive disagreement from administrative silence. Responsiveness can be assessed through a documented explanation and feasible next steps, not simply through the number of messages sent or the speed of closure.

10.6 Temporal Revision, Dependency Management, and Institutional Memory

Rules that adequately govern an initial collaboration may become ill-suited to later resources, technologies, and relations. A permission model adopted for anonymous teaching materials may prove inadequate when machine-assisted linkage creates a plausible re-identification risk. An authorship convention designed for a short collaborative report may leave maintenance roles invisible when the archive later supports multiple research papers. A committee with appropriate expertise at the founding stage may lose crucial linguistic or professional capacity. Revision is therefore a routine governance function rather than evidence that the original rules were necessarily defective.

Revision should be temporally explicit. A proposed change can specify its rationale, factual basis, affected domains, consultation process, decision authority, prospective effective date, transitional treatment of existing contributions, and conditions for subsequent evaluation. The provenance of the old rule should remain accessible to authorized reviewers, and the new rule should identify the contexts in which it applies. The distinction matters for previously valid licences or completed uses: introducing a new preference for reciprocity cannot retroactively withdraw permissions already granted through an irrevocable licence, where its terms and governing law produce that effect. New reciprocity arrangements can instead be negotiated for future contributions or attached to distinct services and commitments where legally and ethically appropriate. Likewise, governance reform cannot extinguish independent legal or ethical claims by declaring that an old rule has been superseded.

An inherited decision can give rise to nested return obligations or expectations. For example, a glossary contributed to a training commons might later support a validated educational resource, whose distribution produces recognition, funding, or new cooperation opportunities. The record of those relations can inform future governance choices about attribution, access and resource allocation. It does not determine a unique allocation of economic proceeds, nor does it transform a moral expectation of reciprocity into a debt. Sections 6 and 7 establish why the creation of heterogeneous benefit, demonstrable causal dependence, and legally authorized distribution remain separate questions. A durable governance system would preserve these distinctions even when contributors advocate stronger mutual-return commitments.

Institutional memory must accommodate contestation. A record that only preserves final committee decisions may reproduce the viewpoint of those already exercising authority. A revised rule can therefore retain a protected account of dissenting reasons, alternative interpretations, and unresolved evidentiary gaps, with access conditions adapted to sensitivity. This does not entail publication of confidential submissions or permanent retention of personal information irrespective of applicable law. The ethical design problem is to preserve sufficient interpretive continuity to make revision accountable while

Table 10: Constructed governance disputes and possible differentiated review routes. Each example is hypothetical; jurisdiction-specific duties and actual institutional competence must be verified before implementation.

Configuration	Competing interests or uncertainty	Possible governance response
Credit contested after reuse	Contributor record conflicts with a later authorship claim; original evidence is incomplete	Separate historical correction from formal authorship review; preserve disagreement and notify legitimate downstream editors
Protected source in shared method	A useful teaching artifact embeds information that may identify a service recipient	Suspend unsafe distribution pending competent privacy review; consider a non-identifying derivative and restricted evidence retention
Professional sign-off disputed	Contributors support public release while a designated professional reviewer raises a safety concern	Verify mandate and substantive grounds; enable reasoned revision and independent referral where warranted
Volunteer excluded after complaint	Access is withdrawn following a governance objection, with disputed retaliation	Offer a safe independent review and examine documented grounds; avoid treating the exclusion as proved misconduct without inquiry
Delayed benefit allocation	A historical contribution supports a later funded derivative, but reuse terms vary	Trace licences and commitments; distinguish negotiated future return from an existing enforceable entitlement
Community representation contested	A public description is challenged as inaccurate by people affected but absent from the contributor register	Open a protected route for affected-party input; assess factual correction and representational harm separately from ownership

minimizing unnecessary data accumulation and exposure. The organizational-memory literature already demonstrates that storage, retrieval, and use are distinct aspects of institutional recollection [65]. The GR extension asks whether differences among these functions condition later possibilities of recognition, cooperation, and equitable returns.

10.7 A Minimal Decision and Review Record for Shared Resources

A minimal structured record can make governance decisions comparable without assuming that every issue admits an algorithmic answer. A correction to an internal acknowledgement, a complaint about safeguarding, a contractual dispute, and a claim requiring a judicial or regulatory remedy belong to different procedures; a commons review record does not transfer jurisdiction among them. Let a case c denote a situated request, complaint, or rule-revision proposal; let t identify the relevant time; and let $\mathcal{E}_{c,t}$ represent the evidence that the authorized reviewer may legitimately consider at that time. The proposed record specifies the following fields in Equation 8.

$$G(c, t) = (d, a, s, e, p, o, r, \tau, \rho)_{c,t}. \quad (8)$$

Here d is the decision domain; a identifies the decision-maker and the verified source of authority; s records affected positions and safe routes for participation; e describes an evidentiary basis and unresolved uncertainty without requiring public disclosure of the underlying materials; p identifies applicable permissions and protective constraints; o records the disposition and its reasons; r lists remedies, referrals, or review options actually available; τ specifies effective periods and review dates; and ρ references a provenance-preserving record of changes and corrections. The expression represents a *documentation schema*, not a validity theorem, an automatic authorization function, or a claim that the fields are exhaustive. Its practical value is conditional upon correct classification, trustworthy records, competent review, adequate confidentiality controls, and institutional resources.

Table 10 compares six constructed configurations. Its cases are hypothetical stress tests, not observations of named institutions, and their indicated routes are possible governance responses rather than universally applicable legal conclusions.

The schema has limitations beyond evidentiary incompleteness. It can record an explanation while failing to measure whether a complainant understood it, could safely respond, or experienced meaning-

ful remedy. It can note that a community consultation occurred while obscuring who set the agenda and whose language was used. It can log a nominally independent reviewer while omitting dependence on the project leader for future funding or professional advancement. It can also generate administrative work that displaces the substantive collaboration it is intended to support. Empirical evaluation should therefore compare the record with interviews, procedural audits, protected feedback, and the actual feasibility of appeals; a higher number of completed entries is not itself evidence of fairer governance. Documentation should be proportionate to resource sensitivity and foreseeable risk.

10.8 GR Reality Levels, Rival Explanations, and Evaluation Criteria

The governance framework can be examined at the three reality levels used throughout the present research programme. At the *ontological level*, the ultimate status of institutional norms, authority, value and relational entities remains suspended; the paper does not infer their ultimate nature from the usefulness of its record model. At the *relational level*, repeated authorization, recognition, complaint handling, resource maintenance, and rule revision may constitute historically stable structures that affect which future contributions and protections are feasible. At the *manifestation level*, these relations become partially accessible through minutes, version histories, policy texts, access denials, reports of participation, written decisions, and visible remedial acts. These manifestations can be incomplete, strategically presented, or inaccessible for legitimate protective reasons. The distinctions permit an investigation of governance processes without converting an available administrative record into an exhaustive account of social reality.

The provisional GR hypothesis is that the durability and generativity of an assistance commons may depend partly on the historically coupled functioning of several interfaces: the admission of contributions, credible attribution, legitimate permission, safe participation, revisable decisions, and feasible return pathways. Under some conditions, failure in one interface can alter others. Repeated unexplained refusals of recognition may reduce future participation; loss of historical records may make later disputes difficult to adjudicate; a confidentiality breach may legitimately narrow access and thereby change possibilities for reuse; an effective repair process may restore confidence without requiring every conflict to be resolved by consensus. These are bounded causal propositions requiring empirical evaluation, not a claim that GR has established a novel law of institutional development.

Plausible rival explanations include institutional capacity, legal compliance, professional organizational culture, resource scarcity, funding continuity, incentive alignment, staff turnover, and the quality of existing complaint mechanisms. Several such explanations may account for an observed outcome more parsimoniously than an additional relational vocabulary. An informative empirical design could compare sites or periods with similar substantive resources but different complaint access, decision traceability, or rule-revision procedures; examine whether corrections are implemented and maintained; and assess whether relevant participants can safely report mistakes without subsequent loss of opportunity. Process tracing might help determine whether a documented change in governance preceded and plausibly contributed to an improvement in participation or resource quality, while recognizing selection effects and unmeasured organizational differences. These comparisons should not depend on access to identifiable aid-recipient records when protected or aggregate observations suffice.

The proposed model also admits failure conditions. An elaborate participatory structure may delay urgent protective decisions; apparent consensus may conceal dependencies; a formal appeal can exist while remaining prohibitively costly; incremental revision may preserve a harmful distribution of voice; and an easily accessible complaint channel may be unsafe if confidentiality or retaliation protections fail. Under such circumstances the framework should identify the mechanism that did not operate as posited, revise its explanatory scope, or yield to a better-supported account. A successful governance arrangement is therefore not defined by the mere existence of collective procedures or increasingly extensive documentation. It is assessed through the lawful and ethical defensibility of decisions, participants' feasible agency, protection of affected persons, adequacy of correction routes, and the ability to sustain beneficial cooperation without systematically transferring its costs to less powerful participants. The resulting

account provides the institutional constraints and decision semantics for the technical infrastructure proposed for Section 11, while leaving that subsequent design open to empirical and legal correction.

11 Technological Infrastructure for Provenance and Governed Reuse

The technical infrastructure of an assistance-related knowledge commons has a narrower and more demanding role than making contributed materials searchable. It must support the historical reconstruction of contributions, differentiation of legally and institutionally authorized uses, responsible recognition, restricted handling of protected information, and revision of decisions over time. The analytical problem is to design interfaces among these operations without assuming that a database record settles a normative disagreement or that technical accessibility establishes legitimate permission. This section proposes a layered architecture grounded in existing provenance, metadata, policy-expression and security standards. It first specifies the objects and separation of functions; then examines identifiers, evidence, permission decisions, privacy-preserving disclosure, interoperable exchange, and institutional review; finally it offers a minimal event-record schema, constructed failure cases, and a bounded GR interpretation. The architecture is a conceptual design suitable for subsequent institutional specification and empirical testing. It is neither a tested software system nor a representation of practices adopted by a particular hospital, university, or humanitarian organization.

11.1 Data Objects, Institutional Mandates, and Architectural Boundaries

The basic technological objects are contributed artifacts and their versions, recorded activities, claims about those activities, persons or organizations described as agents, permission statements, institutional decisions, and documented transformations or downstream uses. They occupy different positions in the governance process. An artifact may be an educational handout, translation, methodology, program, glossary, research dataset, accessibility template, or evaluative report. An activity may involve editing, translation, review, pseudonymization, quality assurance, withdrawal, or transfer. A claim represents an assertion about an activity or its participants, supported by evidence of varying strength. A permission statement reports an apparent legal or institutional basis for a specific proposed use; a decision records a situated determination by an actor with an identifiable mandate. A downstream-use record reports a transformation or use without presupposing that a benefit, moral credit, or legal debt has thereby been established.

A practicable architecture should keep these categories conceptually separate even when they share storage. In particular, a recorded contribution is not identical to the artifact eventually published; a contribution claim is not identical to a proven event; and a digital statement about permission is not equivalent to a right holder's legally effective authorization. These distinctions restate the institutional questions developed in Sections 3, 4, and 5 in terms that can guide information-system design. They also imply a distinction between *governance authority* and *system administration*: the person able to alter a database or grant a software role may not be competent to adjudicate authorship, waive confidentiality, approve professional dissemination, or resolve a community's objection.

For conceptual purposes, the proposed infrastructure has five cooperating functions. A *provenance function* preserves versioned assertions about events and derivations. A *policy and authorization function* describes requested actions and checks available evidence of permissions and constraints. A *recognition function* records descriptive credits, consent to disclosure, disciplinary determinations and contested cases. A *protected-evidence function* holds material accessible only to authorized reviewers under applicable safeguards. A *governance and review function* records the competent decision, its rationale, effective period, correction mechanism and available referral. These are functional distinctions rather than a requirement to deploy five software services. A small organization may use version-controlled documents and a controlled repository; a larger network may use separate repositories and interoperable registries. The adequacy of either arrangement depends on its security, reliability, maintainability, and governance, including its capacity to operate without exposing vulnerable participants.

The system boundary should encompass the people who must maintain records and correct errors. A repository that requires elaborate annotation without allocating staff time for review will accumulate unverified metadata. A universal identifier that is useful for researchers may endanger participants who require anonymity or pseudonymity. A machine-readable rule that reduces ambiguity for a routine use may conceal institutional disagreement when different custodians interpret the relevant permissions differently. Consequently, the architecture treats resource sensitivity, participant position, decision competence, record quality, and operational cost as design inputs rather than matters to be inferred from technical elegance alone.

11.2 Identifiers, Version Relations, and the Temporal Structure of Records

Persistent identifiers support the recovery of historical relationships when artifacts are copied, moved, revised, translated, or repackaged. The FAIR principles associate persistent identification, meaningful metadata and provenance with the findability and reuse of research objects, while explicitly permitting authentication and authorization when necessary [66]. In a generative commons, an identifier may denote an artifact family, a specific immutable version, an activity, a claim, a contributor identity held under a permitted disclosure arrangement, or a governance decision. Treating these identifiers as interchangeable can undermine both scientific reconstruction and legitimate correction. A current training resource may have one publicly usable version while an earlier draft remains restricted because it contains sensitive material. A derivative may lawfully reuse the public version but not the restricted working source.

A proposed minimal rule is to distinguish *resource identity*, *version identity*, and *record identity*. Resource identity supports discovery across a lineage; version identity identifies the content or state relevant to a particular reuse event; record identity enables amendments to an assertion without silently overwriting what was previously claimed. Timestamps likewise require interpretation. The time when a contribution occurred, the time when it was recorded, and the effective time of an institutional permission may differ. These distinctions matter when a licence changes for future versions, when an acknowledgment is corrected years after a project, or when an organization acquires new information relevant to its assessment of an earlier decision. Historical traceability benefits from recording the difference between *valid time* and *recording time*, without assuming that the clock values themselves establish the authenticity of an event.

Content digests and signed records can help detect unintended alteration, subject to appropriate cryptographic implementation. An append-only or publicly replicated audit design is therefore optional rather than a default: irreversible replication of identifiers or sensitive metadata may conflict with legitimate correction, minimization, controlled disclosure, or deletion obligations. An architecture may instead preserve authorized evidence of a decision while allowing correction or removal of protected material under an applicable retention schedule. They cannot demonstrate that an assertion was truthful when entered, that a person possessed relevant legal authority, or that a derivative was used ethically. Cryptographic evidence should therefore be read as evidence about specified properties of records, such as integrity or signer association, and not as a general proof of provenance. The W3C's Verifiable Credentials Data Model v2.0 provides a framework for representing claims from issuers and explicitly distinguishes verifiability from the truth of those claims [72]. Its use would be justified only where reliable issuer governance, acceptable privacy properties, revocation processes, and cross-institutional verification requirements warrant the added technical and maintenance burden.

Identity resolution also presents a safety problem. Long-lived identifiers may help attribute work to mobile scholars or former volunteers, but cross-dataset linkage can reveal employment, health, displacement, institutional affiliations, or other sensitive patterns. A minimal record may therefore contain a role or a restricted pseudonym rather than a public personal identifier. Recovery of the identity, if genuinely necessary, should occur through a legally and institutionally authorized procedure with appropriate notice, proportional access, retention rules and a safe route to challenge mistaken linkage. Persistent identification is a method of continuity, not a mandate for universal exposure.

11.3 Provenance Assertions, Evidence Grading, and Contestable History

W3C PROV-O offers a standardized language in which entities, activities and agents can be related through generation, use, derivation, attribution and association [64, 63]. Its value for a commons lies primarily in interoperability: a laboratory, volunteer collective or university unit may describe recognizable historical relationships even when their applications and terminologies differ. The ontology does not substitute for archival investigation or a disciplinary assessment of contribution quality. An RDF statement recording that an entity was *DerivedFrom* an earlier entity is a structured assertion requiring evidentiary support, not an automatic determination of proper scholarly credit, permitted derivative use, or economic compensation.

The information model proposed here separates three layers of provenance evidence. An *event assertion* describes what an identifiable source reports; an *evidence reference* specifies how that assertion is supported and who may inspect the underlying material; and an *assessment record* reports the extent to which a competent reviewer regarded the assertion as verified, disputed, incomplete or superseded at a specified time. Where reviewers disagree, the infrastructure should preserve the meaningful disagreement and its grounds without implying that every claim is equally credible. A withheld confidential interview, for example, may support a restricted review without permitting publication of the interview transcript. Conversely, a machine-generated transformation log may establish that a file was processed by certain software while leaving uncertain who authored the original ideas or whether a resulting representation is scientifically valid.

The schema should allow agents to perform several roles across one activity and should permit multiple accounts of a complex contribution. A method derived through discussion, annotation and successive small corrections often lacks a single decisive creation event. A volunteer may identify an ambiguity, a specialist may propose a correction, a translator may adapt the result to another language, and an accessibility reviewer may make the artifact usable by a previously excluded group. These contributions can be represented as distinguishable activities with qualified relations and supporting records where evidence exists. Incomplete evidence should remain visible as an uncertainty, and absence from the recorded graph should not automatically be treated as proof that a person's contribution did not occur.

Correction in such a system entails more than editing a description. A mistaken attribution may already have propagated to datasets, catalogues, teaching materials or published citations. The architecture should track revised assertions and feasible notification routes to known downstream stewards, while recognizing that a public licence or external publication may limit effective control over earlier copies. Revision mechanisms must therefore distinguish a correction to the commons' *own records* from the legal authority to compel alterations elsewhere. The governance process of Section 10 provides institutional meaning to such records, including confidentiality-preserving review, an explanation of contested decisions, and remedies within the relevant mandate.

11.4 Policy Expression, Authority Verification, and Reuse Decisions

The technical representation of permissions should identify the requested use, the resource and version, the proposed user, relevant role and purpose, temporal scope, applicable licence or contractual text, and any protected-information constraints. W3C's Open Digital Rights Language (ODRL) supplies a machine-readable model for permissions, prohibitions and duties related to the use of assets [61]. It can express policy statements and support interoperability. An ODRL policy is still a statement by its assigner within a particular authority context; it does not itself prove that the assigner owns the relevant rights, can lawfully disclose personal information, or can override the obligations of another institution. These limitations are especially consequential when an ostensibly reusable artifact incorporates third-party images, copyrighted questionnaires, personal data, unpublished professional advice or material produced under a restrictive agreement.

The permission system should distinguish a policy *assertion* from a legally and institutionally justified *decision*. A request to reproduce an open teaching diagram may be answerable from a documented licence and version, subject to third-party materials and mandatory legal limitations. A request to train an

AI model on records of service interactions may involve a different purpose, data categories, consent or legal basis, professional confidentiality duties, collective interests, security protections and institutional research oversight. A policy engine may retrieve and compare relevant conditions, identify known incompatibilities, and escalate unresolved cases. The presence of a permissive string in metadata should not automatically trigger distribution when an independent restriction applies. Equally, the inability of an automated policy engine to evaluate an applicable statutory exception should not be taken to prove that the use is unlawful; it may require competent human legal review.

For operational triage, the architecture retains the earlier paper’s three provisional classes: *clear for the defined operation*, *restricted pending specified conditions*, and *review required*. A “clear” classification refers only to the evaluated use, version, actor and context; it is not a universal certification of an artifact. A “restricted” outcome can mean that an institution knows the stated use violates a binding policy or that release is appropriately limited because the material is protected. A “review” outcome captures missing rights evidence, ambiguity, contested interpretation, or the need for professional and ethical judgment. More detailed local statuses may be necessary. Every assessment should record what was actually checked and leave independent legal determinations with actors competent to make them. The framework does not identify a globally applicable hierarchy among licences, national laws, professional rules and contractual commitments; the hierarchy must be established within the applicable jurisdiction and mandate.

A critical temporal consequence follows. In many licensing contexts, a contribution’s incorporation into a later revenue-generating derivative does not retroactively transform an already valid public licence into an obligation to share profits. Future return arrangements can be negotiated and recorded for uses to which they legitimately apply, but neither a stored attribution nor the mere existence of a value path generates such a right. The technical interface should therefore display *documented entitlements*, *recorded voluntary commitments*, and *proposed reciprocity arrangements* separately. This distinction preserves the historical circulation analysis of Section 7 without reducing it to a misleading automated royalty mechanism.

11.5 Protected Metadata, Access Control, and Safety-Sensitive Retrieval

The architecture needs differentiated disclosure planes because some metadata can itself be identifying or dangerous. A title containing a rare diagnosis, a publicly exposed affiliation, the location of a displaced community, or a detailed provenance link may reveal protected facts even when the associated file remains inaccessible. Anonymization and pseudonymization involve distinct risks, and combining individually innocuous attributes may permit re-identification. Consequently, access policy applies to identifiers, relationship graphs, search snippets, logs, exports and derivative analytics as well as to the source content. Restricted evidence should not be inferable merely by probing a catalogue or comparing public versions of its metadata.

A feasible deployment might use four practical disclosure categories: public descriptions of resources cleared for release; authenticated metadata for a defined community; restricted evidence and decision records accessible to authorized reviewers; and isolated materials whose processing requires additional safeguards or a separate institutional process. These are proposed categories rather than universal legal classifications. The public tier may expose a resource identifier and a general-purpose description without revealing an individual beneficiary, sensitive location or confidential source. The protected tiers require concrete rules for purpose limitation, authenticated access, least privilege, separation of duties, logging, retention, incident response and secure correction or deletion. NIST SP 800-53 provides a substantial catalogue of controls relevant to access management, auditing and privacy risk, although its requirements and implementation are context-dependent and do not constitute binding law for every organization [43].

A system can preserve accountability while limiting retention of sensitive source material. Where lawful and appropriate, an audit may retain a narrowly scoped record that a competent review occurred, its date, the type of issue considered, and a route for authorized re-examination, without retaining the

original confidential account beyond its justified period. Such a record should be designed against false reassurance: a case identifier and an approval code say little about whether deliberation was competent, independent or fair. Decisions that affect vulnerable people require access to substantive reasons by appropriate participants or review bodies, within necessary confidentiality limits. A retention policy should accommodate correction, accountability, legal requirements and data minimization without promising both comprehensive indefinite archives and unrestricted deletion in every case.

Machine-readable privacy metadata may assist stewardship but should be treated with similar restraint. The Data Privacy Vocabulary (DPV), a W3C Community Group specification, describes purposes and features of personal-data processing [60]. It is neither a W3C Recommendation nor an independent legal basis for processing. Recording “research” as a purpose cannot demonstrate that research use is lawful or ethical; the actual project, applicable protections and procedural authorizations remain determinative. When cross-institutional reuse is proposed, an export should carry enough machine-readable warning to prevent silent assumptions that previous permissions transfer automatically, while avoiding disclosure of confidential evidence within the warning itself.

11.6 Interoperable Exchange, FAIR Accessibility, and Collective Data Governance

Interoperability concerns the ability of participants and institutions to interpret and exchange resources under constraints that survive transfer. W3C DCAT version 3 offers a vocabulary for cataloguing datasets and data services, supporting metadata exchange across distributed catalogues [71]. RO-Crate version 1.3 supplies conventions for packaging research artifacts and machine-readable descriptive metadata in a portable form [51]. These standards can facilitate discovery, documentation and transfer; their combination does not require a single institutional database or a centralized owner of all contributed knowledge. A commons may preserve plural repositories and locally governed data while exchanging limited descriptions and permitted artifacts through agreed interfaces.

The FAIR principles inform this architecture by emphasizing findability, accessibility through well-defined protocols, interoperability and reusability; importantly, they do not entail indiscriminate public availability of every dataset [66]. The CARE principles for Indigenous data governance emphasize collective benefit, authority to control, responsibility and ethics [5]. Their origin and relevance should be respected: CARE addresses Indigenous Peoples’ rights and interests, and cannot simply be treated as a generic checklist that automatically transfers community authority to an unrelated institution. In settings where Indigenous data or knowledge are involved, the relevant community’s own governance arrangements are substantively central. In other contexts, CARE may inform questions about power and collective benefit by analogy, without implying that distinct communities possess identical rights or normative arrangements.

A minimal cross-system exchange should state the artifact and version, the nature and limits of the sender’s authority, the rights and access information actually verified, provenance or citation links appropriate for disclosure, the purpose of the transfer, the status of any protected components, and the process for receiving corrections. More sophisticated metadata may be useful, but transfer should remain proportional to the receiving institution’s legitimate needs. A recipient able to reproduce a method does not thereby acquire authorization to obtain the personal records from which that method was originally developed. Similarly, a research object package may include a cleared synthetic example, a protocol, and public citations while omitting protected source records. The loss of direct data access can reduce the reproducibility of particular claims; that limitation should be stated rather than concealed by a formal declaration of interoperability.

Portability also has a social dimension. Formats may be technically open while requiring equipment, connectivity, language competence, accessibility accommodations, or specialist skills unavailable to some participants. Maintenance contracts and dominant software platforms can create dependency that limits a group’s ability to correct or move its records. Open export formats, documented provenance, governance continuity, and proportionate training may reduce such dependencies, but they also cost resources. A comparative study should therefore assess whom interoperability enables to act, who

controls import and export, and whether sensitive participants can understand or contest a record without engaging in unsafe public disclosure.

11.7 Decision Events, Audit Semantics, and Constructed Technical Configurations

An implementable record should express what occurred at the interfaces between technical processing and institutional judgment. Let r denote a resource version, u a proposed use, q a request or contested assertion, and t the time of evaluation. Equation 9 specifies a proposed *governed-use event record*.

$$\mathcal{T}(r, u, q, t) = (i, v, h, p, e, a, d, \rho, \sigma)_{r,u,q,t}. \quad (9)$$

Here i identifies the resource or claim without requiring public personal identification; v records a specific version and relevant time; h identifies an event or historical-relationship assertion with its evidence status; p denotes the policy source and applicability limits considered; e references accessible evidence at the appropriate disclosure level; a identifies the decision-maker and verified mandate; d states the situated determination or unresolved status and reasons; ρ points to available correction, contestation or escalation procedures; and σ records security, disclosure and retention constraints. The fields document a *process of assessment*. They are not an equation for legality, and no mathematical operation on the tuple makes an unauthorized use permissible. Fields may be unknown, contested or legitimately withheld from general view; a traceable restricted reference may be more appropriate than a public copy of the underlying evidence.

The tuple in Equation 9 concerns an event at a governance interface. It complements the general decision-review record in Equation 8 and the historical contribution record developed in Section 3; it does not replace either. A governance reviewer may have access to reasons that a general technical operator should not see. Conversely, a system administrator may verify that a requested file version matches a recorded digest without judging the fairness of an authorship determination. The infrastructure is adequate only insofar as these positions are connected through controlled, revisable procedures and their competencies remain legible.

Table 11 illustrates six constructed configurations. They are deliberately hypothetical and express design questions rather than findings about institutions or claims that a given technical standard solves the described conflict.

The cases expose tensions among traceability, minimization, participation and timely action. An append-only public ledger may preserve changes while permanently exposing sensitive relationships. Centralized control may simplify safety review while increasing concentration of institutional power. Automated policy checks may prevent routine errors while imposing burdens on participants unable to encode their reasons in a preferred vocabulary. Cryptographically signed assertions may deter tampering while giving false confidence to readers who mistake issuer authenticity for the truth of contested facts. These tradeoffs require situated governance decisions rather than a fixed technical maximization of transparency, immutability or automation.

11.8 GR Reality Levels, Rival Architectures, and Evaluation Programme

The three GR reality levels clarify the epistemic standing of the proposed infrastructure. At the *ontological level*, the ultimate status of social relations, institutional authority, meaning and value remains suspended; a provenance graph is a representational choice and does not prove that society is fundamentally constituted by graph edges or computational events. At the *relational level*, historically repeated activities of validation, permission, maintenance, recognition, exclusion, negotiation and correction may establish relatively stable conditions for further participation and value creation. At the *manifestation level*, portions of these activities become accessible as entries in logs, version histories, credentials, policy descriptions, interviews, documented decisions and practical outcomes. Manifestations can be selectively recorded, distorted, incomplete, legitimately inaccessible, or retrospectively contested. The explanatory task is to understand their relationship without taking the digital trace for the entirety of the underlying social process.

Table 11: Hypothetical technical configurations in assistance-related knowledge commons. The indicated responses are proposed safeguards; institutional authority and legal requirements must be established in each actual deployment.

Constructed configuration	Distinct evidentiary or governance risk	Proposed technical and institutional response
Open teaching template with restricted source	A public artifact derives from protected information; graph links may expose a source	Publish a cleared derivative with abstract provenance; restrict source linkage and authorize specialist review
Volunteer disputes contribution credit	Repository history and recollections diverge; public identity creates additional exposure	Preserve claim versions, contextual evidence and confidential review; distinguish credit correction from formal authorship
Research package transferred between organizations	A receiver reads a machine-readable policy as legally complete authorization	Export scoped permission evidence and warnings; require local validation of mandate and purpose before release
Historical identifier links protected participants	Public identifiers enable linkage across otherwise separated records	Use purpose-bounded pseudonyms and disclosure tiers; audit linkage and withdrawal or correction procedures
Later commercial reuse of a publicly licensed method	Provenance establishes influence but does not establish a retroactive profit claim	Display the original licence and separate any independently agreed return arrangements
Urgent withdrawal and downstream copies	A correction or safety notice does not eliminate material distributed elsewhere	Record affected versions, contact known stewards, document feasible mitigation and remaining uncertainty

The provisional GR hypothesis is that generativity may depend in part on the coordination of technical and institutional interfaces through which contributions become interpretable, reusable and governable over time. Under some conditions, usable provenance reduces the cost of recognizing earlier work; appropriate policy semantics reduce uncertainty about authorized reuse; protected review makes a correction possible without publicly identifying an affected person; and retrievable institutional decisions help subsequent actors understand why an artifact is accessible or restricted. Yet the same components may amplify exclusion when their maintenance costs are transferred to volunteers, when metadata categories erase local meanings, or when administrators acquire unilateral control over contested identity and credit records. The hypothesis concerns historically conditioned interactions among mechanisms. It does not establish that the introduction of an additional technical platform increases trust, fairness or value return.

Rival accounts require explicit attention. Better outcomes after a repository upgrade may be attributable to new staffing, management reforms, legal counsel, funding continuity, more experienced researchers, lower case complexity, or changes in the wider policy environment. A simple, access-controlled document repository may outperform an elaborate knowledge graph when staff time is limited or confidentiality risks dominate. Conversely, a distributed set of trusted repositories may outperform centralization where participants possess different legal mandates and need independent control over records. Technical choices should therefore be compared by the problems they actually solve, their costs, their failure modes, the reliability of human review, and their compatibility with the governance arrangements of affected groups. A claim of improved recognition should be evaluated through corrected credits and participants' experiences, not merely through the number of recorded provenance edges.

A feasible empirical design could compare versions of the same repository before and after introduction of a proportionate provenance-and-review workflow, or compare matched sites with different levels of metadata standardization and independent complaint access. Pre-specified outcomes might include successful authorized reuse, time required for contested attribution correction, unauthorized disclosure incidents, preventable access denials, error rates in permission interpretation, maintenance burden, and participants' ability to identify available review routes. Qualitative interviews could assess whether nominally accessible procedures are understandable and safe for volunteers, professionals and people affected by assistance practices. Observation should avoid collecting identifiable beneficiary information where

aggregate indicators, cleared synthetic records or confidentially administered reviews suffice. Findings would need to distinguish technical capacity from actual institutional capability and examine unintended effects such as chilling participation or widening power asymmetries.

The infrastructure proposal has recognizable failure conditions. It fails as an accountability mechanism if evidence cannot be inspected by an appropriately authorized reviewer; as a permission aid if machine-readable policy routinely obscures decisive legal constraints; as a recognition aid if contested contributions cannot be corrected; and as a protective system if metadata leaks sensitive identity or interaction patterns. A technically valid export that an institution cannot maintain, understand or safely govern likewise fails an important practical objective. These failures may require a narrower design, simpler procedures, different authority arrangements, or abandonment of an unsuitable technical layer. For the purposes of the present theoretical paper, the proposal establishes an interface vocabulary and a set of evaluable distinctions. It does not claim a deployed system, empirically verified institutional effects, or a generally valid engineering specification. Its appropriate next use is comparative examination of constructed and documented configurations under carefully stated source, authorization and safety conditions.

12 Comparative Cases and Constructed Configurations

Comparative inquiry into assistance-related knowledge commons must separate observable institutional arrangements from conclusions about their effects. This section examines four publicly documented organizational settings and a series of explicitly constructed configurations. The settings are research-method repositories, university-connected professional learning networks, community humanitarian mapping, and humanitarian data stewardship. They differ in their resources, participants, authority structures, exposure to sensitive information, and pathways of subsequent reuse. The objective is to evaluate how far the analytical distinctions developed in the preceding sections travel across those differences, while identifying occasions on which distinct causal explanations fit the same observed outcome. The method is a source-bounded structured comparison: public documentation supports limited descriptions of organizational features, whereas hypothetical configurations expose propositions and possible failures of the proposed generative-commons framework. Neither a platform description nor an illustrative scenario is treated as proof of realized distributive justice, institutional performance, or causal impact.

12.1 Comparison Units, Source Status, and Analytical Dimensions

The unit of comparison is an institutional configuration connecting a contribution, a resource, an authorized potential use, and a subsequent decision or benefit. An organization alone is too coarse a unit. Within the same organization, a public training template may circulate across universities, a protected case record may be restricted to a clinical team, and a methodological discussion may be accessible only to specified reviewers. The organization houses several partially connected commons and non-commons arrangements. Conversely, a single contribution may travel across organizations without creating a unified governance authority. Cases should therefore be indexed by resource class, participants, decision domain, and observation period rather than by a binary label indicating whether a site possesses a commons.

The comparison uses six substantive dimensions. *Resource provenance* concerns the reconstructibility of contribution and transformation histories. *Permission and protection* concerns the legal and institutional conditions under which a use can occur. *Recognitional position* concerns who may be credited or heard, and how decisions are challenged. *Conversion and return* concerns the value experienced by particular actors, which may involve learning, capacity, safety, scholarly credit, or material benefits. *Interface power* concerns who can open, close, translate, or change the conditions of participation. *Temporal continuity* concerns maintenance, platform changes, funding, memory, withdrawal, and the ability to reconstruct a long sequence of transformations. These dimensions are analytically distinct even where one mechanism affects several of them.

Evidence is graded at the level of each proposition. A *documented design statement* is an organization's publicly declared service, workflow, rule, or ambition. A *documented event* requires an adequately identified source recording that an activity occurred. An *observed outcome* requires evidence concerning a result and its measurement. A *causal explanation* requires stronger comparative or process evidence addressing alternatives. Finally, a *constructed configuration* is an analytical scenario whose premises are stipulated for examination. In the present section, the four institutional settings are grounded primarily in official public documentation of services or policies. The downstream contribution and benefit sequences added to them are stipulated examples. The sources were consulted on 11 October 2026, and descriptions of future institutional transitions retain that temporal qualification.

The governing question is accordingly modest: given a documented institutional possibility, which further records, permissions, interviews, and outcomes would be needed to conclude that a particular contribution was recognized or that value returned in a given form? For a multi-institutional system, the analyst must also establish who can disclose relevant evidence. Information available to the analyst is neither necessarily complete nor necessarily safe to make public. A denied request for sensitive records may indicate appropriate stewardship; it cannot, by itself, establish suppression of an otherwise valid attribution claim. Existing knowledge-commons case-study methods and polycentric-governance analysis support this attention to specific institutional configurations [21, 48]. The proposed GR language adds a provisional hypothesis about how multiple interfaces jointly condition future generative capacities; that additional hypothesis remains separate from the documented descriptions.

12.2 Research-Method Repositories and Platform Continuity

Repositories for protocols, scripts, templates, preregistrations, and methodological documentation provide a relatively familiar setting for distributed intellectual contribution. The Open Science Framework (OSF) illustrates a configuration in which a project may contain multiple components with different access settings, while identifiers, contributors, and project descriptions help readers recover portions of a research history. Official OSF documentation describes public and private project components, view-only links, and mechanisms for discoverability and citation [7]. These advertised features are sufficient to establish that differentiated access and some persistence functions are part of the described service. They do not establish that the metadata reconstructs all intellectual influences, that contributor credit is fair, or that every apparent permission permits a proposed downstream use.

A method commons may include a statistical script initially written by a graduate researcher, documentation corrected by a volunteer translator, and a later extension maintained by a different laboratory. A public version could permit use under a specified licence while the annotations connecting the code to confidential research data remain restricted. Later scholarly value may accrue to an article, an educational module, or a clinical protocol that employs the method. An analyst could reconstruct an authorized reuse trajectory from cited release versions, commit records, institutional permissions, and subsequent acknowledgements. Even a well-documented trajectory would not alone establish the translator's entitlement to authorship of the article or a share of future revenue. That determination involves role-specific scholarly criteria, rights, prior agreements, and potentially the wishes of persons who require protected recognition.

Platform governance introduces a separate longitudinal challenge. The Center for Open Science has announced that new OSF Projects and components will cease to be created after 16 November 2026, and that existing OSF Projects will become read-only on 19 February 2027 [6]. Both dates remain future at the date of this manuscript. The announcement states that existing public Project records will remain accessible through their established URLs and DOIs, while Registrations and Preprints continue as separate workflows. It does not establish that living Project editing will persist on OSF after the read-only change. Accordingly, this is evidence of a *planned platform transition*, not an observed loss of research content, a documented institutional failure, or evidence that the promised preservation will or will not be delivered. Its analytical significance lies in the difference between persistence of an earlier artifact and the capacity of a community to continue coordinating new contributions on the same infrastructure.

A constructed continuity test would follow one method repository whose members expect to maintain a living protocol after the announced transition. If the public archive remains readable but active revision moves elsewhere, the relevant outcomes include successful export, preservation of licensing and provenance context, retrievability of historic discussion, availability of a new maintenance steward, and accessibility of correction or complaint channels. Success may arise from disciplined archival practice, alternative hosting, sustained staffing, or interoperability standards rather than a distinct GR mechanism. Failure may take the form of fragmented version histories or abandoned maintenance obligations even though every earlier public file remains accessible. The case therefore distinguishes *record survival*, *institutional continuity*, and *generative continuity* without asserting that they necessarily move together.

12.3 University-Connected Professional Learning and Institutional Mandates

University-connected professional-learning networks provide a second setting in which contributions circulate across disciplinary and organizational boundaries. Project ECHO, headquartered at the University of New Mexico Health Sciences Center, describes a networked model of virtual case-based learning, capacity-building, training, and collaboration among hubs and partners [50]. This documentation establishes a relevant *educational interaction architecture*. It does not establish that the model operates through volunteer management, that every participant is a researcher, or that its reported organizational activities meet a particular criterion of distributive justice. A hospital-adjacent commons considered here is an abstract extension of the institutional possibilities of university-connected learning, not a description of a specific hospital's volunteer programme.

In the constructed configuration, a clinician, an educational specialist, a trainee, and an authorized volunteer translator contribute to a reusable orientation resource for nonclinical visitors. A university educator may contribute a pedagogy, a clinician may review factual accuracy, and the translator may adapt the text for a linguistic community. Each produces a different object of possible recognition: authorship of a research article, acknowledgment in an educational artifact, compensation under a contract, professional development, or a confidential contribution record. The resource becomes generative if participants can lawfully adapt it, learn from subsequent corrections, and sustain a safe process for maintaining it. Yet the material may also become more costly to govern when repeated revisions require scarce professional review or when volunteer labor is used to substitute for otherwise funded work.

The key boundary is professional and data-governance authority. Case-based education may depend on clinical experience, but access to identifiable patient information is governed by distinct duties and permissions. A translator's permission to adapt a cleared public handout gives no independent authority to review protected medical records. A researcher who wishes to evaluate the effectiveness of the teaching resource may need further ethics and data-governance assessment even when the teaching itself is authorized. Similarly, a participant's opportunity to contribute practical knowledge does not automatically confer authority to approve clinical advice or institutional policy. The resource, pedagogical decision, professional act, research dataset, and contribution-credit determination occupy different jurisdictions of competence.

Several rival accounts might explain an observed improvement in collaboration. More experienced instructors, protected teaching time, professional incentives, pre-existing trust, and more reliable communications could each improve educational reuse and participant satisfaction. To test the narrower interface hypothesis, observation would need to establish whether a documented change in provenance, attribution, or review arrangements actually improved the recoverability and lawful adaptation of a resource, net of those factors. Relevant measures include reviewer burden, correction latency, accessible participant feedback, unauthorized reuse events, and the distribution of learning opportunities. This setting shows how interdisciplinary proximity can create occasions for value generation while leaving its realization contingent upon professional mandates, available capacities, and safe institutional coordination.

12.4 Community Mapping and Local Participation in Humanitarian Assistance

Community-oriented mapping offers a case in which the material product is potentially more visible than the historical experience of its contributors. The Missing Maps initiative publicly describes a staged workflow: remote volunteers trace features from imagery into OpenStreetMap; local participants may add contextual information through field mapping; humanitarian organizations and communities can then use map data for planning and response [40]. Its stated principles also emphasize local participation, quality control, caution about rapid collection, and local access [41]. These statements document a project design and normative commitments. They do not independently prove that local communities possess effective decision power in each mapping campaign or that an identifiable downstream benefit has returned to each contributor.

The workflow suggests a valuable distinction between *map completion* and *community-serving use*. A remote mapper can contribute a traced road segment. A local mapper can correct its significance, add place names, or identify information whose publication would be unsafe. A humanitarian actor can use a cleaned map for logistical planning, while a community organization may use it for locally selected purposes. These activities differ in expertise, exposure to harm, visibility, and ability to influence the eventual application. The same artifact can support multiple constituencies, with compatible or competing accounts of what counts as value. Mapping output metrics may describe features edited or areas covered while leaving unobserved the quality of local access, contestability, community priorities, or protection from misuse.

A constructed mapping case exposes the relation between open licensing and power over interfaces. Suppose remotely collected imagery supports a map subsequently repurposed for a commercial logistics product. The licence may permit the reuse under applicable conditions. Historical attribution, an ethical interest in local benefits, and a contractual right to a financial return remain separate issues. Suppose, alternatively, that a locally knowledgeable contributor identifies the location of an especially vulnerable population and requests restriction. The first governance question concerns whether the information is appropriately included in a public map at all; the contributor's credit should not require publication of the sensitive location. In either scenario, the open-data principle operates within an ethically and legally bounded resource set rather than as a mandate to disclose everything that can be mapped.

The constructed case also exposes limits of a purely linear value-flow picture. A corrected map may help one team plan a response, and that response may generate further local knowledge that improves the next map. Circulation could be nested and indirect. Equally, a one-off volunteer contribution may generate public value without a return pathway traceable to the initial contributor. Local benefits might consist of safer navigation, improved planning capacity, or access to reusable tools rather than money. An adequate empirical study would record multiple actors' interpretations, mapping quality, actual deployments, and the costs or risks borne by local participants. Without those observations, the documented workflow supports a plausible venue for generative relations rather than a demonstrated generative-return cycle.

12.5 Humanitarian Analytics, Sensitive Data, and Governed Reuse

Humanitarian analytics provides a boundary case because further dissemination can generate operational benefits while increasing the likelihood of harm. OCHA's revised Data Responsibility Guidelines, announced in February 2025, describe principles, processes, and tools for safe, ethical, and effective handling of humanitarian operational data [59]. Humanitarian Data Exchange (HDX) criteria address information about context, affected populations, and response arrangements, while excluding specified classes of personal and sensitive non-personal data from material shared on the platform [58]. Public HDX documentation also describes automated and human review of submitted datasets [57]. These are documented institutional rules and processes. They neither imply that risks have been eliminated nor authorize an outside investigator to access sensitive material.

A constructed analytics configuration begins with an authorized assessment team collecting information for a specified humanitarian purpose. A data specialist develops a non-sensitive summary table, an analyst prepares a reproducible code workflow, and a local intermediary identifies an interpretive error.

Table 12: Four documented institutional settings and their constructed analytical extensions. Source descriptions establish organizational features, while value-return paths and outcomes remain hypotheses requiring independent evidence.

Setting and documented feature	Resource and possible value	Decisive governance interface	Unresolved empirical question
Research-method repository; OSF access and transition notices	Versioned methods; research reuse, learning, credit	Version continuity, licences, steward succession	Can active correction and collaboration continue through a new workflow after read-only conversion?
University-connected learning; Project ECHO network model	Cleared educational materials; professional and collective learning	Competence, review, mandate, educational-data boundary	Does accountable interdisciplinary review increase usable learning without undue costs?
Community humanitarian mapping; Missing Maps workflow	Map features and local knowledge; preparedness and mapping capacity	Local voice, quality assurance, safety of disclosure	Who receives demonstrable benefits and who can alter mapping priorities?
Humanitarian data stewardship; OCHA and HDX safeguards	Cleared aggregates and methods; operational learning	Sensitivity review, purpose, protected access, correction	Which governed disclosures improve decisions without increasing harm?

A cleared aggregate output is published, while source-level records remain under a distinct governance arrangement or are lawfully deleted when retention is no longer justified. The analyst's code may be publicly reusable even where the data used in a particular run cannot be shared. The intermediary might be credited collectively if individually named recognition would create a protection risk. Scientific reproducibility is then pursued through methodological transparency, controlled verification, synthetic inputs, or approved third-party audit rather than assumed public access to beneficiary records.

The distinction among permission, utility, and safety matters acutely here. A technically accessible dataset might be unusable for a particular secondary purpose because that purpose exceeds its collection conditions. A non-personal dataset may be sensitive in context, including where a location or association exposes a group to coercion. A licence is unable by itself to resolve all questions of consent, data protection, professional confidentiality, or humanitarian duty. Similarly, withholding an identified record can preserve valuable relations of trust and enable further lawful collaboration. The resulting *restricted generativity* is a candidate theoretical interpretation; it must be assessed against alternative accounts of ordinary information-security compliance and domain-specific professional ethics.

Evaluation should attend to successful authorized information exchange, documented correction of misleading aggregates, protection incidents, delay attributable to review, and the extent to which affected people have an intelligible route for questions or objections. A comparison that records only publication volume or analytic speed risks rewarding unsafe dissemination. Yet excessively burdensome controls may impede legitimate humanitarian decisions. A more informative criterion compares attainable safe uses, accuracy, maintenance costs, and documented benefits under competing governance designs. The OCHA and HDX sources provide institutional reference points for this design question; they do not supply the counterfactual data required to establish that the proposed GR explanation outperforms alternatives.

12.6 Comparative Matrix of Institutional Evidence and Analytical Hypotheses

Table 12 juxtaposes source-supported institutional features with the problems that the proposed framework would need to explain. Its last column expresses a research question or test rather than a finding. The table is deliberately limited to concise distinguishing features so that a shared schema does not erase the considerable domain differences described in the preceding case analyses.

The same documentary evidence can support several plausible interpretations. An active workflow

transition succeeds because metadata is interoperable, because its steward is particularly committed, or because new funding permits maintenance. A teaching network circulates materials because of an accessible credit system, because its teachers enjoy professional support, or because institutional rules already provide incentives. Community mapping strengthens local agency when local contributors shape priorities, but the presence of local edits alone may coexist with externally determined agendas. Humanitarian data controls reduce disclosures where procedures are followed, yet their effectiveness may depend on staffing and domain expertise more than on a shared metadata vocabulary. The comparative matrix therefore organizes questions that require process evidence and counterfactual comparison; it does not equate surface similarity with underlying theoretical identity.

12.7 Constructed Stress Cases, Missing Evidence, and Causal Alternatives

Six constructed stress configurations probe failures that may occur even when one component of the commons performs well. In the *archived-method case*, a dataset and method are well cited, but its living revision workflow becomes unavailable on the original platform after a stipulated transition, and no replacement is established. Archived versions remain accessible while prospective correction capacity declines. In the *anonymous-contributor case*, an educational resource is improved by a person for whom disclosure creates professional or personal risk. A public credit requirement would undermine the conditions of safe contribution; a protected recognition record may be more appropriate. In the *uncleared-derivative case*, a reusable analytics script accidentally includes small-cell examples derived from protected records. Technical reproducibility and historic contribution evidence cannot legitimize publication of the unsafe derivative.

In the *local-mapping priority case*, volunteers contribute numerous features while local organizations report that different information is needed. High activity counts may coexist with weak responsiveness. In the *unfunded-stewardship case*, a university unit receives many useful volunteer translations but has insufficient professional time to review and maintain them. Gross contribution volume rises, while usable resources and participant trust stagnate. Finally, in the *delayed-commercialization case*, an openly licensed method becomes important to a profitable product years later. Historic provenance can support appropriate credit and negotiated future collaboration, while the original licence and any independent contractual commitments govern the enforceability of particular financial claims.

These constructions specify mechanisms that can be investigated, rather than narrating episodes that occurred. They also illuminate the difference between a missing observation and a negative result. The absence of a publicly visible contributor name may reflect anonymity by choice, missing metadata, contested authorship, or an unrecognized contribution. The absence of an identifiable monetary payment may be consistent with valuable learning, collective protection, a noncommercial licence, uncompensated labor, or exploitation. A restricted document may indicate appropriate confidentiality, incomplete permissions, inefficient bureaucracy, or discriminatory gatekeeping. Analytical coding should therefore preserve *unknown*, *not applicable*, *disputed*, and *confidentially verified* statuses instead of forcing each case into a simple success/failure dichotomy.

Alternative explanations remain central. Transaction-cost economics may account for benefits from clearer permissions; organizational-learning theory for improved memory; established professional ethics for legitimate restrictions; labor relations for differences in participation; and legal compliance for shifts in data practices. Knowledge-commons scholarship already accounts for much of the variation in governance arrangements [21, 1]. The proposed GR approach merits retention only where its analysis of coupled interfaces and historically conditioned capacity adds specificity that is absent from an adequately developed competing model. A valuable research result could find that no additional GR mechanism is necessary for a given class of cases. Such a result would appropriately narrow the theory rather than invalidate the comparative research.

12.8 GR Reality Levels and Requirements for Comparative Evaluation

The comparative exercise operates across three GR reality levels. At the *ontological level*, it suspends claims about the ultimate nature of institutions, subjectivity, knowledge or value. The fact that a repository is described by a provenance graph or a community by a governance network does not establish that either representation is an ontologically complete account. At the *relational level*, recurrent interactions among contributors, stewards, rights holders, professionals, communities, reviewers, and resource versions can form relatively stable capacities for cooperation, exclusion, correction, and further value generation. Different arrangements may make similar artifacts support different kinds of participation and reuse. At the *manifestation level*, those interactions become partially accessible through licences, source histories, published organizational rules, interview accounts, audit records, reported benefits, or observable decisions. Such traces remain selective, historically situated, and sometimes appropriately restricted.

The provisional generative-relational proposition is that the future usability and distribution of a contribution can depend on how its provenance, legitimate permissions, recognition practices, access boundaries, and institutional memory are coupled over time. A participant who can identify a contribution may lack a safe route to challenge its credit; an institution may possess technical access but lack permission to reuse a record; a community may possess a usable artifact without authority to influence its subsequent application. These distinctions become especially consequential when one operation succeeds while a connected operation fails. The proposition is explanatory and comparative; it is neither a general law of value nor a substitute for the standards that govern the specific setting.

A more demanding cross-case test would specify the resource and outcome in advance, identify the relevant time window, and document the operation of each interface. For example, the effect of a maintained provenance-and-appeal process on attribution corrections could be examined while tracking the availability of professional reviewers, organisational resources and case complexity. A study of university-connected education could compare adaptation and review histories without exposing patient records. Mapping research could include local organizations in defining desirable outcomes and adverse effects. Humanitarian analytics research could use appropriately cleared aggregate indicators, secure independent audit or synthetic test cases where direct access to sensitive data is unwarranted. These designs must distinguish the permissions required to conduct research from those required for ordinary operational use.

Comparative evidence could challenge the proposal in several ways. Clear evidence that a simpler organizational or legal explanation fully accounts for the relevant differences would narrow its distinctive explanatory role. Persistent failures of attribution correction, protective access, or downstream usefulness despite apparently coordinated interfaces would challenge the proposed mechanism. Strong reported benefits combined with severe unmeasured burdens, excluded participants, or unauthorized disclosures would undermine a claim of generativity if that claim depended on an incomplete account of costs. Conversely, evidence that high-quality value-return arrangements are sustained with little formal provenance would challenge any interpretation that digital traceability is generally necessary. These possibilities establish a path from a broad relational vocabulary to discriminating tests.

The present comparison therefore yields an architecture of research questions rather than a catalogue of successful implementations. Its grounded propositions concern publicly described organizational practices and current policy announcements. Its additional paths of contribution, harm, recognition, and return are constructed. Their empirical evaluation requires situated records, responsible participation, jurisdiction-specific legal review, counterfactual care, and explicit attention to unavailable evidence. The comparative framework supplies conceptual inputs for the empirical operationalization and evaluation design to be developed subsequently, without prejudging that design's results.

13 Empirical Operationalization and Evaluation Design

An account of generative commons becomes empirically assessable when its proposed mechanisms are connected to observations that can discriminate among competing explanations. This section specifies an evaluation design for assistance-related knowledge infrastructures in which contributions, permissions, recognition, and possible returns arise across heterogeneous actors and time horizons. Its objective is to define suitable observational units, operational indicators, temporal comparisons, causal questions, and evidentiary limits, while preserving the differences between legal entitlement, institutional process, and experienced value. The discussion combines structured qualitative comparison, event-history reconstruction, participant-sensitive measures, and conditional quantitative designs. It draws on established programme-evaluation, contribution-analysis, and process-tracing methods [37, 39, 9]. The proposed measures remain a research protocol rather than findings about a particular hospital, voluntary organization, or data platform. An ethical and legal feasibility assessment is a prerequisite to any empirical implementation involving protected records or affected populations.

13.1 Research Questions, Theories of Change, and Evidentiary Claims

The research object is a governed arrangement for producing and circulating resources of assistance-related knowledge: for example, methods, learning materials, public-facing guidance, translation, software, and maintenance records. The arrangement may create opportunities for scholarly recognition, capacity development, service improvement, financial benefit, safer collaboration, or improved access to usable knowledge. These possible results differ in recipient, temporality, and evaluative significance. An evaluation accordingly begins by identifying *which result matters to whom* and *which hypothesized institutional operation might influence it*. Counting submitted files or volunteer hours alone can describe activity without answering those questions.

Five families of empirical questions organize the design. First, *provenance integrity* asks whether authorized reviewers can reconstruct consequential contributions and later transformations with uncertainty appropriately recorded. Second, *permission integrity* asks whether a proposed reuse was authorized in its operative context and whether protective requirements were met. Third, *recognition and participation* asks whether contributors and affected noncontributors have credible, safe channels to correct descriptions and influence decisions within their legitimate domains. Fourth, *value circulation* asks whether particular persons or communities obtain independently evidenced educational, scientific, relational, protective, material, or other valued outcomes, and on what terms. Fifth, *continuity and repair* asks whether responsible reuse, revision, and remedy remain feasible when staff, platforms, licences, or institutional partners change. These questions should be prioritized with relevant participants and competent institutional authorities before determining specific indicators. The updated CDC evaluation framework places contextual assessment, collaborative question selection, credible evidence, and subsequent use of findings within a revisable evaluation cycle [37].

Each hypothesized explanation requires a stated theory of change. For example, a better-documented provenance process might improve the probability that downstream users identify an earlier contributor; improved identification might permit a correction request; and a feasible review procedure might then produce a more accurate public account. The first connection requires documentation and searchability, the second practical access and knowledge of the procedure, and the third competent and sufficiently independent adjudication. A correction could also arise through ordinary editorial diligence without a distinct commons-governance mechanism. A different chain might link governed reuse to skills acquired by a volunteer and then to later opportunities, while institutional mentoring or the volunteer's prior capacities remain alternative causes. Mayne's contribution-analysis approach is relevant precisely because an intervention may be a contributing condition within a wider causal package, without being sufficient or necessary on its own [39]. Each explanation should therefore specify plausible intermediate observations, background conditions, threats to the explanation, and evidence that would count against it.

Descriptions, correlations, within-case causal contributions, and counterfactual effects occupy separate evidentiary positions. A traceable edit is an observation. A higher rate of documented credit among participants is an association. A sequence of diagnostic observations excluding specific competing explanations may support a bounded contribution claim. An estimate that the governance intervention changed a defined outcome requires a credible contrast between conditions with and without the relevant intervention. The research programme does not presume that all these forms of claim will be obtainable at each setting. It assigns the strongest defensible claim to the evidence actually available.

13.2 Units of Observation, Population Boundaries, and Temporal Windows

Empirical units must preserve differences that the theoretical framework treats as consequential. A *contribution event* is a situated activity, such as creating a protocol draft, translating instructions, reviewing a safety concern, repairing a broken link, or organizing a workshop. An *artifact version* is a state of a reusable resource that may be associated with multiple events and contributors. A *permission decision* is a time- and context-specific determination concerning access or reuse. A *recognition decision* concerns how a contribution is described or credited, with its own evidentiary and procedural basis. A *benefit episode* is an assessed change or realized advantage for an identifiable bearer; the bearer may be a person, group, community, or institution. An *institution-period* records organizational capacities, workloads, and policy conditions over a defined interval. These units are linked by typed relations, while remaining separately countable and interpretable.

The target population must extend beyond contributors whose identifiers appear in a repository. Some participants are prevented from entering a workflow; some are represented through an organization; some perform maintenance without leaving visible authorship marks; others are affected by a resource without having supplied it. A prospective study should therefore describe eligible participants, eligible nonparticipants, affected persons or communities, staff, reviewers, institutional custodians, and potential downstream users, along with their differing permissions to take part in research. Sampling based only on accessible metadata would disproportionately reflect visible contributors and could conceal exclusion or protective non-disclosure. Where safely feasible, independent sampling frames, protected interviews, and records of unsuccessful access requests can help characterize these missing positions. Absence from a register is not itself evidence of an absence of contribution.

Observation windows should be chosen according to the mechanism and outcome, not simply according to an administratively convenient year. The creation of a tutorial may be observable within weeks; skills, reuse, maintained infrastructure, or contested credit may unfold over years. An event-history design can record the dates of contribution, validation, permission changes, adoption, recognition requests, corrections, and experienced returns. Observation begins at a specified eligibility or contribution point, with a documented end date and reasons for incomplete follow-up. Different cohorts may enter at different times; a resource may outlast the departure of its original participants. Accordingly, cohort entry, organizational transitions, delayed events, and right-censoring should be recorded explicitly. A historical observation window cannot be reconstructed merely by assigning present-day interpretations to earlier decisions.

Comparison also requires attention to scale. A single decision about a protected teaching artifact may be embedded in a laboratory, department, university, and external partnership. Their rules may interact without forming one unified authority. Overlapping participants and shared resources create dependence among observations. The design should avoid treating hundreds of related records as hundreds of independent institutional experiments. Case-level and organization-level descriptions may be more defensible than conventional significance tests when only a few organizational arrangements are observed.

13.3 Operational Indicators and Measurement Provenance

An indicator should describe a precisely defined observable aspect of a construct, with a denominator, time window, source, and uncertainty specification. For provenance, a candidate measure is the propor-

Table 13: Illustrative measurement matrix for an assistance-related knowledge commons. Measures are research proposals, not observations or universal performance standards.

Construct	Candidate observation and required denominator	Interpretive or protection limit
Provenance and correction	Dated version histories recovered among sampled eligible resources; documented correction pathways among cases reviewed	An accessible record may be incomplete or contested; restricted identities may remain undisclosed
Governed reuse	Proportion of sampled reuse decisions with recorded licence, role, consent or other applicable grounds and verified review	Recorded approval is neither a legal opinion nor proof of safe downstream use
Recognition and participation	Time and disposition of eligible credit appeals; independent reports of ability to raise objections safely	Complaints, silence, and withdrawal have different meanings; confidentiality may be required
Heterogeneous returns	Recipient-specific evidence of learning, usable methods, capacity, protection, or authorized material receipts	Measures are domain-specific and generally not additively commensurable
Continuity and maintenance	Retrievable versions, restored services, steward turnover, unresolved upkeep tasks across specified periods	Persistence of files differs from workable governance and continuing production
Burden and adverse effects	Documented time, expense, unsafe disclosure, intimidation, exclusion, or unsupported claims among eligible events	Harmful incidents may be systematically underreported, especially under power asymmetry

tion of *sampled eligible artifact versions* for which an authorized reviewer can recover a dated change record linked to its declared predecessor. Its meaning depends on the operational definition of eligibility, the completeness of historic imports, and the treatment of anonymous or confidential work. A separate indicator can assess whether a contributor can contest a provenance assertion without unsafe disclosure. Neither statistic alone measures historical truth or deserved authorship.

For permissions, one could audit a purposive or probability sample of actual reuse decisions to assess whether the responsible reviewer correctly identified applicable licences, privacy constraints, professional approvals, and the institutional mandate at the date of reuse. Legal conclusions require competent jurisdiction-specific assessment; a policy-engine log records an implemented decision, not necessarily a lawful one. For recognition, a study might measure time to acknowledgment or correction, the availability of safe appeals, and contributor-reported adequacy of credit, while separately reporting the distribution of cases rejected for substantiated reasons. For participation, reported inclusion should be paired with evidence that participants could understand the decision, access suitable language or support, and exercise the authority nominally assigned to them. Those who withdraw or decline to answer should not be silently classified as satisfied.

Outcomes involving heterogeneous value call for multiple non-aggregated measures. Educational capability might be evaluated with demonstrable skills or participant-defined ability to perform a task. Scientific value might involve subsequent use of a verified method or the correction of a flawed protocol. Institutional capacity could be assessed through sustained maintenance or the availability of a competent replacement steward. Protective value might involve reduced unsafe exposure, feasible referral, or a remedy that affected persons judge accessible. Material outcomes could be recorded through authorized payments, grants, or expenses reimbursed. Several of these indicators may co-occur, but a monetary sum or a single composite score would erase differences in whose interests are advanced and whose costs are borne. The established RE-AIM framework illustrates why reach, effectiveness, adoption, implementation, and maintenance should be considered as distinguishable evaluation dimensions; its application here is an adaptation, not a claim that RE-AIM independently validates the GR theory [25].

Table 13 specifies a compact measurement matrix. It deliberately includes adverse outcomes and incomplete evidence alongside positive indicators. The precise thresholds, eligible populations, and assessment instruments would have to be established separately for a concrete institution.

Every observation requires provenance of its own. A measurement record should identify the op-

erational definition and its version, observation interval, evidence source, collector or responsible role, access classification, known missingness, and review status. A change in the questionnaire or logging policy can alter a trend even when underlying practices remain stable. For interviews, careful translation and locally meaningful categories may be needed, while interviewees' statements about their experiences should be distinguished from independent evidence of a legal or historical claim. Construct validity and measurement burden should be assessed jointly: a comprehensive register that exhausts volunteers or exposes sensitive subjects may undermine the very capacities the evaluation aims to understand.

13.4 Linked Histories and a Minimal Research Record

The preceding sections propose separate records for contribution provenance, permissions, recognition, institutional decisions, and later uses. Empirical analysis needs a bounded means of joining those records without presuming their agreement. The minimal research record in Equation 10 is indexed by an eligible observational unit u and an observation time or interval t . It captures source evidence, an operational status, and the conditions under which a claim could be checked.

$$\mathcal{O}(u, t) = (\iota, \kappa, \tau, \epsilon, \pi, \nu, \mu, \rho)_{u, t}. \quad (10)$$

Here ι is a pseudonymous or authorized unit identifier; κ is its observational class, such as contribution event or benefit episode; τ is the valid time and observation window; ϵ records an evidence pointer and reliability assessment; π identifies access constraints and the lawful or institutional basis for review; ν specifies the measure, its definition, and the observed value or qualitative description; μ encodes non-observation, disagreement, and censoring statuses; and ρ identifies authorized corrections and version history. The tuple is a proposed documentation schema. It neither defines a new legal status nor supplies a numerical measure of generativity. Several fields may have to remain restricted or be represented only by safe references to records held elsewhere. The ability to join two records is an authorized research operation subject to independent safeguards, rather than a permission implied by their common identifier.

The empirical system should distinguish an event date from the date when evidence about that event was entered or corrected. If a later institutional archive labels an earlier contribution differently, the investigator must preserve the original description and the reason for retrospective revision. Likewise, a later benefit may be tentatively linked to an earlier contribution without establishing that the contribution was uniquely responsible for the benefit. Linkages should be typed as directly documented, independently corroborated, inferred under stated assumptions, disputed, inaccessible, or merely proposed. Separate provenance for these linkage judgments is essential because the analyst's reconstruction can itself become a new source of authority over scholarly credit or institutional reputation.

For an empirical return-path claim, a minimal sequence could consist of an authenticated contribution record, a permitted transformation into a reusable artifact, a documented later use, an identified recipient of a benefit, and evidence that the claimed form of benefit was actually experienced or received. Some segments may remain uncertain. A partial path can remain analytically valuable as a partial path, and a validated benefit can exist without demonstrable dependence on the earlier event. Researchers should report such possibilities separately rather than assigning them an invented percentage of return. When a claim concerns a protected population, the absence of a publishable person-level trace may be a successful privacy outcome. Publication can report audited aggregate pathways or case descriptions after competent disclosure review, without exposing identifiable events.

A design for comparability would preregister the most important observation definitions and evidence-grading rules before inspecting outcomes, while allowing disclosed amendments when unanticipated resource types emerge. Exploratory discovery remains possible, but the manuscript should mark post hoc claims and retain revision history. The research record thereby becomes a device for scrutiny and correction, rather than an automated means of allocating credit or authorizing reuse.

13.5 Longitudinal Comparisons and Causal Identification

Longitudinal designs are useful when the hypothesized mechanisms operate through delayed, nested, or interrupted paths. A prospective panel could sample contributors, eligible noncontributors, artifacts, and governance decisions at entry and then periodically document subsequent reuse, maintenance, credit, dispute resolution, and experienced benefits. Repeated observation helps locate change, but it does not itself isolate an intervention’s effect. Organizations adopting an improved provenance system may also have better funding, more stable personnel, different legal advice, or a stronger prior culture of recognition. A rise in documented return paths could reflect improved recording rather than increased benefit. Similarly, increased complaints after an accessible grievance channel is introduced could indicate a safer reporting environment, a worsening underlying condition, or both.

Three complementary inferential strategies are appropriate under different access conditions. *Within-case process tracing* reconstructs sequences and tests diagnostic observations against the predicted mechanisms and their rivals; Collier’s methodological account supports attention to causal-process evidence rather than mere chronological narration [9]. *Contribution analysis* evaluates the coherence and empirical support of a theory of change while examining other sufficient or contributory conditions [39]. *Comparative outcome analysis* may examine changes in carefully defined outcomes across comparable units and periods when adequate data, overlap, and institutional safeguards exist. Choice among methods should depend on the actual causal question, not on a hierarchy that automatically favors numerical estimates.

For a well-defined governance regime A , a cluster-level outcome Y_k meaningful within value domain k , and an eligible set of organizational or network clusters $\mathcal{G}^*$, Equation 11 expresses a *possible* average regime effect at horizon h . Here $Y_{g,k}(a, t + h)$ denotes a potential cluster-level outcome under a sufficiently specified regime a , with t as baseline. This target is interpretable only if the unit boundary, intervention version, and interference assumptions are defended; it is not an estimated result.

$$\Delta_k(h) = \mathbb{E}[Y_{g,k}(1, t + h) - Y_{g,k}(0, t + h) \mid g \in \mathcal{G}^*]. \quad (11)$$

Estimating the quantity requires a meaningfully specified intervention and comparison, legitimate access to outcome data, attention to common causes of assignment and outcome, and an account of missing follow-up. A commons intervention is likely to produce *interference*: a participant’s experience may depend on other participants’ exposure, and the same resource may circulate through compared settings. The cluster-level target in Equation 11 therefore assumes that within-cluster spillovers are incorporated in $Y_{g,k}$ and that cross-cluster spillovers are sufficiently limited, explicitly modeled, or bounded for the particular comparison. The number and composition of genuinely separable clusters may be too small to support an effect estimate. Where these conditions fail, an exposure-mapped network estimand or a qualitative account of diffusion is preferable to pretending that a participant-level assignment has an independent potential outcome. When assignment is voluntary, matching or adjustment cannot remove unmeasured confounding by assertion. Cochrane’s guidance on risk of bias in nonrandomized intervention studies emphasizes confounding, intervention classification, missing data, outcome measurement, and selection of reported results as separate domains [55]. Where these obstacles cannot be addressed, descriptive trajectories and bounded causal-process evidence should be reported without numerical claims of intervention impact.

An evaluation may also compare future changes in an outcome with preregistered negative-control outcomes that the proposed mechanism should not plausibly affect, or with occasions on which the relevant pathway was absent. Negative controls are informative only when their exclusion restrictions and contextual similarity are defended. Interviews can probe whether apparent improvement reflects ordinary mentoring, additional paid staff, publication incentives, legal compliance, or technical platform features. Likewise, a design should examine which groups do not benefit, even when aggregate uptake grows. The objective is a theory-testing research programme in which GR interpretations compete fairly with simpler administrative or economic explanations.

13.6 Missingness, Power Asymmetry, and Heterogeneous Evaluation

Missing evidence has multiple origins with different implications. A contribution may never have been logged, its record may have been destroyed under a legitimate retention schedule, or its identity may be intentionally protected. A participant may decline an interview to avoid burden or fear retaliation; a partner institution may lack authority to transfer an archive; a researcher may discover a record only after the analysis window closes. Treating all absent values as zeros would systematically understate some forms of contribution and overstate the completeness of governance. Treating all restricted records as evidence of concealed misconduct would create a different distortion. The proposed μ field in Equation 10 should therefore distinguish at least structurally inapplicable, not recorded, unknown, access-restricted, withdrawn, disputed, and lost-to-follow-up states.

The study should assess whose data are missing and whether missingness is related to vulnerability, institutional position, workload, language, or the outcome being evaluated. A participant dependent on a supervisor's recommendation may hesitate to contest a credit claim, and an undocumented translator may be outside the membership registry. Such mechanisms can produce apparently favorable outcomes even as the least empowered participants disappear from the analytic dataset. Protected anonymous feedback, community-defined outcome measures, safe third-party reporting, and sensitivity analyses can reduce some distortions, but each option has limitations. Anonymous surveys may preclude linked follow-up; protected interviews may be too risky or burdensome; aggregate tabulation can conceal uneven distribution within a group. An ethically acceptable study may therefore have to accept unresolved uncertainty.

Heterogeneous valuation also precludes a universal outcome scale. A research repository might produce publishable methods for one group while imposing unpaid curation work on another. An educational commons might enhance professional confidence while creating reputational exposure for a participant whose contribution is made public without permission. A humanitarian dataset might have high scientific reuse but require exclusion of otherwise useful variables because of re-identification risk. These outcomes can be compared as a structured profile, with affected groups participating in the interpretation where feasible. A qualitative account of how a group values a protection or capability may carry more local validity than an externally imposed score. Monetary conversion may be appropriate for specified expenses or payments, but it should not substitute for these value judgments by convention.

Power also influences data production itself. Authorities decide which software logs are retained, which complaints are deemed eligible, which roles become visible, and which organizations can fund evaluation. The investigator should document these measurement interfaces, conflicts of interest, and institutional veto points. Independent review, where feasible, can test whether publication decisions systematically favor institutionally convenient outcomes. Confidentiality restrictions are not evidence of illegitimate gatekeeping per se; the analysis must examine the source and proportionality of constraints, the possibility of protected review, and the actual mandate of decision-makers. Audit findings about procedural accessibility should remain distinct from allegations about a specific actor's motivations or legal compliance.

13.7 Research Ethics, Governance of Evaluation, and Implementation Sequence

The evaluation's ethical design is part of the phenomenon under study. Recording historical relationships may inadvertently reveal medical information, humanitarian location data, pseudonymous identities, unresolved allegations, or commercially sensitive methods. Studies involving patients, service recipients, or populations exposed to humanitarian risk must be assessed under the applicable research, institutional, professional, and data-protection rules before collection or linkage. Institutional approval where required, proportionate consent arrangements, lawful data-processing grounds, minimization, purpose limitation, appropriate retention and access controls, and a practical route for responding to incidents take priority over the analytic convenience of full historical reconstruction. Existing OCHA guidance explicitly treats responsible operational-data management as requiring safe and ethical procedures [59]. Its institutional requirements cannot automatically be generalized as positive law governing every university or voluntary association.

An ethically proportionate implementation could proceed in stages. First, researchers construct and test a coding manual using fully synthetic contribution histories, including protected and contested cases, to identify ambiguous fields. Second, they audit publicly available documentation or deliberately released demonstration artifacts for completeness, reviewer agreement, and inappropriate inference. Third, following required permissions and governance review, they pilot a small number of consented or otherwise appropriately authorized institutional cases with separate analysis of burden and privacy exposure. Fourth, they conduct a pre-specified longitudinal or comparative study only if the earlier stages demonstrate sufficient construct validity, data quality, participant safety, and institutional capacity. A harmful pilot result should justify revision or termination rather than an expansion undertaken to generate a larger dataset.

Implementation should distribute decision-making responsibilities. Subject-matter specialists assess professional or legal constraints; authorized custodians manage access; researchers design and analyze measures; independent or suitably separate reviewers handle contested claims; contributors and affected communities inform which outcomes merit examination and how findings should be interpreted. The exact allocation depends on the institutional context and cannot be specified universally by this theoretical paper. Consent to participate in research should not be represented as consent to public attribution, indefinite retention, or commercial redistribution. Publication plans should separate de-identified aggregate results, attributed contributions released with appropriate authorization, and confidential research records. Participatory discussion is especially important when the design could convert unpaid or community-generated knowledge into results from which the community derives little influence or benefit.

The analysis plan should state its primary questions, eligible samples, observation windows, missing-data rules, proposed comparisons, adverse-event checks, and conditions for stopping or revising the evaluation. It should also state what evidence the researchers would accept as showing that the framework adds little to established methods. Changes in those specifications may be necessary as partners or risks change; a dated, reasoned amendment provides accountability without pretending that exploratory research can avoid adaptation. The CDC evaluation framework's ethical, transparent, and learning-oriented commitments support such use-focused revision [37]. These procedures are proposed criteria for responsible inquiry, rather than evidence that any particular commons already follows them.

13.8 GR Interpretation, Rival Models, and Disconfirmation Criteria

The proposed Generative Relational interpretation is evaluated at three distinguishable levels. At the *ontological level*, this research suspends claims about the ultimate status of social or economic being. Observational evidence concerning archives, organizational rules, or reported benefit does not adjudicate whether relational structures possess an ultimate metaphysical priority. At the *relational level*, the study models sufficiently persistent patterns among contribution histories, permissions, recognitional decisions, maintenance, actors, and institutional interfaces, and asks whether those patterns help condition later capacities for action or value generation. At the *manifestation level*, those relational histories become accessible through documents, software logs, policy texts, judgments, interviews, and reported outcomes, each subject to selective recording and interpretation. The levels clarify the model's evidentiary limits and do not claim that the research record in Equation 10 captures relational reality without remainder.

A substantive GR hypothesis for this paper is that the *configuration of interfaces* among provenance, authorization, recognition, safe participation, and maintenance may help explain variation in who can generate and receive subsequent value. This is stronger than the descriptive observation that such operations coexist. To test the hypothesis, researchers should identify occasions where similar resources and funding are associated with differing interface arrangements, and examine the predicted temporal mechanisms. If simpler features, such as paid staffing, quality of professional supervision, a clear licence, or pre-existing technical capacity, sufficiently account for the observed differences, GR should remain a supplementary description or be revised. If the same interface structure repeatedly predicts outcomes that its purported mechanism cannot generate, or if observed paths bypass its proposed necessary links,

the hypothesis requires restriction. A model that simply redescribes every eventual outcome as a form of generativity would have inadequate discriminatory content.

Several empirically important adverse results deserve advance specification. Complete provenance might coexist with unfair recognition because participants lack an effective challenge mechanism. Formal access rights might coexist with exclusion because translation or safe participation is unavailable. A carefully maintained archive might fail to produce new collaborations because no community has the resources to continue the work. Conversely, high-quality recognition and return may occur in loosely recorded settings through stable personal relationships or established professional practices. Each possibility can be a useful constraint on the model, and none automatically establishes misconduct or failure by a named institution. The comparative cases in Section 12 supply promising settings for future study, but their official public descriptions are not yet a dataset capable of adjudicating these alternatives.

The evaluation would thus produce at least three separate outputs: a transparent account of the observable institutional arrangement and its evidence limits; a case-specific judgment about mechanisms and their plausible rival explanations; and a cautiously delimited assessment of what, if anything, the GR vocabulary makes more intelligible than antecedent commons governance and programme-evaluation theories. Strong evidence might justify a domain-specific operational recommendation. Mixed or missing evidence might justify only a research design improvement. Adverse evidence might call for eliminating a mechanism from the model. Such differentiated conclusions respect the conceptual heterogeneity of value and the disciplinary independence of legal, ethical, organizational, and empirical inquiry. The research programme remains generative precisely insofar as its proposed distinctions can be corrected by responsible observation.

14 Adverse Cases, Research Ethics, and Theoretical Limits

The value of a generative-commons framework depends partly on the cases in which its explanatory expectations prove inadequate. In particular, observed document retention, credited contributions, and downstream uptake must be tested against the possibility that interface alignment is a consequence of institutional capacity rather than an independent cause of later benefit. This section subjects the proposed relations among contribution provenance, permission, recognition, reuse, value circulation, and institutional memory to adverse configurations and research-ethical constraints. Its objectives are to distinguish morally troubling results from genuine counterevidence to a theoretical mechanism, to establish safeguards for investigating institutions and people exposed to unequal power, and to identify the limits of the GR interpretation relative to established explanations. The discussion proceeds through constructed counterexamples, analysis of extraction and impaired value return, protective restrictions and trade-offs, research-governance requirements, evidentiary failure modes, prospective disconfirmation criteria, and the three GR reality levels. Its method is critical and comparative rather than an empirical report. The cases are stipulated for analytical purposes; their features and outcomes are not attributed to a named university, hospital, humanitarian organization, or volunteer programme. This section thereby examines the ethical feasibility of the empirical design in Section 13 as well as the discriminatory content of the theory itself.

14.1 Counterexample Types and Rival Explanatory Mechanisms

A counterexample acquires evidentiary force only relative to an adequately specified proposition. For the present study, at least four different propositions should be separated. A *descriptive proposition* concerns the occurrence of an event, such as the retention of a contribution record. A *structural proposition* identifies an operative relation among institutions, decisions, or resources, such as the existence of an authorized route for challenging recognition. A *mechanistic proposition* states that changing an interface affects an intermediate process, such as the capacity of a reviewer to find a protected historical record. A *causal or evaluative proposition* concerns whether that process improves an outcome of consequence to an identified person or community. Showing that a record exists does not establish a

protective mechanism, and showing that a mechanism operated does not establish a fair distribution of its results. Conversely, an undesirable result does not, by itself, disconfirm a narrowly formulated claim that a particular interface made a particular action possible.

The explanatory target must therefore be stated before observations are interpreted. The strongest version of a *configuration hypothesis* considered in this paper suggests that the joint conditions of historical provenance, context-appropriate permission, credible recognition, feasible participation, and maintained institutional interfaces help explain the persistence and distribution of generative opportunities. Several weaker readings are possible. The framework may merely classify relevant interfaces. It may offer a historical reconstruction that is useful for interpretation without isolating a distinctive causal mechanism. It may also identify factors already described adequately by institutional economics, organizational learning, professional ethics, or administrative law. The first reading is descriptive, the second interpretive, and the third is a substantive and contestable explanatory claim. Evidence relevant to one should not silently be counted as support for the others.

Counterexamples should be grouped by the claim they challenge. *Component sufficiency failures* occur where detailed records, permissions, or credit coexist with exclusion or poor outcomes; they disconfirm claims that one component is sufficient, while leaving a multi-component theory open. *Pathway failures* occur where a proposed intermediate link cannot be traced or is bypassed. *Alternative-pathway successes* arise when valuable outcomes occur in the absence of a supposedly necessary interface, potentially disconfirming necessity claims. *Observational indistinguishability* arises when several theories predict the same archival or institutional patterns. Finally, *ethical non-testability* occurs when the evidence needed for a discriminating observation would expose participants to unacceptable risks or violate applicable constraints. The final category is a limit on the proposed research design, not a justification for treating a hypothesis as confirmed.

The design in Section 13 can be used to prerecord rival predictions and diagnostic observations. Process tracing is helpful when it specifies what an explanation would lead one to expect in the relevant chronological sequence, while contribution analysis allows an intervention to remain one causal condition among several [9, 39]. The cases developed below therefore include candidate alternatives alongside predictions of the generative-commons account. Their function is to make the framework more vulnerable to evidence, rather than to multiply examples that appear to confirm it.

14.2 Extraction, Displaced Costs, and Impaired Return

The first family of adverse configurations concerns the distribution of burdens and benefits along a contribution history. Consider a volunteer-created educational resource whose later institutional and commercial reuse is fully documented. The contributors receive accurate descriptive credit, but substantial maintenance work remains unpaid and their community obtains little practical opportunity to use or improve the resulting resource. One account might describe a properly attributed, legally authorized reuse. Another might identify distributive disadvantage, while a third could detect no enforceable additional entitlement under the actual licence and contractual terms. These statements are compatible because they address different normative and legal objects. A generative-commons analysis has a possible role in describing historically connected benefits and costs, yet the determination of wrongfulness requires independent grounds in law, agreement, professional duty, or defended ethical principles.

Extraction is therefore used here as a proposed evaluative description of a configuration in which one set of actors systematically obtains advantages from another's capacities or contributions while important costs, risks, opportunities for influence, or possibilities of regeneration are shifted away from the beneficiaries. Such a description requires evidence of more than a positive monetary return downstream. It calls for an identified bearer of costs, a defensible account of the relevant contribution and governance relationship, a specified evaluative standard, and consideration of voluntary arrangements and available alternatives. Unequal benefits alone are not sufficient to establish a breach of contract, illegality, coercion, or exploitation. Distributional assessment should also ask whether contributors knowingly accepted noncommercial or unpaid arrangements, whether their preferences changed, what options were

genuinely available, and whether the output served beneficiaries beyond its initial producers.

A second configuration concerns *maintenance depletion*. A project receives an increasing quantity of volunteer-produced methods, translations, or data annotations, while professional review capacity remains fixed. The resulting queue delays corrections, strains staff, and eventually reduces usable output. Raw submission counts would report rising participation even though the conditions of continued production deteriorate. The mechanism may reflect ordinary queueing constraints or staff shortages rather than a distinctive relational dynamics. The GR interpretation gains empirical significance only if the analysis of coupled contribution, validation, and return interfaces supplies testable insights beyond those familiar organizational explanations. A practical evaluation should therefore track review time, backlogs, rework, unaddressed safety concerns, participant experience, and the opportunity cost of professional oversight rather than interpreting contribution volume as net generative value.

A third configuration involves *delayed appropriation*. A university-origin method is published under terms permitting subsequent commercial reuse; a later firm builds a profitable product without contacting the original contributors. Historical links and downstream gains may be detectable, but they do not by themselves establish a revenue-sharing duty. The original permissions, any separately negotiated obligations, relevant attribution terms, and the scope of applicable law remain decisive to a legal question. Prospective commons governance might design funding pools, optional benefit-sharing commitments, community stewardship arrangements, or negotiated access to improvements. Such measures must be implemented through competent institutions and valid agreements; proposed reciprocity cannot be retroactively inferred from the moral attractiveness of a longer circulation loop.

A fourth configuration involves *risk export*. An external research group benefits from a community's knowledge, while community members bear reputational, security, or surveillance exposure created by detailed published provenance. The community may legitimately value privacy or control more than individual credit or open reusability. The CARE Principles for Indigenous Data Governance foreground collective benefit, authority to control, responsibility, and ethics in relation to Indigenous peoples and their data [26]. Their Indigenous-led provenance is substantively important. This study may learn from their explicit attention to authority and benefit while avoiding any assumption that the same governance rights or decision procedures apply automatically to all communities or legal settings. Under suitable local governance, an appropriate outcome might be restricted reuse, collective recognition, delayed publication, or foregoing the research altogether.

14.3 Constructed Adverse Configurations and Diagnostic Comparisons

Table 14 collects six deliberately constructed cases. Its diagnostic column states what would have to be established before the case could challenge a particular inference. These cases are conceptual test instruments rather than findings concerning any real institution. They also provide candidate negative and deviant cases for the comparison protocol proposed in Section 12.

The first four cases undermine the simple assumption that documentation, openness, activity volume, or traceability automatically generates fairly distributed benefit. The fifth is an especially important challenge to a strong necessity thesis: a small, stable group may maintain reliable mutual recognition and reciprocal learning through interpersonal knowledge without a formal recordkeeping infrastructure. The sixth places attention on effective power rather than written rules. If independent evidence establishes that a procedural interface exists but is inaccessible to those whose interests it purports to protect, the presence of that interface should not be scored as achieved participation or effective remedy.

These cases further caution against encoding evaluation outcomes in their own premises. A case named *extractive* should not be assigned an extraction score solely because its return path is short, its participant lacks money, or a commercial derivative exists. A case designated *successful* should be supported by independently assessed outcomes rather than by the researcher's favorable interpretation of reuse. The analytical variables introduced in Sections 6 and 13 should retain multiple statuses, including disputed, not observed, protected, and not applicable. A negative comparison can then indicate which proposed pathway was absent, which outcome was independently measured, and which alternative ex-

Table 14: Constructed adverse configurations, competing explanations, and discriminating evidence. None describes an investigated institution.

Constructed configuration	Apparent commons-related difficulty	Evidence needed for a discriminating assessment
Accurate credit, inaccessible benefit	Recognition exists while useful training or support remains unavailable to original participants	Observe downstream access, actual benefit, participant preferences, alternative provision, and resource constraints
Open repository, protected contributor	Public provenance exposes the identity of a person who requires anonymity	Establish disclosure risk, alternative credit arrangements, the relevant permission and the availability of protective review
Documented volunteer output, review backlog	More contributions coincide with delayed validation and increased professional burden	Compare intake, staffing, review quality, opportunity cost, and trends before and after interface changes
Commercially valuable derivative	An old openly licensed method contributes to a profitable later product	Examine licence terms, contractual commitments, causal role, and independent ethical expectations
Informal cooperation, successful return	Participants obtain meaningful benefits without elaborate provenance or formal governance	Determine the actual role of trust, existing professional routines, community institutions, and unrecorded interactions
Elaborate governance, persistent exclusion	Complaint and participation procedures exist, yet vulnerable contributors cannot use them safely	Examine language, dependence, retaliation risk, review independence, outcomes, and credible exit options

planation remains plausible.

14.4 Protective Withholding, Institutional Mandates, and Conflicting Goods

Some apparent failures of openness or circulation are defensible outcomes of competent stewardship. Consider a health-related case record that could help validate a new research method, yet contains identifiable participant information. A request to release the case record publicly is refused, while reviewers are offered an appropriately governed synthetic example or access through an approved secure process. The denial of public release is consistent with protecting the person whose information made the resource possible. A measure that treats all denials as a failure of commons participation would invert the underlying ethical purpose. ICRC guidance emphasizes the protection of personal data in humanitarian action, particularly where disclosure could expose people already facing serious risks [32]. The relevance of that guidance depends on context and institutional role; it does not make an ICRC practice universally binding positive law.

Comparable conflicts arise when a donor-funded volunteer project holds information that could enable beneficial future collaboration but cannot disclose it without violating a commitment, compromising patient care, revealing the identity of a humanitarian witness, or exposing a threatened community. Permissions to view, research, reproduce, redistribute, and publicly attribute a resource remain separate. The existence of a technical copying facility does not confer an entitlement to use it. In certain settings the ethically defensible response may be a data minimization plan, a safer derivative, controlled analysis, a time-limited embargo, or no release at all. Researchers should evaluate whether such alternatives genuinely preserve legitimate inquiry while respecting the constraints, rather than assuming that every restriction can be repaired by metadata engineering.

Protective reasoning may nevertheless become a means of arbitrary exclusion. Its credibility depends on identifiable reasons, competent authority, proportionality to the risk, consistent application, an

accessible review process where appropriate, and attention to the interests of the people exposed to harm. Confidentiality may also preclude disclosing every reason publicly; procedural accountability in those cases can involve an independent authorized reviewer or an appropriately summarized explanation. The burden of explanation and the scope of available review vary by professional domain and law. This paper therefore proposes questions for comparative institutional design, rather than a universal formula deciding when a restriction is justified.

A recurring challenge is the asymmetry between *benefit to the researcher* and *risk to the participant*. An academic team may gain theoretical insight by reconstructing a complete contribution network, while the people represented in that network gain little from its public disclosure and may face retaliation. More comprehensive historical representation then becomes a worse research outcome if it requires preventable exposure. The construct of value circulation should accommodate such protective non-events: valuable knowledge can be retained under a controlled regime, and a significant benefit may consist in preserving the capacity to act without unwanted visibility. These possibilities also constrain comparisons across settings, because publicly incomplete records may reflect conscientious stewardship, poor documentation, deliberate concealment, or a mixture that cannot safely be disentangled.

14.5 Research Relationships, Consent, and Independent Ethical Review

Empirical study of a generative commons can change the relations under investigation. Asking who contributed, who received credit, who had a choice, and who incurred a cost may influence employment relationships, professional reputations, humanitarian protection arrangements, or expectations of future compensation. The investigator is therefore an actor within an ethically significant field of relationships, even when the research uses existing documents. Where participants are patients, aid recipients, dependent volunteers, precariously employed staff, or members of communities exposed to conflict or social exclusion, the stakes can be especially high. An interview may reveal a disagreement that a participant cannot safely raise through their institution's ordinary complaint channel.

The research protocol should make the source of each permission explicit. Consent to contribute to a volunteer activity differs from consent to be a research participant; neither alone authorizes public identification, the disclosure of clinical information, or unrestricted downstream linkage. Participation should be evaluated for voluntariness in context, including power relationships, language, time, literacy, disability access, and realistic ability to decline without loss of ordinarily available services or opportunities. The CIOMS–WHO guidelines describe meaningful community engagement and special protections for health-related research involving vulnerable persons [12]. The WMA's revised 2024 Declaration of Helsinki likewise addresses medical research involving human participants and identifiable data, including scientific value, independent ethics review, confidentiality, and research-participant protection [70]. These frameworks have defined subject-matter scope and normative authority; they should be distinguished from binding national law, contractual duties, and the review requirements actually applicable to a particular study.

An evaluation involving protected human records should receive the permissions and ethical review required by its jurisdiction and host institutions before identifiable information is obtained. The design should anticipate possible secondary identification from apparently innocuous metadata, small groups, timestamps, professional roles, language identifiers, and cross-platform linkage. Pseudonymization may reduce certain risks while leaving re-identification possible. Aggregation may also expose a rare trajectory if a community or institution is sufficiently small. Investigators should accordingly specify a data minimization rationale at field level, an authorized retention schedule, access tiers, encryption and other proportionate protections, incident-response responsibilities, publication controls, and the status of data after withdrawal where withdrawal is feasible under applicable rules.

Independent review is particularly important when researchers also occupy the institutional position that allocates work, credit, funding, or access. A supervisor's approval to examine records should not be confused with a subordinate's voluntary agreement to take part in a study. A university–hospital partnership may have separate ethics, data stewardship, professional, and employment authorities; ap-

proval in one domain does not necessarily substitute for another. The research protocol must document which domains are implicated and how disagreements among competent authorities will be addressed. An affected community may contribute to identifying relevant outcomes, suitable modes of engagement, and unacceptable disclosure risks, while not being made solely responsible for harms created by the researchers' design. In international collaboration, local knowledge and independently competent review help reduce the chance that methodological convenience overrides contextual protection.

Finally, mechanisms for complaint and correction should operate within the study itself. Participants may need an independent contact, a secure channel for reporting misuse, an explanation of what information will be published, and ways to correct descriptive errors without relinquishing anonymity. Researchers should assess and budget the time that feedback requests impose on volunteers and community representatives. If the resulting burdens outweigh the plausible scientific and social value, a project should be reduced, redesigned, or discontinued. The aim is not to make a more detailed database at any cost; it is to learn under conditions that respect the people whose relationships constitute the research object.

14.6 Observational Failures, Negative Evidence, and Safe Falsification

Adverse-case testing requires a discipline of distinguishing *negative evidence* from *absence of accessible evidence*. A missing attribution in a public repository may reflect a truly overlooked contribution, a deliberate request for anonymity, a classification error, or the absence of a publishable record. A missing benefit in a research database may reflect genuine lack of benefit, inadequate follow-up, a private non-monetary benefit, or a participant's decision to refuse the question. Restricted files may contain evidence of an important causal pathway, but the researcher's lack of authorization to read them cannot reasonably be encoded as proof that the pathway did not exist. This distinction is central to valid comparisons under differential observability.

The prospective study should specify observable implications and rival explanations before results are known. For example, if the proposed interface mechanism claims that accessible correction routes increase the likelihood of accurate recognition, researchers might compare similar contribution histories under different correction procedures, record the dates and dispositions of correction requests, and assess whether recognized errors were actually remedied. The comparison would also measure staffing, editorial diligence, participant confidence, language support, and work pressure. If well-established editorial procedures fully explain the result, GR may remain a terminology for the arrangement without an additional mechanistic role. A comparable study of long value-return trajectories should distinguish delay caused by permission bottlenecks from delay caused by lack of demand, insufficient maintenance, unavailable funding, or inaccessible end-user training.

Evidence capable of weakening a proposed mechanism may be stated in advance. Repeated cases in which its supposedly necessary interface is absent while independently evidenced value return remains robust would undermine necessity. Cases in which carefully measured interface differences have no expected intermediary consequences, despite appropriate statistical power or sufficiently discriminating process evidence, would weaken the corresponding causal hypothesis. Cases in which a rival account predicts outcomes more accurately with fewer assumptions would reduce the distinctive utility of the GR explanation. Significant harm from an attempted intervention would call into question the intervention's practical value and may require stopping the study even before causal adjudication is complete. These are different kinds of revision: conceptual, empirical, comparative, and ethical.

Preregistration or a dated analysis plan can record such possibilities, although adaptation is often needed when participants' safety or institutional permissions change. Researchers should maintain a transparent distinction between planned and exploratory comparisons, record attrition and missingness, and consider sensitivity to unmeasured confounding and interference across interconnected participants. The Cochrane guidance on non-randomized studies emphasizes bias from confounding, selection, classification, missing data, and outcome measurement [55]. Those principles help structure causal assessment where appropriate; they neither guarantee identification nor require quantification of values that partici-

pants regard as heterogeneous or incommensurable.

Safe falsification can sometimes proceed without exposing protected histories. Synthetic records may reveal ambiguity in the formal vocabulary or failure of an algorithm to respect an access rule. Authorized reviewers may examine confidential evidence and provide bounded, non-identifying findings. Publicly released protocols may be tested for their internal consistency. These procedures are particularly useful for determining whether an *analytical representation* behaves as claimed. They cannot establish that a real-world causal or normative mechanism occurs in an institution whose relevant participants and outcomes remain unobserved. The evaluation report should describe that remaining boundary rather than treating an inaccessible case as either confirmation or refutation.

14.7 Theoretical Domain, GR Reality Levels, and External Accounts

The proposed GR interpretation remains a bounded research hypothesis. At the *ontological level*, ultimate claims about the being of persons, institutions, value, and relations remain suspended. Neither a network of recorded contributions nor the language of circulation warrants an assertion about the meta-physical constitution of the social world. At the *relational level*, historically formed and sufficiently stable arrangements among actors, institutional roles, permissions, recognition, maintenance, and reuse may be modeled as conditions of future capacities. This is where the proposed coupling of governance interfaces has its proper analytical object. At the *manifestation level*, these arrangements become accessible through interviews, software histories, policy documents, statements of credit, observable decisions, and reported benefits. Manifestations can be selective, contested, protected, and discontinuous; they do not constitute a complete view of relational reality.

Several disciplinary accounts may explain the same configurations without a distinct GR mechanism. Commons-governance research identifies rules in use, collective-choice arrangements, resource boundaries, and institutional variation [47, 21]. Organizational learning explains why knowledge is retained or lost when personnel, routines, and classification practices change. Professional ethics and data-protection practice explain some apparent restrictions on sharing. Labor and political-economy analyses clarify unpaid work, bargaining power, distributive asymmetry, and institutional dependence. Legal doctrine can determine the validity and limits of certain authorizations or obligations that a relational diagram merely describes. The GR approach should engage these theories at the scope of their actual claims and should not treat terminological translation as proof of theoretical equivalence.

A defensible distinctive contribution might lie in a precise account of *cross-interface conditioning*: for example, how a documented contribution can be reusable under an authorization regime but remain unable to produce value for a participant when recognition, review, maintenance, or access is absent. Yet this configuration also may be explained by a well-developed institutional analysis. A rigorous comparison must determine whether GR generates an independently testable prediction, clarifies a neglected variable, organizes heterogeneous historical evidence more economically, or reveals a practically consequential question that was otherwise omitted. If none of those advantages can be demonstrated, the appropriate outcome is to present GR as one optional descriptive vocabulary. Such restraint is consistent with retaining value, law, ethical responsibility, and scientific explanation as partially distinct objects rather than subsuming them under a single principle.

The framework also has limits of generality. Knowledge resources in humanitarian protection, hospital-based support, local mapping, scientific software, and university teaching differ in risk, mandate, participant vulnerability, and legally protected interests. A contribution event may generate benefits while imposing costs in several dimensions, with no justified common scale. Institutional memory may be sustained through informal trust rather than permanent records. A person may safely participate without public recognition, and a community may legitimately refuse reuse. Cross-cultural and Indigenous forms of governance require attention to their own authorities and histories; the CARE Principles should be treated as a substantive, situated contribution to the field rather than as a convenient universal slogan [26]. These differences are constraints on the scope and application of the theory, not peripheral cases to be eliminated by a more expansive definition.

14.8 Revision Protocol and Responsible Continuation of the Research Programme

A provisional framework becomes more reliable when it states how it would change. The present programme proposes a four-part revision record for future studies. The first part identifies the *claim under review*, including whether it is descriptive, formal, explanatory, legal, or normative. The second identifies the *adverse observation and its provenance*, including missingness, confidentiality, source status, and whether the observation was independently replicated. The third identifies *rival explanations and remaining uncertainty*, including whether a simpler account fits the evidence and whether safety or authorization limits prevent further adjudication. The fourth records the *revision decision*: retain with a narrower domain, reformulate the mechanism, remove a causal claim, redesign a proposed intervention, or terminate a research activity whose risks are disproportionate to its value. A dated decision should specify who had authority to make it and which concerns remained unresolved.

This record should not become an automated mechanism for judging the moral worth of participants or organizations. It is a research-governance practice designed to keep scholarly explanations accountable to evidence and to the people exposed to inquiry. Public reports can disclose methodological limitations, negative results, broad features of safety responses, and the grounds of conceptual revision while withholding personal or operational information that would create unjustified risk. Different audiences may appropriately receive different levels of detail. The research team's desire for public transparency cannot alone override lawful restrictions or independently justified duties of confidence. In medical research, the 2024 Declaration of Helsinki explicitly addresses reporting of negative and inconclusive results alongside appropriate protection of participants [70]; translation of that commitment into non-medical commons settings remains a proposed methodological choice subject to applicable governance arrangements.

Priority for empirical work should be assigned according to the possibility of informative and ethical comparison. Synthetic histories are suitable for testing category definitions, temporal consistency, and access-control logic. Publicly documented and genuinely authorized records may support a small structured comparison of procedures. In-depth studies involving participants should proceed only after appropriate independent review, consultation, and safety planning. Longitudinal causal questions should be attempted when valid observations of both outcomes and alternative causes are obtainable without disproportionate burdens. At each stage, the researchers should consider whether the expected information can distinguish the GR interpretation from established commons governance, programme evaluation, organizational learning, and legal or professional explanations. An inability to make that distinction is itself a substantive limit on what the research can claim.

The resulting contribution of this section is a set of boundaries for continued investigation. Historical provenance, authorization, recognition, and value return can be connected in a coherent analytical account, while their actual relations remain contingent and ethically constrained. Some observed failures call for repair of institutional practices; others call for reconsideration of the evaluative standard; still others require withdrawal of an explanatory hypothesis. The next and concluding section will synthesize what the proposed framework makes available for research and design, specifying the claims that remain open, the protections that should accompany future investigations, and the circumstances under which simpler existing theories provide the preferable explanation.

15 Conclusion

The research object of this paper has been the historically organized relation among contributions, the institutions through which they become reusable, and the heterogeneous values that subsequent activity may generate. Its principal result is a bounded conceptual and methodological framework for examining a *generative commons* in aid- and volunteer-related knowledge infrastructures. The framework distinguishes the occurrence of a contribution from its description, an authorization from a technically available action, recognition from authorship or enforceable entitlement, and the generation of value from the effective availability of a benefit to a particular person or community. It also treats the contin-

ued capacities for producing, interpreting, repairing, and sharing resources as objects of governance. The following conclusion identifies the contributions of these distinctions, clarifies how they interact, specifies their institutional and methodological limits, and sets out a feasible research agenda. The account remains a theoretical proposal built in conversation with antecedent commons scholarship, generative-justice research, and established documentary and ethical standards. It reports neither an implementation nor verified causal effects.

15.1 Contribution Histories and the Boundaries of Shared Resources

The first contribution concerns the unit of analysis. A shared repository or collection of educational, scientific, or humanitarian materials is only one manifestation of a commons arrangement. Its generative capacities also depend on people able to use the materials, institutions authorized to maintain them, interpretive conventions by which they remain intelligible, and procedures through which mistakes and permissions can be reviewed. Commons scholarship already offers substantial accounts of resources, communities, rules in use, and governance outcomes [47, 27, 21]. The present paper proposes a more specific observational interface among contribution events, resource transformations, recognized roles, reuse permissions, and possible downstream benefits. This proposal supplements rather than supersedes those antecedent frameworks.

A contribution history has several analytically separable constituents. A person or collective performs an activity under situated conditions; an artifact or a changed practice may emerge; an institution or another observer records a provenance assertion; a later actor transforms or relies upon the resulting resource; and a further institutional decision may recognize some part of that history. The identity of the contributor, the adequacy of the record, and the significance of the contribution can remain disputed. Section 3 therefore describes documentary provenance as an evidence-bearing assertion, rather than a self-validating account of historical reality. Standards such as PROV provide disciplined means of representing such assertions [63, 64]; their expressive capacity does not establish the reliability of the evidence supplied to them.

The distinction matters particularly for modest, distributed, and difficult-to-observe work. Translation, maintenance, error correction, participant support, and cross-disciplinary mediation may condition the value of later outputs without generating an easily citable primary artifact. Conversely, a prominently attributed document may be little used or may require substantial repair before its reuse becomes responsible. A governance framework concerned with historical contributions should consequently permit partial records, conflicting accounts, and appropriately protected forms of attribution. Perfectly complete histories are rarely a realistic premise for institutional judgment. Reviewable uncertainty may be more valuable than a falsely comprehensive ledger.

The institutional boundary of the commons is equally consequential. Contributors and recognized members may differ from the people whose information, care, work, or safety is affected by the shared resource. Section 2 accordingly treats affected outsiders as relevant positions in the institutional description. Their interests need not arise from authorship, membership, or a licence. A person's confidentiality interest, for example, can constrain proposed uses of a resource even where the person has supplied no copyrightable expression. A legitimate design question is therefore how to make opportunities for reuse responsive to the persons and obligations situated beyond the immediate contributor community.

15.2 Permission, Recognition, and Differentiated Institutional Claims

A second contribution is the systematic separation of positions that may become conflated in institutional records. The source of a contribution, the holder of an intellectual-property right, the subject of personal information, a person entitled to an acknowledgement, an academic author, and an authority competent to approve reuse need not coincide. The legitimacy of each claim depends on the relevant legal, contractual, disciplinary, or ethical setting. Section 4 therefore treats access decisions as contextual determinations within identifiable authority boundaries. Public availability, possession of an artifact, and the technical

ability to copy it each differ from a legally and ethically justified permission to use it for a particular purpose.

This differentiation also applies to the relation between recorded provenance and recognition. A record may describe who carried out a task, while an academic publication applies field-specific authorship criteria and an institution applies its own justified acknowledgement rules. A scholarly contributor-role taxonomy can improve descriptive accuracy without itself resolving authorship, accountability, or compensation [42, 30]. An attribution obligation under an applicable licence is a further and separately grounded matter. Section 5 proposes a contestable recognition record in which the evidence for a role, the normative basis of recognition, the disclosure constraints, and the status of a dispute can remain visible to appropriate reviewers. It is a candidate design artifact, not an automatic device for assigning rights.

These distinctions clarify the ethics of withholding as well as sharing. In contexts involving identifiable patients, beneficiaries, at-risk volunteers, vulnerable communities, or sensitive humanitarian operations, restrictions may preserve the conditions of responsible assistance and continuing collaboration. A descriptive acknowledgement may need to be confidential, collective, pseudonymous, or declined. The protection of an affected person may take priority over the public display of a provenance chain. Guidance on humanitarian data protection and collective data governance supplies relevant normative and procedural considerations, although the force of particular obligations depends on institutional and legal context [32, 5]. An evaluation that equates openness with fairness would fail to represent those considerations adequately.

The institutional outcome proposed here is a set of reviewable decisions rather than a universal allocation rule. A permission record can identify who authorized a use and under which stated conditions. A recognition record can identify what contribution has been acknowledged and which claims remain unsettled. A dispute process can provide appropriate standing, reasons, safe escalation, and correction. None of these instruments guarantees substantive justice, and each can impose documentation, technical, or emotional costs. Their value is therefore contingent on practical accessibility, proportionate review, and accountability to those affected by the decision.

15.3 Heterogeneous Value, Circulation, and the Conditions of Return

A third contribution concerns the relation between value generation and the routes through which benefits are realized. The manuscript recognizes scientific, educational, relational, protective, organizational, material, and economic forms of value as potentially relevant evaluative objects. Such terms name context-sensitive evaluations rather than a pre-existing inventory of commensurable quantities. The approach draws on the capability perspective, on scholarship questioning unexamined commensuration, and on work concerning plural values [53, 18, 36]. Its generative-value vocabulary also has an important intellectual debt to Eglash and colleagues [17].

Section 6 proposes a partial relation among value-generating conditions. One activity may enable another without rendering their values interchangeable. A translation can make a course comprehensible; comprehensible instruction can permit someone to develop a skill; acquired competence can make a later collaboration feasible. Each change may require additional people, permissions, maintenance, and interpretation. Neither a single monetized equivalent nor a linear chain of causation is presumed. The significance of an enabling relation must be evaluated within the circumstances and values of the affected participants.

Section 7 further distinguishes circulation, successful use, and return. A resource may pass through several institutions without producing a demonstrable improvement for its source community. A use that benefits an external audience may still be legitimate even where its authors obtain no direct return. Conversely, a delayed economic gain for a downstream actor may motivate new questions about recognition, reciprocity, or extraction without retroactively establishing a legal obligation to share that gain. The evaluative issue concerns which benefits actually arose, whose capacities were sustained or depleted, which institutions controlled relevant interfaces, and what legally or ethically justified expectations applied at

the time.

Long trajectories deserve special care. As the number of transformations and institutions grows, records may fragment, contributors may become unreachable, licences may become difficult to interpret, and the capacities required to reuse a resource may disappear. Yet a longer trajectory can also contain redundancy, trusted intermediaries, repairable records, and multiple independent opportunities for benefit. Length alone therefore does not measure fragility. Institutional memory matters both as an infrastructure of retention and as a set of practices for retrieving, correcting, interpreting, and responsibly retiring historical records. The organizational-memory literature supports the significance of these functions [65]; the present paper's proposed relation between memory and heterogeneous return remains to be evaluated empirically.

An implication of this account is that generativity can be impaired by interventions that appear successful under narrow output metrics. A project may raise its publication count while drawing down unpaid maintenance capacities. A platform may expand downloads while reducing the ability of affected people to contest a harmful classification. An initiative may deliver a useful artifact while shifting the costs of interpretation and support onto a less powerful participant group. Such cases require an evaluation that attends to the conditions of subsequent value production, the distribution of risks, and the repairability of governance arrangements. They also require restraint: a difference between contributions and benefits does not, without additional evidence and normative justification, demonstrate wrongful appropriation.

15.4 Participation, Professional Boundaries, and Revisable Authority

A fourth contribution links the commons' generative capacities to the distribution of authority over the interfaces through which resources are interpreted, reused, and contested. Participation can involve presence, communication, influence, a defined decision-making mandate, or the ability to request review. Those positions have different practical significance. The traditions of participatory and collaborative governance illuminate these differences [2, 11, 24, 1]. The paper's further proposal is to examine how particular positions condition identifiable contribution and value pathways over time.

Section 8 distinguishes formal permission to participate from feasible participation, which may depend on language, accessibility, time, institutional support, security, and credible routes for contestation. Institutional interface control may shape what is counted as a contribution, whose testimony is treated as reliable, which reuse is approved, and where benefits become observable. The presence of a participatory meeting, a public repository, or a formal complaints form provides only partial evidence about these capacities. A meaningful evaluation would ask whether affected persons can safely make use of the relevant opportunity and whether their participation has an identifiable relation to institutional decisions.

The significance of these interfaces is particularly evident in volunteer and professional relationships. A volunteer's willingness to help and an employed professional's legal or disciplinary responsibility arise from different institutional positions. Competence, delegation, oversight, employment status, and obligations of confidentiality require independent assessment. Section 9 therefore proposes a role-activity compatibility inquiry while maintaining the independence of professional and research ethics. It also recognizes the significant intellectual and organizational labour performed by intermediaries without converting every contribution into professional authority, academic authorship, or a claim against an institution.

The governance analysis in Section 10 consequently favors differentiated, accountable decision domains. Collective participation may be appropriate for shared resource priorities or contributor-recognition conventions. Safety-sensitive information, clinical questions, statutory decisions, and research approvals may require a differently constituted and appropriately qualified decision-maker. Disputes about attribution, restricted access, a person's safety, and allocation of resources can call for distinct standards and appellate routes. The proposed institutional ideal is a system in which reasons can be given, decisions can be contested, authority boundaries remain legible, and corrections do not unnecessarily expose sensitive people. Such arrangements must be assessed by their operation, including

their maintenance burdens, rather than their mere formal existence.

15.5 Technical Representations and the Evidentiary Burden

The technical contribution of Section 11 is an architectural vocabulary for maintaining inspectable relations among artifacts, provenance assertions, permission decisions, recognition claims, and revisions. It draws on existing provenance and metadata standards while assigning different functions to documentation, policy expression, access control, and audit. The potential attraction of common identifiers and interoperable records is that independently governed institutions may be able to understand selected parts of a contribution history without accepting an opaque database's account of what occurred [64, 61, 66]. This is a conditional possibility. Interoperability can also expose hidden dependencies, reveal sensitive linkages, or reproduce mistaken classifications across systems.

A technically sound record has at least three distinct questions attached to it. The first concerns *semantic adequacy*: does the record represent the event or decision that its label purports to denote? The second concerns *evidentiary adequacy*: what supports its historical or institutional assertion, and who can challenge that support? The third concerns *normative authorization*: who is entitled to create, inspect, modify, disclose, or rely upon the record for the intended purpose? A system that performs well on one question can perform poorly on another. Digitally signed assertions may identify their signer without establishing the truth of the assertions; fine-grained access-control software can implement a mistaken policy; exhaustive audit logs can impose unjustified surveillance risks.

The study therefore offers a design principle of proportionate traceability. Institutional records should retain the detail needed to support justified decisions and subsequent review, while limiting identifiable information and the opportunities for harmful linkage. Where disclosure would jeopardize a participant, an authorized reviewer may need access to evidence that the public cannot receive. Where a contribution dispute is resolved, a corrected public summary may be appropriate without disclosing the protected testimony used in the decision. Where the costs of maintaining a comprehensive provenance architecture exceed its prospective benefits, a smaller, auditable process may better serve the institution. The technical design should remain subordinate to warranted authority, participant protection, practical maintenance capacity, and the possibility of correction.

These limitations place the technological proposal within an empirical rather than purely engineering agenda. Whether persistent identifiers, structured event records, or governed catalogues improve the interpretation and reuse of resources depends on people, institutional capacities, and the specific resource being shared. The manuscript neither supplies a production implementation nor demonstrates improved outcomes in an operating organization. Its schemas organize questions for subsequent prototypes and controlled evaluation, and their sufficiency remains open.

15.6 Generative Relational Interpretation and Explanatory Alternatives

The Generative Relational interpretation in the paper provides a possible account of the mutual conditioning of resources, persons, institutions, classificatory practices, and historical value pathways. Its intended contribution concerns relations among mechanisms that are often studied separately. A provenance practice may affect whose contributions can be recognized; recognition may alter future participation; participation may affect the capacity to maintain the resource; maintenance may condition reuse; and reuse may generate benefits that alter institutional incentives. These are candidate couplings. Their historical existence, direction, and strength cannot be inferred from the conceptual possibility of the sequence.

The interpretation retains three distinct levels of reality. At the level of *ontological reality*, the ultimate status of the entities and relations invoked by the model is suspended. The use of relational language, network representations, or temporal structures therefore supplies no proof that social or economic reality ultimately consists of the proposed objects. At the level of *relational reality*, sufficiently stable and generatively efficacious arrangements can be modeled through historically constituted actors, capacities, resource dependencies, constraints, and institutional relations. Their existence and persistence remain questions for appropriate forms of inquiry. At the level of *manifestation reality*, researchers encounter

documents, interviews, access decisions, benefits reported by participants, metadata, interruptions, and contested accounts. These manifestations are shaped by the very power, confidentiality, and measurement processes that the research seeks to understand.

Keeping the levels distinct limits two potential errors. An observable document should not be equated with the totality of the contribution or relation it reports. Equally, a theoretically plausible relation should not be presented as empirically operative without observations capable of distinguishing it from alternatives. A missing public record may arise from failure of attribution, purposeful protection of a participant, incomplete archival practice, or a contribution that was never within the institution's recording scope. A downstream gain may arise through previously documented reuse, independent rediscovery, changes in demand, or a combination of mechanisms. GR may assist in organizing these possibilities, but the framework gains explanatory force only when it helps discriminate among them.

Existing commons governance, organizational learning, institutional economics, participation studies, knowledge-management research, and ordinary professional or legal analysis may already account for some of the patterns proposed here. Section 14 accordingly identifies situations in which a detailed GR reconstruction offers little incremental understanding, in which its proposed links fail, or in which safe evidence for testing is unavailable. A more elaborate interpretation should not displace a simpler well-supported explanation merely because it can redescribe the same observation. The paper's contribution is therefore a researchable integrative vocabulary with explicit conditions for correction, rather than a demonstration of theoretical superiority.

15.7 Ethically Feasible Comparative Research

The next stage of inquiry is an ethically feasible comparative research programme. The comparative discussion in Section 12 identifies publicly documented institutional environments concerning method repositories, professional learning, participatory mapping, and humanitarian data. Their publicly available descriptions support limited accounts of organizational features and announced changes. They do not amount to an outcome dataset, a cross-case causal estimate, or evidence that any organization has implemented the proposed generative-commons framework. The constructed cases in Sections 12 and 14 test internal coherence and expose possible failures, but should not be confused with observed instances of success or misconduct.

A first research phase could develop a small collection of wholly synthetic histories. Such histories can test the internal consistency of provenance records, version transitions, disputed attribution, partial permissions, protected identities, and time-dependent benefits. Synthetic tests can expose contradictions among proposed decision rules while avoiding exposure of actual patients, volunteers, or beneficiaries. Their evidentiary contribution would be formal and procedural. They would establish neither the historical frequency of a phenomenon nor the real-world usefulness of a governance intervention.

A second phase could compare bounded, properly authorized institutional procedures using non-sensitive documentation and independently checked public records. Candidate questions include whether a given type of contribution can be reconstructed from available records, whether users understand reuse conditions, how conflicts are escalated, which actors carry maintenance burdens, and whether restricted or withdrawn materials retain a defensible record of their history. Comparisons should identify their temporal windows, resource classes, policy versions, and alternative explanations before drawing conclusions. Published organizational descriptions should be treated as descriptions of stated arrangements unless further evidence establishes actual operation.

A third phase could examine lived experiences and longitudinal effects where relevant consent, institutional permissions, and independent ethical review make such inquiry appropriate. Research designs might compare access to correction mechanisms, safe recognition opportunities, continuity of reuse, capability development, or maintenance costs. Section 13 specifies the necessary separation between descriptive indicators, claims of mechanistic contribution, and any attempted causal effect estimate. Sensitive records require data minimization, proportionate retention, justified authority, and review of potential re-identification. The desirability of testing a theory supplies no independent license to expose people

or collect information that an investigator has no authority to obtain [32, 12].

Research outcomes should be allowed to vary in their implications. Evidence that records improved retrieval may support a limited recommendation for document management without validating claims about value return. Evidence that a complaint process improved the accuracy of recognition may support the particular procedure without establishing broader justice. Evidence of extractive downstream use may motivate institutional repair while leaving some components of the GR theory intact. Persistent failure to identify the proposed relational mechanism, especially where established models account more successfully for the observations, should narrow or eliminate that part of the theory. Ethical infeasibility can also be a genuine boundary to empirical inquiry; it should not be represented as confirmation of an otherwise untested explanation.

15.8 Institutional Implications and Closing Assessment

For institutions seeking to sustain shared research and assistance-related resources, the practical implications of this framework are deliberately conditional. A promising governance arrangement would make the provenance of resources inspectable to appropriately authorized persons, describe permissions at the level warranted by the intended use, provide proportionate opportunities for recognition and correction, and make the burdens of maintaining common resources visible. It would preserve differentiated professional and institutional mandates while offering affected participants realistic and safe routes to influence decisions relevant to them. It would also attend to future capabilities: the resource's continuing usefulness, the community's ability to understand and revise it, and the distribution of costs across those who sustain its circulation.

These considerations do not imply that a single institution should implement every available technical instrument or that openness, detailed attribution, or collective voting is universally appropriate. A small and trusted working group may require a simple procedure rather than a permanent database. A privacy-sensitive collaboration may properly limit the circulation of information while sharing non-identifying methods. A research partnership may need a specific agreement about derivative works and scholarly credit, while a community assistance programme may place greater weight on accessibility and participant protection. The relevant governance arrangement should be justified by the resource, people, authority, and feasible capacities of the case, with rights and obligations interpreted in the applicable legal and institutional context.

The paper's central proposition is thus an invitation to evaluate the *conditions of continued generativity*, while permitting findings that ordinary stewardship, professional resources, or network diffusion account for the observed outcomes as well as or better than the GR proposal. A contribution can become an enabling resource through a sequence of relations whose future significance is difficult to foresee at the time of its production. Institutions may widen or narrow that possibility through the ways they remember history, exercise authority, protect people, and govern reuse. The resulting benefits and burdens need not return along symmetric paths, and a justifiable response to their distribution requires more than an inventory of outputs or a measure of circulation. By separating observable histories from their interpretation, institutional permissions from ethical claims, and explanatory hypotheses from demonstrated outcomes, the proposed framework offers an agenda for studying how shared resources can remain useful, corrigible, and responsive to those who help sustain them. Its ultimate adequacy will depend on conceptual critique, legally informed comparison, responsible empirical investigation, and a willingness to revise or relinquish mechanisms that the evidence does not support.

References

- [1] Chris Ansell and Alison Gash. Collaborative governance in theory and practice. *Journal of Public Administration Research and Theory*, 18(4):543–571, 2008.
- [2] Sherry R. Arnstein. A ladder of citizen participation. *Journal of the American Institute of Planners*, 35(4):216–224, 1969.
- [3] Yochai Benkler. Coase's penguin, or, linux and the nature of the firm. *Yale Law Journal*, 112, 2002.
- [4] Geoffrey C. Bowker and Susan Leigh Star. *Sorting Things Out: Classification and Its Consequences*. MIT Press, 1999.
- [5] Stephanie Russo Carroll et al. The CARE principles for indigenous data governance. *Data Science Journal*, 19:43, 2020.

- [6] Center for Open Science. Osf changes. Official institutional website, 2026. Accessed 2026-10-11; description of published service or policy, not independently audited outcome.
- [7] Center for Open Science. Welcome to osf projects. Official institutional website, 2026. Accessed 2026-10-11; description of published service or policy, not independently audited outcome.
- [8] CHS Alliance, Groupe URD, and Sphere Association. Core humanitarian standard on quality and accountability (2024 edition), 2024. Revised 2024 standard; source is the official CHS website.
- [9] David Collier. Understanding process tracing. *PS: Political Science & Politics*, 44(4):823–830, 2011.
- [10] Committee on Publication Ethics. Discussion document: Authorship. COPE discussion document, September 2019, 2019.
- [11] Andrea Cornwall. Unpacking 'participation': Models, meanings and practices. *Community Development Journal*, 43(3):269–283, 2008.
- [12] Council for International Organizations of Medical Sciences. *International Ethical Guidelines for Health-related Research Involving Humans*. Council for International Organizations of Medical Sciences, Geneva, 4 edition, 2016.
- [13] Creative Commons. Attribution 4.0 international public license: Legal code, 2013.
- [14] Creative Commons. Attribution-noncommercial 4.0 international public license: Legal code, 2013.
- [15] Creative Commons. Frequently asked questions. Online guidance; accessed 11 October 2026, 2026.
- [16] DataCite Metadata Working Group. Datacite metadata schema documentation for the publication and citation of research data and other research outputs, version 4.6, 2024.
- [17] Ron Eglash, Kwame P. Robinson, Audrey Bennett, Lionel Robert, and Mathew Garvin. Computational reparations as generative justice: Decolonial transitions to unalienated circular value flow. *Big Data & Society*, 2024.
- [18] Wendy Nelson Espeland and Mitchell L. Stevens. Commensuration as a social process. *Annual Review of Sociology*, 24:313–343, 1998.
- [19] European Parliament and Council of the European Union. Regulation (EU) 2016/679 of 27 april 2016 (general data protection regulation). Official Journal of the European Union, L 119, 4 May 2016, 2016.
- [20] Miranda Fricker. *Epistemic Injustice: Power and the Ethics of Knowing*. Oxford University Press, 2007.
- [21] Brett M. Frischmann, Michael J. Madison, and Katherine J. Strandburg, editors. *Governing Knowledge Commons*. Oxford University Press, 2014.
- [22] Archon Fung. Varieties of participation in complex governance. *Public Administration Review*, 66(s1):66–75, 2006.
- [23] Raghu Garud and Arun Kumaraswamy. Vicious and virtuous circles in the management of knowledge: The case of infosys technologies. *MIS Quarterly*, 29(1):9–33, 2005.
- [24] John Gaventa. Finding the spaces for change: A power analysis. *IDS Bulletin*, 37(6):23–33, 2006.
- [25] Russell E. Glasgow, Thomas M. Vogt, and Shawn M. Boles. Evaluating the public health impact of health promotion interventions: the RE-AIM framework. *American Journal of Public Health*, 89(9):1322–1327, 1999.
- [26] Global Indigenous Data Alliance. The CARE principles for indigenous data governance. Principles report, 2019. Official report hosted at the University of Nebraska–Lincoln; accessed 2026-10-11.
- [27] Charlotte Hess and Elinor Ostrom, editors. *Understanding Knowledge as a Commons: From Theory to Practice*. MIT Press, 2007.
- [28] Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. Methodological assessment report on the diverse values and valuation of nature, 2022.
- [29] International Committee of Medical Journal Editors. Corrections and version control. ICMJE Recommendations, online section, checked 11 October 2026, 2026.
- [30] International Committee of Medical Journal Editors. Defining the role of authors and contributors. Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly Work in Medical Journals; current online recommendations, checked 11 October 2026, 2026.
- [31] International Committee of the Red Cross. Professional standards for protection work. Third edition, 2018.
- [32] International Committee of the Red Cross. Handbook on data protection in humanitarian action. ICRC reference and digital handbook page, 19 November 2024, 2024. Web reference to the living handbook and its editions; does not imply a newly issued third edition in 2024.
- [33] International Federation of Red Cross and Red Crescent Societies. Volunteering policy. IFRC General Assembly policy, 8 July 2022, 2022.
- [34] International Labour Office. Manual on the measurement of volunteer work, 2011.
- [35] International Labour Organization. Volunteer work. ILO labour-statistics resource page, 14 April 2016, 2016.
- [36] Jasper O. Kenter, Liz O'Brien, Neal Hockley, Neil Ravenscroft, Ioan Fazey, Katherine N. Irvine, Mark S. Reed, et al. What are shared and social values of ecosystems? *Ecological Economics*, 111:86–99, 2015.

- [37] Daniel P. Kidder, Leslie A. Fierro, Elena Luna, et al. CDC Program Evaluation Framework, 2024. Technical Report RR-6, Centers for Disease Control and Prevention, 2024. Published September 26, 2024; accessed 2026-10-11.
- [38] Massimo Marelli, editor. *Handbook on Data Protection in Humanitarian Action*. Cambridge University Press, 3 edition, 2024.
- [39] John Mayne. Contribution analysis: Coming of age? *Evaluation*, 18(3):270–280, 2012.
- [40] Missing Maps. Mapping together for humanitarian action. Official institutional website, 2026. Accessed 2026-10-11; description of published service or policy, not independently audited outcome.
- [41] Missing Maps. Who we are. Official institutional website, 2026. Accessed 2026-10-11; description of published service or policy, not independently audited outcome.
- [42] National Information Standards Organization. ANSI/NISO Z39.104-2022: CRediT, contributor roles taxonomy, 2022.
- [43] National Institute of Standards and Technology. Security and privacy controls for information systems and organizations. Special publication 800-53 revision 5, release 5.2.0, NIST, 2025.
- [44] OECD. *OECD Guidelines for Citizen Participation Processes*. OECD Public Governance Reviews. OECD Publishing, Paris, 2022.
- [45] ORCID. Connecting with collaborators: Contributor roles in works metadata. ORCID documentation, accessed 11 October 2026, 2026.
- [46] Organisation for Economic Co-operation and Development. Recommendation of the council on enhancing access to and sharing of data. OECD/LEGAL/0463; adopted 6 October 2021, 2021.
- [47] Elinor Ostrom. *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge University Press, 1990.
- [48] Elinor Ostrom. Beyond markets and states: Polycentric governance of complex economic systems. *American Economic Review*, 100(3):641–672, 2010.
- [49] Paul Pierson. Increasing returns, path dependence, and the study of politics. *American Political Science Review*, 94(2):251–267, 2000.
- [50] Project ECHO, University of New Mexico. What we do. Official institutional website, 2026. Accessed 2026-10-11; description of published service or policy, not independently audited outcome.
- [51] RO-Crate Community. *RO-Crate Metadata Specification 1.3*. ResearchObject.org, 2026.
- [52] San Francisco Declaration on Research Assessment. Read the declaration. San Francisco Declaration on Research Assessment (DORA), declaration adopted in 2013, 2013.
- [53] Amartya Sen. *Development as Freedom*. Oxford University Press, 1999.
- [54] Susan Leigh Star and James R. Griesemer. Institutional ecology, ‘translations’ and boundary objects: Amateurs and professionals in berkeley’s museum of vertebrate zoology, 1907–39. *Social Studies of Science*, 19(3):387–420, 1989.
- [55] Jonathan A. C. Sterne, Miguel A. Hernan, Alexandra McAleenan, Barnaby C. Reeves, and Julian P. T. Higgins. Chapter 25: Assessing risk of bias in a non-randomized study. In *Cochrane Handbook for Systematic Reviews of Interventions*. Cochrane, 6.5 edition, 2024. Chapter last updated October 2019; Handbook version 6.5 dated 2024.
- [56] UNESCO. Recommendation on open science. Adopted by the UNESCO General Conference, 23 November 2021, 2021.
- [57] United Nations Office for the Coordination of Humanitarian Affairs. Data review. Official institutional website, 2026. Accessed 2026-10-11; description of published service or policy, not independently audited outcome.
- [58] United Nations Office for the Coordination of Humanitarian Affairs. Data scope and criteria. Official institutional website, 2026. Accessed 2026-10-11; description of published service or policy, not independently audited outcome.
- [59] United Nations Office for the Coordination of Humanitarian Affairs, Centre for Humanitarian Data. Revised ocha data responsibility guidelines. Official institutional website, 2025. Accessed 2026-10-11; description of published service or policy, not independently audited outcome.
- [60] W3C Data Privacy Vocabularies and Controls Community Group. Data privacy vocabulary (DPV), version 2. Community group final report, W3C Community Group, 2024.
- [61] W3C Permissions and Obligations Expression Working Group. ODRL information model 2.2. W3C Recommendation, 15 February 2018, 2018.
- [62] W3C Provenance Working Group. Constraints of the PROV data model. W3C Recommendation, 30 April 2013, 2013.
- [63] W3C Provenance Working Group. PROV-DM: The PROV data model. W3C Recommendation, 30 April 2013, 2013.
- [64] W3C Provenance Working Group. PROV-O: The PROV ontology. W3C Recommendation, 2013.
- [65] James P. Walsh and Gerardo Rivera Ungson. Organizational memory. *Academy of Management Review*, 16(1):57–91, 1991.
- [66] Mark D. Wilkinson et al. The FAIR guiding principles for scientific data management and stewardship. *Scientific Data*, 3:160018, 2016.

- [67] Workshop on Governing Knowledge Commons. The GKC (Governing Knowledge Commons) research framework. Research framework reference page; accessed 11 October 2026, 2026.
- [68] World Health Organization. Who guideline on health policy and system support to optimize community health worker programmes, 2018.
- [69] World Intellectual Property Organization. Frequently asked questions: Copyright. Online guidance; accessed 11 October 2026, 2026.
- [70] World Medical Association. WMA Declaration of Helsinki: Ethical principles for medical research involving human participants. Policy declaration, amended October 2024, 2024. Medical research and identifiable human data; accessed 2026-10-11; ethical guidance rather than a universally applicable statute.
- [71] World Wide Web Consortium. Data catalog vocabulary (DCAT) – version 3. W3c recommendation, W3C, 2024.
- [72] World Wide Web Consortium. Verifiable credentials data model v2.0. W3c recommendation, W3C, 2025.