

Epistemic Power in Relational Trajectories: An Investigation of Authority and Trust Formation

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Abstract

Institutional trust in persons, contributions, and knowledge claims depends partly on the organization of evidence and the authority attached to its evaluation. This fourth study in a five-paper research programme investigates how situated power relations condition the production, preservation, access, assessment, accreditation, and contestation of relational evidence. It distinguishes expert authority and legitimate delegation from prestige effects, coercive dependence, and discretionary gatekeeping, while treating these categories as questions for empirical and normative inquiry. A trajectory-sensitive approach is proposed to represent typed powers over evidentiary pathways and to examine how institutional trust can reproduce or alter those powers. Historical-materialist analysis directs attention to archival labor, evaluative resources, infrastructural control, and the material conditions of participation. This v1.1 audited discussion draft contains ten complete sections addressing trajectory-shaping power, evidentiary visibility, evaluation standards, credentialing, testimony, material participation, feedback between trust and power, contestability, empirical research designs, and the synthesis of epistemic and ethical implications. The proposed analytical architecture is preliminary; it reports no original empirical findings or validated causal estimates.

Keywords: epistemic power; relational trajectories; evidence access; institutional authority; trust formation; contestability; evaluative labor

Discussion Paper Note

Paper IV is the power-and-institutional-authority investigation of a coordinated five-paper research programme. Paper II investigates structural observability and the possibility of encounter with heterogeneous events. Paper III investigates the cognitive mediation of relational evidence. Paper IV examines situated authority over evidentiary trajectories, institutional participation, and the reproduction of trust. Paper V is reserved for the circulation and conversion of representations and commitments.

This **v1.0 working draft contains all ten sections: the Introduction, trajectory-shaping power, evidentiary visibility, evaluation standards, credentialing and testimony, material participation, the conditional dynamics of trust and institutional power, contestability, research designs, and the Conclusion.** The detailed ten-section outline and research plan are supplied as separate files in the editable package. The provisional title remains open to author revision. The present study is exploratory, without original empirical findings or an established general formal theory of power.

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DRAFT

Notices

Publication status. All ten research sections have a complete first draft. An initial integrated consistency audit has been conducted in v1.1, while comprehensive source-interpretation checks, external scholarly critique, empirical testing, and author approval remain outstanding. This is an exploratory scholarly DRAFT. No original empirical or causal estimates are reported.

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1 Introduction

The fourth investigation in a programme on relational evidence and epistemic trust examines the institutional and material conditions through which some histories become authoritative while others remain difficult to encounter, evaluate, or contest. Its specific object is *trajectory-shaping epistemic power*: situated capacities to alter the production, preservation, accessibility, interpretation, accreditation, and practical consequences of evidence about contributions and relationships. The section establishes the historical and conceptual motivation for this inquiry, differentiates several mechanisms of power, identifies the paper's boundaries within the research programme, and introduces a provisional analytical vocabulary. The method combines critical engagement with social and political theory, social epistemology, infrastructure studies, and historically situated political economy. The formal architecture developed in subsequent sections is presented as a research proposal requiring comparative and empirical assessment.

1.1 Evidence-bearing histories and institutional mediation

Relational contributions unfold through heterogeneous activities: inquiry, experimentation, caregiving, technical repair, criticism, translation, coordination, collective learning, and the creation or stewardship of material and informational infrastructures. Records of such contributions can include correspondence, research artifacts, protocols, repositories, independent reports, evaluations, contracts, institutional archives, and testimonies. An event history can be extensive while the evidence available to a particular evaluator remains fragmentary. The available record can also contain genuine discrepancies, uncertain attribution, partial documentation, and justified limitations on disclosure. An evaluative institution consequently operates through selective, revisable representations of productive histories.

Selective representation is unavoidable in many finite institutional settings. A hiring panel cannot reconstruct an applicant's complete research history, a journal editor cannot directly observe every stage of an experiment, and a public institution cannot reproduce all of the circumstances underlying a submitted claim. Such constraints create a practical demand for documentation standards, sampling, specialist assessment, delegation, and trusted intermediaries. These arrangements can enable reliable inquiry when their competencies, limitations, and routes for correction are intelligible. They can also distribute the opportunity to be heard and the costs of demonstrating credibility unequally. The present inquiry studies this distribution as an institutional and relational process.

The dependence of inquiry on socially organized practices has a substantial intellectual history. Longino's account of science as social knowledge relates objectivity to critical interaction within communities rather than isolating epistemic warrant within a single assessor [35]. Fricker's account of epistemic injustice identifies ethical significance in the practices through which speakers are assigned credibility and through which shared interpretive resources become available [21]. Medina subsequently develops an account of epistemic resistance that is attentive to imposed silences and the conditions of participation [37]. These works address different questions and retain their own conceptual commitments. The present paper draws on them to motivate an investigation of how the conditions for evaluating evidence can themselves become objects of institutional control.

Consider a hypothetical collaborative research programme in which several researchers produce distinct methodological contributions. A funding body's evaluator receives a concise institutional report describing the programme, while the complete provenance record is maintained in several repositories. The report may accurately summarize certain findings while omitting early methodological work or community-based maintenance. A senior organization may have authority to nominate experts, define allowable evidence, and certify authorship. A junior contributor may have strong documentary evidence but face a high cost of obtaining archival access and submitting a challenge. A third institution may accept the certification for subsequent appointment decisions. Each institutional step may be defensible under some purposes and problematic under others. Their joint operation changes which records are encountered, which contributions acquire a recognized description, and which future opportunities become feasible. This example is hypothetical and represents no identifiable organization.

The analytically salient feature of the example is that an evaluator's final belief is conditioned by a history of organizational decisions made before individual judgment takes place. Access permissions, reporting formats, review criteria, and appeal procedures organize the evidence that reaches the evaluator. An account focused entirely on observer cognition would leave much of this institutional determination unexplained. Conversely, the observation that an institution has discretion over records is insufficient to conclude that it exercises wrongful power: access restrictions can protect privacy, evaluation rules can improve consistency, and credentialing can convey genuine expertise. The relevant research problem is to specify who can shape a trajectory, through which mechanisms, under what constraints, and with what implications for evidentiary justification and subsequent relations.

1.2 Power in the organization of evidence

Political and sociological theories provide several complementary starting points for analyzing these mechanisms. Dahl's relational formulation treats power through the ability of one actor to affect another's conduct within a specified setting [15]. Bachrach and Baratz emphasize the importance of controlling which matters reach authoritative decision processes [4]. Lukes develops a wider discussion of power beyond immediately visible conflicts and overt decisions [36]. The present paper adopts no single tradition as a complete theory of epistemic power. Their shared methodological value lies in making the description of institutional outcomes sensitive to decisions, excluded alternatives, and the conditions in which preferences and assessments form.

Applied to knowledge practices, a decision-centered description might record that a review committee rejected a manuscript or that a repository administrator denied access to a file. An agenda-sensitive description asks which kinds of research or testimony can enter review, which metadata qualify a submission for discovery, and which interpretations of contribution are admissible. A broader trajectory-sensitive description also considers how recurrent resource allocations, organizational dependence, reputational signals, and sanctions change future opportunities to produce, preserve, or contest evidence. These levels are analytically related without becoming interchangeable. An individual's adverse result, for example, supplies evidence of a disadvantage; establishing a particular power mechanism requires a warranted account of an actor's relevant capacity, its exercise or credible threat, and plausible alternative arrangements.

The paper accordingly treats power as a *typed and situated relation* rather than a fixed scalar attribute possessed by each person or institution. A reviewer may control the application of a rubric without controlling the evidentiary archive. A platform may control discovery and ranking while lacking authority to certify the truth of a claim. A professional body may define credentialing conditions while having limited jurisdiction over subsequent employment. A resource provider may affect whether independent verification is feasible without determining a reviewer's private belief. An individual actor can also occupy several roles, and a formal institution can distribute authority among multiple actors. A trajectory-based analysis must be able to describe these differences.

For initial orientation, Table 1 distinguishes six proposed sites of institutional influence. The categories are analytical prompts rather than mutually exclusive natural kinds; a single operation may affect several simultaneously. The critical issue is the relation between the mechanism, the actor authorized or able to exercise it, and the evidentiary and material consequences for specified participants.

Two implications follow from distinguishing these sites. First, identical public evaluations can arise through different evidentiary pathways. One evaluation may rest on independently checked records, while another may depend on an unexamined credential or a shared report reproduced across several institutions. Their apparent agreement provides limited information about evidentiary independence. Second, the absence of open disagreement cannot, on its own, establish voluntary acceptance of a standard. Participants may have incomplete information about available alternatives, lack standing to challenge the decision, or reasonably fear material consequences. Such possibilities require investigation; they should not be inferred categorically from institutional hierarchy.

Table 1: Provisional mechanisms through which power may shape an evidentiary trajectory. Each row identifies an analytical site and a possible observable implication, rather than a conclusion about legitimacy or wrongdoing.

Mechanism	Institutional capacity	Possible evidentiary implication
Production and custody	Determine which activities are documented and who can maintain records	Differential preservation and reconstruction of contribution histories
Access and encounter	Set permissions, discovery routes, rankings, and distribution	Differential probability of encountering relevant evidence
Evaluation	Define admissible evidence, criteria, interpretive standards, and reviewers	Differential treatment of comparable claims or contributions
Accreditation	Issue credentials, certifications, and authoritative summaries	Conversion of assessment into recognized institutional status
Participation and remedy	Regulate standing, review procedures, audit access, and challenge costs	Differential opportunities to correct or appeal a judgment
Resources and sanctions	Allocate verification labor, institutional support, rewards, and penalties	Differential capacities to produce evidence and bear disagreement

1.3 Authority, justified reliance, and contestability

Epistemic authority performs useful institutional work. Complex knowledge production requires delegation to specialists, agreed methods for checking claims, and practical means of relying on results that users cannot replicate directly. An accredited laboratory can transmit information about procedures and competence; an expert review can make a technical judgment more intelligible to non-specialists; professional standards can make performance comparable across cases. These functions supply reasons to study authority's epistemic reliability and the rules by which it is held accountable.

The paper distinguishes at least four objects that are often described under the common term *trust*. *Evidentiary warrant* concerns whether an assessment is supported by reasons and relevant records. *Credibility attribution* concerns the standing an observer gives to a source or institution. *Institutional authorization* concerns a rule-governed capacity to issue an evaluation or certification with defined consequences. *Behavioral reliance* concerns acting in dependence on an assessment or authority, often amid costs and constraints. An individual can rely on an institution while doubting its judgment because viable alternatives are absent. Another can regard an expert as credible while withholding permission to act in a high-risk setting. The distinction between these responses is central to this paper, even though the detailed cognitive models of inference and reliance are developed in the companion investigation.

Legitimate authority, within the present analytical proposal, is a situated institutional achievement open to independent examination. Its justification may draw on domain-specific competence, procedural integrity, proportional evidentiary requirements, transparent standards, correction capacity, and the ability to hear relevant criticism. A particular system can satisfy some conditions and fail others. For instance, a specialized review panel may possess substantial technical competence while applying a classification scheme poorly suited to interdisciplinary contributions. A public archive may be accountable through formal appeals while imposing unusually high search costs on participants with fewer resources. The joint epistemic and ethical appraisal must therefore attend to the accuracy of the procedure and to the effective opportunity to contest it.

Theories of epistemic injustice provide a reason to regard participation and interpretive access as substantive, rather than purely administrative, variables [21, 37]. Fraser's analysis of public spheres likewise motivates attention to the unequal social conditions under which an apparently open deliberative process operates [20]. These contributions do not yield a universal checklist for all research institutions. They support the narrower argument that institutional procedures should be investigated for the conditions of entry, testimony, challenge, and revision that they create. A formal right of appeal may be less effective when the relevant records are inaccessible or when the costs of a challenge exceed the resources of

an affected contributor. Conversely, an informal route for correction may sometimes be effective even where formal appeal provisions are limited. The paper treats actual contestability as an empirical and institutional question.

A second difficulty concerns the epistemic status of credentials and prestige. Credentialing can condense a history of supervision, training, examination, and accountability into a portable signal. It can also produce a relatively durable advantage when evaluators substitute a status marker for examination of the underlying evidence. Merton's analysis of the Matthew effect in science documents how recognition and communication processes can advantage already prominent contributors [38]. The present research extends that concern only as a *candidate mechanism*: cumulative visibility may affect evaluation in a particular institutional setting, but the direction and magnitude of this effect require suitable designs and comparison cases. Status can correlate with real expertise; distinguishing warranted inference from distortion is a central problem of identification.

An institutional assessor thus faces at least two tasks. The first is to evaluate the evidence and expertise relevant to a particular proposition or contribution. The second is to evaluate how the infrastructure and authority chain selected that evidence for encounter. An evaluator may be capable of the first task while lacking access to the second. The asymmetry creates a potential site of epistemic power, because the organization controlling the transmission or certification process can affect which reasons become available for judgment. The analysis will ask when this control is justified by reliability, safety, or privacy and when its configuration produces avoidable error, unjust exclusion, or concentrations of authority resistant to correction.

1.4 Knowledge infrastructure and material dependence

Power over relational evidence is often exercised through infrastructure whose operation becomes routine. Database fields, metadata conventions, repository permissions, indexing criteria, review portals, automated ranking rules, and institutional retention policies can determine which portions of a record remain recoverable. Infrastructure studies demonstrate that technical access and actual use depend on situated organizational arrangements and forms of learning, labor, and support [59]. Studies of platform moderation similarly show that classification and governance decisions shape what users encounter and what counts as permissible participation [23]. These literatures concern different technical and institutional domains; their relevance here is to illuminate the governance of interfaces through which evidence circulates and becomes actionable.

AI-mediated knowledge production intensifies the practical significance of these questions in some settings. Automated summarization can facilitate searches across extensive records, translation can broaden linguistic access, and machine-assisted analysis can help identify missing documentation. Yet a summary is an additional representational artifact, produced under selections, prompts, permissions, and quality constraints. It may faithfully preserve the material needed for a decision, or it may omit the provenance necessary for justified attribution. An institution relying on such a system can acquire new capacity over attention and narrative selection even when the underlying records remain unchanged. The analysis therefore considers how control of the pipeline matters independently of the amount of material it processes.

A historical-materialist inquiry adds the organization of labor and material reproduction to this account of technical mediation. Archiving, data cleaning, community translation, maintaining software dependencies, reproducing results, and preparing evidentiary appeals require time, specialist knowledge, computing capacity, and access to institutions. These activities may be undertaken by salaried staff, precarious contributors, volunteers, public agencies, private providers, or mixed collaborations. Their allocation affects which histories can be preserved and made evaluable. A research community that depends on unpaid custodial labor may possess a rich apparent commons while reproducing unequal capacities to participate. A well-resourced organization may provide genuinely beneficial infrastructure while gaining considerable influence over the categories by which contributions are recognized.

The paper's interest in material conditions should not be construed as a claim that every credibil-

ity judgment reduces to economic class, property ownership, or direct financial exchange. Professional norms, expertise, law, administrative discretion, social relationships, and technical design mediate material constraints through historically changing institutions. Their effects must be specified rather than assumed. The relevant economic question is how material capacities sustain or restrict the production, accessibility, evaluation, and challenge of knowledge claims, and how an ensuing institutional judgment can affect subsequent access to the means of producing evidence.

Material dependence can complicate the interpretation of expressed trust. A contributor may endorse an authority out of considered agreement, prudential conformity, gratitude for genuine support, or concern about withdrawal of funding or access. An observer may draw useful information from the endorsement, but the conditions of its production affect its diagnostic value. The analysis should avoid reading compliance or praise as direct evidence of warranted trust. Similarly, criticism from a materially dependent participant may entail different risks than criticism from an evaluator able to exit the institution. The relationship between expression, belief, and material constraint requires separate representation.

1.5 Trajectories, feedback, and the paper's analytical scope

The term *trajectory* refers here to a recorded or reconstructed sequence, potentially only partially ordered, of relational, productive, and institutional events. Events can include contributions, reports, evaluations, credentials, challenges, amendments, resource decisions, and the production of new evidence. A trajectory representation can preserve links among events and sources while remaining incomplete and contestable. An event index may be introduced to compare arrangements, without implying that social processes possess a uniquely correct global temporal order or that one representation exhausts their reality.

Trajectory-shaping power concerns an actor's or arrangement's capacity to alter relevant pathways through these event histories. One site of influence may affect initial evidence production; another may affect a later institutional evaluation; a third may change the feasibility of future correction. A static network position can provide contextual evidence about such capacities but is not, by itself, a demonstrated causal effect. Network centrality, organizational seniority, and credential accumulation are neither necessary nor sufficient to establish a particular power mechanism. The paper will investigate power through typed relations, feasible interventions, rules, sanctions, and the historically situated alternatives against which institutional influence can be assessed.

A provisional distinction among *recorded*, *accessible*, *assessed*, and *institutionally consequential* evidence provides a useful starting point. A contribution can be recorded without being indexed. It can be accessible without being encountered by an evaluator. It can be encountered without being deemed relevant under an authorized rubric. An assessment can be positive without granting a certification or access to resources. These are distinct transition sites, some of which may be conditioned by individual judgment and others by organizational decisions. The first task of formalization is to identify the relevant interfaces; quantitative estimation comes later and depends on data and design.

Power and trust may also form a feedback process. A trusted institutional assessment can attract further participants, confer authority on a standard, and concentrate subsequent evidence within the certifier's systems. Independent verification and effective appeal can improve the legitimacy and reliability of that concentration. Under other conditions, the same concentration may suppress rival interpretations, weaken independent verification, and make correction increasingly costly. Withdrawal of trust, institutional reform, and the emergence of alternative archives can modify these arrangements. The direction of feedback is conditional: growing trust does not inherently imply either oppression or epistemic improvement.

The programme's division of labor clarifies the limits of the current investigation. Paper I examines the recognition paradox of AI-mediated production and mismatches between changing productive activity and institutional evaluation. Paper II addresses the structural encounter of heterogeneous relational events and the opportunity for trust to form. Paper III analyzes cognitive mediation, including attention, memory, belief revision, testimony assessment, and reliance. Paper IV examines the rules and power

relations that shape evidence access, authority, participation, and consequences, including their reproduction through trust. Paper V will investigate the subsequent circulation and conversion of trajectory representations and commitments through provisional relational-currency interfaces. The present paper discusses these interfaces when necessary to identify power; it reserves a general theory of circulation and conversion for that companion study.

1.6 Research questions and standards of inference

The inquiry is organized around four connected problems. The first concerns *configuration*: which actors, roles, infrastructures, and higher-order rules determine the feasible pathways through which relational evidence becomes available or authoritative? The second concerns *identification*: how might a researcher distinguish legitimate expertise, administrative coordination, resource scarcity, status advantage, coercion, and intentional exclusion when they can generate similar observed outcomes? The third concerns *reproduction*: under which conditions do public evaluations and expressions of trust reinforce or alter the capacities that shaped them? The fourth concerns *normative design*: which arrangements make evidentiary authority sufficiently reliable, contestable, and responsive to heterogeneous contributions without requiring unlimited disclosure or eliminating necessary specialization?

Answering these questions requires care with the counterfactual language of power. A claim that an institution *could have* changed an evaluation may refer to formally available discretion, technically feasible alteration, historically plausible alternatives, or a causal effect of a specified intervention. These are different claims. Institutional charters, documentary records, participant interviews, platform logs, procedural changes, and comparison across cases can supply different forms of evidence. None is automatically decisive in isolation. A counterfactual can be a disciplined conceptual test even when numerical identification is impossible, provided that its assumptions and alternative explanations remain explicit.

The research design will therefore distinguish descriptive mapping of authority from causal analysis. A rulebook can establish formal decision rights while leaving their practical exercise unknown. Administrative records can document the timing of exclusions while leaving motives ambiguous. Interview accounts can reveal perceived dependence while remaining vulnerable to selective recollection and unequal capacity to speak. A randomized change to the display of a certification can identify an effect on an observed judgment in a defined setting, yet it may leave the institutional reasons for certification untouched. A complete empirical analysis of power would often need triangulation across qualitative institutional reconstruction, intervention or quasi-experimental designs where feasible, and inspection of the material environment in which participants act.

Normative evaluation likewise requires several criteria to be kept distinct. A decision procedure can be accurate yet inadequately contestable. A highly participatory process can be susceptible to manipulation or impose unsustainable verification labor. Open access to a private record can improve some forms of auditability while causing serious privacy harms. A reliable expert hierarchy may enable cooperation across substantial differences in competence. The paper will investigate the conditions under which these aims can be jointly supported, together with the tradeoffs and residual conflicts that cannot be dissolved by a single global scalar of institutional quality.

The anticipated contribution is a framework for treating epistemic power as historically situated control over *trajectories of evidence and authority*, linked to trust through specific, testable mechanisms. The framework is preliminary. It offers no universal taxonomy of power, no assumption that authority is inherently illegitimate, and no empirical proof that a particular institution has generated an injustice. Its value will depend on whether the proposed distinctions illuminate otherwise conflated mechanisms, support comparative inquiry, and remain open to criticism from those whose contributions and records are at issue.

2 Relational Configurations of Trajectory-Shaping Power

This section develops the analytical vocabulary through which the paper examines power over relational evidence. Its objective is to distinguish a documented position of authority, a practically available capacity to intervene, an exercised intervention, and a demonstrated effect on a specified evidentiary outcome. The argument proceeds by defining contextual trajectories and actor roles; separating formal permissions from attainable choices; locating higher-order rules; constructing bounded counterfactual contrasts; and examining interdependent gatekeepers, the costs of contestation, and the evidence required to identify a mechanism. The formalism is a proposed representation for comparative institutional inquiry. Its mathematical objects do not establish an underlying social ontology or supply causal identification merely by being specified.

Dahl’s relational formulation emphasizes the relation between actors and conduct, while Bachrach and Baratz extend attention to the control of agendas and decisions that never reach an overt contest [15, 4]. Lukes places these disputes within a wider examination of the meaning of power [36]. The present inquiry draws a bounded lesson from these approaches: a researchable account of epistemic power should specify *who can alter which evidentiary pathway, through which mechanisms, under what institutional conditions, with what feasible alternatives*. Such specification leaves room for authority that assists knowledge production as well as power that restricts it. Neither the existence of an institutional hierarchy nor disagreement with its decisions independently establishes an abusive mechanism.

2.1 Analytical units and admissible trajectory representations

An evidentiary trajectory is represented here as an evolving set of documented or reconstructible relational events. The events may concern production of a claim, preservation of a record, editing or translation, attribution, certification, criticism, access requests, sanctions, and subsequent institutional decisions. Actors include persons and collectives, offices constituted by organizational rules, and authorized stewards of material or computational infrastructure. A software system may perform a delegated operation, while assignment of institutional responsibility requires separate examination of its operators, authorizers, and governing arrangements. These distinctions help prevent technical mediation from being mistaken for an independent source of legitimate authority.

For a particular institutional setting, an *analytical context* can be written as Equation 1.

$$\mathcal{C} = (\mathcal{A}, \mathcal{V}, \mathcal{E}, \preceq, \mathcal{R}, \mathcal{K}, \mathcal{X}). \quad (1)$$

Here $\mathcal{A}$ is the set of analytically relevant actors or roles; $\mathcal{V}$ contains event and artifact instances; $\mathcal{E}$ consists of typed relations among them, including creation, custody, derivation, endorsement, and challenge; and $\preceq$ is a partial ordering expressing established dependencies or order relations between selected events. The collection $\mathcal{R}$ describes formal and operative institutional rules, $\mathcal{K}$ describes material resources and technical facilities, and $\mathcal{X}$ contains contextual conditions such as access regimes, skills, language, and jurisdiction. These components are indexed by a specified study domain and may be incomplete. A partial ordering need not resolve every disputed chronology; a typed evidentiary link need not constitute a causal link. In particular, the context is a model of an investigator’s evidentiary access, not an assertion that an institution is fully captured by a graph.

Let H_k denote the accessible trajectory history at an index k associated with a locally meaningful observation, review, or intervention opportunity. This index orders the analysis and need not represent a uniform physical clock. A state transition can be described by a context-conditioned family of kernels, as in Equation 2.

$$P_{\mathcal{C}}(H_{k+1}, Y_{k+1} \mid H_k, U_k, \mathcal{R}_k, \mathcal{X}_k). \quad (2)$$

Here U_k collects actions taken by the relevant participants, while Y_{k+1} is a vector of designated observables such as record availability or a later ruling. Equation 2 is a *model family*, not an estimated probability law. Conditioning on an adequately specified history can be a useful representation without claiming a first-order Markov property for an abbreviated state. The investigator must document which

dependencies are included, which histories are absent, and whether a model calibrated in one setting could plausibly apply to another.

The trajectory language adds a methodological safeguard to familiar notions of status or centrality. The same actor may be central to an archive’s citation network while lacking the right or technical ability to change an admission rule. A less visible administrator may control permissions, or a maintenance worker may be practically indispensable to preserving the record. Structural positions suggest hypotheses about influence, but they acquire meaning only when linked to specific capacities and observations. The methodological focus shifts from a generalized ranking of powerful actors to the configuration of roles, pathways, and constraints that make certain interventions attainable.

2.2 Formal roles, practical capacities, and effective choice sets

A *capacity* names a possible intervention by an actor in a defined context. An *authority* names a formally or conventionally recognized permission, obligation, or competence to perform a class of acts. Their relationship is historically contingent. Formal authority may be unusable without trained staff, accessible records, language support, time, or enforceable protection. Practical control may also exceed explicit authorization, as with an operator who can technically delete an archived item despite lacking institutional permission to do so. A model that simply nests practical options inside formally authorized options would conceal the latter case.

Definition 2.1 (Contextual intervention menus). For actor a in documented history h and context c , let $\mathcal{U}_a^F(h; c)$ be interventions formally authorized or institutionally recognized, and let $\mathcal{U}_a^P(h; c)$ be interventions practically executable given technical access, resources, and dependencies. Neither set is generally assumed to contain the other. Their intersection identifies acts that are both formally authorized and practically executable under the stated assessment. The menus depend on how acts are defined, which costs and threats are represented, and whose account of the operative rules is accepted.

An institutional charter can support a claim about $\mathcal{U}^F$ while a system log may reveal an instance of $\mathcal{U}^P$. Neither source alone generally identifies the full menu. Interview testimony can illuminate informal constraints, but it may be influenced by fear of repercussions or limited awareness of alternative channels. Moreover, actions can be executed jointly, subject to delegated signing authority, or contingent on the consent of an external party. Menus should therefore be indexed to an actor’s coalition and to the conditions under which the proposed operation is feasible.

Within the present paper, *trajectory-shaping power* is provisionally attributed when an actor or configuration has a feasible intervention capable, under specified conditions, of changing the distribution or attainability of an evidentiary outcome. Capacity can remain unexercised, and a formally possible intervention can fail to produce a consequential change. The assertion that an actor *possesses* a capacity should be distinguished in reporting from the observation that the actor *used* it and from a justified conclusion that the use *caused* a particular downstream difference. The three conclusions require different evidence.

These distinctions also prevent an unearned moral inference. An authorized expert may reduce error by rejecting a submission that fails publicly justified evidentiary standards. A procedural officer may temporarily withhold a sensitive record to protect participants, while a different officer might use similar controls to obstruct criticism. Identification of a lever is an explanatory step; evaluation of its use requires evidence about standards, reasons, proportionality, safeguards, consequences, and affected rights.

2.3 Institutional rule layers and the governance of authority

Institutions shape trajectories partly through the rules determining who enters a review process, who may supply records, what an evaluator may consider, and whose decision binds the organization. The institutional-grammar work of Crawford and Ostrom distinguishes rules, norms, and shared strategies in recurring action situations [14]. Ostrom’s institutional analysis treats organizational practices as structured through combinations of boundary, position, choice, aggregation, information, scope, and payoff

rules [47]. The present paper borrows these categories as a guide to investigation, while the trajectory-specific formalization and its normative interpretations are independently proposed.

For a selected evidentiary action situation, a local rule configuration is represented by Equation 3.

$$\mathcal{R}_h = (R_h^{\text{bd}}, R_h^{\text{pos}}, R_h^{\text{ch}}, R_h^{\text{agg}}, R_h^{\text{info}}, R_h^{\text{scope}}, R_h^{\text{pay}}). \quad (3)$$

The components respectively concern membership and entry, assigned roles, available actions, collective decision aggregation, communication and disclosure, attainable institutional outcomes, and the distribution of costs or benefits. Equation 3 is an analytical decomposition: a single organizational provision may affect several components, the categories can overlap operationally, and local customs may be incompletely documented. The decomposition offers a coding protocol rather than a universal list of substantive entitlements.

For instance, a contribution may be lost from consideration because the relevant archive denies access under an information rule; because an appeal body excludes the contributor under a boundary rule; because a review committee can only approve predefined categories under a scope rule; or because a high expected cost of complaint under a payoff arrangement deters participation. These mechanisms can produce the same observed absence from the final record. Their correction would require different interventions. A complaint about an unfair individual score might miss the rule that prevents an entire class of contributions from entering the assessment domain.

A second distinction concerns the level at which a decision is made. *Operational influence* changes an outcome within an existing set of rules. *Rule-shaping influence* changes who can act, the kinds of evidence admitted, the review standard, or the conditions under which the first type of influence is exercised. These levels are relative to a particular action situation; organizations frequently contain intersecting review boards, external law, professional practices, and technical constraints. The proposed account does not presume a single, infinitely nested sovereign rule hierarchy. A university department may control a local rubric yet remain constrained by university policy, statutory obligations, funding arrangements, or professional accreditation.

Definition 2.2 (Situating rule-shaping capacity). Actor or coalition a has a *situating rule-shaping capacity* over domain d if, at a specified history and under a specified set of institutional conditions, it can feasibly propose, authorize, veto, enforce, or de facto alter a rule whose operation changes the admissible or practicable action menus of one or more participants in d . A capacity claim records the type of operation, its recognized or informal basis, the relevant constraints, and a defined range of possible consequences.

The definition is deliberately broader than unilateral formal amendment. An expert committee may recommend a classification that another body routinely adopts; an infrastructure operator may effectively redefine access by changing a system's technical defaults; a group of contributors may win an amendment through collective action. Yet the definition does not infer success from an attempted proposal. Analyses should record proposal rights, veto points, implementation dependence, and independent authority separately. These distinctions connect agenda-setting approaches to a rule-sensitive and operationally inspectable account of epistemic practices [4].

2.4 Counterfactual influence at typed evidentiary sites

Evidence can be produced, preserved, indexed, accessed, encountered, admitted, evaluated, acted upon, and contested. These sites differ in their measurement and causal relations. A public record may be searchable without being displayed to a particular reviewer; a displayed record may fail to affect a judgment; an adverse judgment may remain institutionally reversible. The paper therefore represents consequences as a vector indexed by the evaluation site, with no presumption that one dimension can stand for the others.

Table 2 gives a provisional map of analytical sites, possible levers, and observable traces. It is intended to guide case documentation rather than provide a complete classification of institutional power.

Table 2: Selected intervention sites in a trajectory of relational evidence. Observable traces identify possible data sources; each remains open to rival interpretations.

Site	Potential intervention	Examples of observable traces
Production and custody	Commission, amend, preserve, or delete a record	Versions, signed logs, custody histories
Indexing and visibility	Assign tags, rank results, omit references	Search logs, catalog versions, exposure records
Access and admissibility	Grant permissions; set eligible evidence classes	Access decisions, admission rules, appeal dockets
Evaluation and accreditation	Fix rubrics; appoint assessors; confer credentials	Criteria, scores, appointments, reasoned rulings
Correction and consequence	Authorize a revision; delay remedy; impose sanctions	Timelines, remedial orders, cost and sanction records

A causal account requires a specified contrast. Let $Y_\ell(u_a, u_{-a})$ denote the potential observable at site ℓ under an intervention u_a by actor a and a joint action u_{-a} by other actors. Suppose that the researcher supplies a well-defined comparison action u_a^0 , a conditional historical state h , a context c , a policy π_{-a} for the other actors' actions, and an outcome functional g_ℓ . A *conditional trajectory contrast* is specified in Equation 4.

$$\Delta_{a,\ell}^g(u_a, u_a^0 \mid h, c; \pi_{-a}) = \mathbb{E}_{\pi_{-a}}[g_\ell(Y_\ell(u_a, U_{-a})) - g_\ell(Y_\ell(u_a^0, U_{-a})) \mid H = h, \mathcal{C} = c]. \quad (4)$$

Equation 4 states the estimand's intended meaning; it does not identify that estimand from observed records. The expectation includes whichever background uncertainty and response behavior the model explicitly represents, and the comparison is meaningful only when both interventions and the outcome are sufficiently well defined. It assumes an evaluable contrast between feasible or carefully articulated hypothetical interventions. If u_a causes other actors to change their strategies, π_{-a} must describe the relevant response regime, or the contrast must be reformulated with joint potential outcomes. If an intervention redefines the very meaning of Y_ℓ , a shared measurement protocol or an alternative outcome definition is required.

The direction of $\Delta_{a,\ell}^g$ has no automatic moral meaning. A negative effect on the probability of admitting a fabricated record may reflect well-functioning scrutiny. A positive effect on the same probability could reflect political protection or a broader inclusion policy, depending on the case. The outcome's desirability, the evidentiary validity of exclusion, and the fairness of participation are independent judgments requiring substantive inquiry. Measurement of effects does not by itself settle the ethics of authority.

An empirical estimate of Equation 4 may require consistency of intervention versions, conditional exchangeability, overlap between comparison conditions, an appropriate treatment of interference, and credible measurement of the outcome. These are demanding conditions in institutional settings where power affects exposure to interventions and the construction of records themselves [28]. Randomized presentation of the same record under two visibility settings might identify a bounded interface effect in that experiment, while saying little about the upstream distribution of records or the institutional right to set the display rules. Qualitative tracing can establish that a person possessed an authority or executed a deletion, while leaving the unobserved alternative trajectory unsettled. These contributions should be reported with their different inferential statuses.

2.5 Interdependent gatekeepers and relational complementarity

A trajectory's outcome can depend on several gates. A repository administrator may determine whether a record is available, a review board may decide whether the record qualifies as admissible, and a certification authority may determine the consequence of a favorable decision. Intervention by one actor can have little marginal effect under an unreformed decision rule, even if the actor's cooperation would

be indispensable after a different reform. Such dependence makes an unconditional actor ranking a poor representation of many institutional configurations.

A simple binary illustration makes the point without treating actual institutional decisions as deterministic. Suppose $u_A \in \{0, 1\}$ indicates whether an archivist releases a record, $u_B \in \{0, 1\}$ indicates whether a committee admits that class of record, and $Y \in \{0, 1\}$ marks whether the record enters a specified assessment. Under the hypothetical conjunction model in Equation 5, both conditions are required.

$$Y(u_A, u_B) = u_A u_B. \quad (5)$$

The toy model in Equation 5 illustrates structural complementarity and does not claim to describe the psychology or historical conduct of any actual archivist or committee.

Proposition 2.3 (Regime-dependent marginal influence). *Under Equation 5, changing either actor's action from 0 to 1 has zero effect when the other actor's action equals 0 and an effect of one on Y when the other actor's action equals 1. Hence a marginal influence attributed to either actor depends on the specified regime of the other actor's conduct.*

Demonstration. For the archive intervention, $Y(1, u_B) - Y(0, u_B) = u_B$; for the admission intervention, $Y(u_A, 1) - Y(u_A, 0) = u_A$. Substituting the two values of the other actor's action proves the stated dependence. The proposition is a formal consequence of the stipulated model and supplies no empirical evidence about a particular organization.

A useful descriptive interaction contrast for a binary joint intervention is Equation 6.

$$\Gamma_{AB} = Y(1, 1) - Y(1, 0) - Y(0, 1) + Y(0, 0). \quad (6)$$

For Equation 5, $\Gamma_{AB} = 1$. In a probabilistic setting, Equation 6 would require a specified scale, potential outcome expectation, and joint intervention regime. Interaction can vanish or reverse on another scale. It should not be mistaken for a unique division of responsibility, a measure of coercion, or an automatic assignment of moral credit. Those interpretations require additional assumptions regarding control, knowledge, intent, substitutability, and the institutional obligations of each participant.

This example also illustrates a larger distinction between the *power to enable* and the *power to obstruct*. If both gates are necessary, either actor may be able to prevent a particular outcome, while neither can produce it unilaterally. An appellate court, union, or professional body may introduce a substitute route; the resulting capacity changes are properties of the larger arrangement, not intrinsic attributes of the actors. The ability to construct an alternative route can itself constitute rule-shaping influence. Describing the actors' relation therefore requires information about bypasses, appeals, cooperation, and the time and material costs of building new channels.

2.6 Contestation costs and the reachability of remedy

Formal availability of review is an institutional property. Effective access to review is a situated capacity of an affected person or group. The latter may depend on documentation, professional support, translation, fees, physical accessibility, stable affiliation, retaliation risk, and the period during which a challenge remains meaningful. A rule may announce a right to correct the record while allowing the underlying decision to become practically irreversible before review can occur. Analyses that treat the existence of a grievance provision as equivalent to reachable relief overlook this difference.

Let $\mathcal{U}_i^P(h; c)$ denote practically executable challenge actions for participant i . For an available material budget b_i , tolerable risk bound ρ_i , and decision horizon τ_i , Equation 7 specifies a context-dependent feasible-remedy set.

$$\mathcal{U}_i^{\text{rem}}(h; c) = \left\{ u \in \mathcal{U}_i^P(h; c) : c_i(u \mid h, c) \leq b_i, \quad r_i(u \mid h, c) \leq \rho_i, \quad t_i(u \mid h, c) \leq \tau_i \right\}. \quad (7)$$

Here c_i , r_i , and t_i are modeled monetary or opportunity cost, exposure to harm, and time to a potentially meaningful review. The bounds are participant-specific and may be estimated imperfectly. Equation 7

deliberately treats psychological and social risk as analytically relevant, while avoiding a claim that such risk is always commensurable with money. Its purpose is to reveal distinct barriers; it is not a welfare-maximization rule. A collective may share costs and thereby expand the set, while association itself may be constrained by rules or threats. Ethical protections and lawful confidentiality can also change which channels are appropriate.

A remedy set may be empty even where a legal route exists. Conversely, an informal collective action, a professional ombudsperson, or an independent archive might make correction practicable despite the absence of a dedicated internal appeal form. Power over remedy includes authority to set deadlines, evidence standards, standing requirements, and effective sanctions for retaliation. One can therefore possess a rule-shaping capacity over the conditions under which others can challenge the exercise of power. Fricker's analysis of epistemic injustice, Medina's emphasis on resistance, and Longino's work on the social conditions of criticism provide philosophical reasons to take inclusion and critical response seriously while leaving the design of institutions open to contextual assessment [21, 37, 35].

The *effectiveness* of a reachable remedy is a further question. A review that can be filed but has no authority to reopen an assessment is different from one that can require an independent examination, restore a record, or reverse an institutional consequence. Similarly, an appeal that technically permits new evidence may offer little protection when the contested decision-maker controls the complete evidentiary file. A study should examine who has standing, who can obtain records, whether an independent judgment is possible, which orders can be enforced, and what costs are borne by the participants. The normative aim is to make those distinctions visible without assuming that every claim merits success or that unrestricted disclosure is always justified.

2.7 Material infrastructures and the reproduction of capacities

Institutional power has material conditions. Archivists require storage, maintenance, labor time, and access to technical standards; reviewers require attention, specialist knowledge, translation, and a sustained budget; contributors may need income and legal security to keep records or challenge adverse classifications. A formally open process can become selective through the unequal distribution of these capacities. Infrastructure research directs attention to the ways information systems are embedded in institutional relations and everyday work [59]. A historical-materialist inquiry extends the descriptive question by examining who produces, maintains, finances, and governs the means through which evidence can be retained and recognized.

These dependencies can be particularly consequential where AI systems accelerate the generation, aggregation, or transformation of documents. Expanding the quantity of available text does not equivalently expand a community's capacity to authenticate claims, preserve provenance, reconcile conflicting versions, or conduct accountable review. A platform that controls indexing or automated summarization may change visibility even when a record remains technically public. Such an inference concerns the institutional possibility of mediated selection; identifying its frequency or effects requires case-specific evidence. Gillespie's analysis of platform moderation provides a relevant precedent for treating information ordering as governance rather than a neutral technical function [23].

Resource dependence may feed back into epistemic authority. Highly trusted certification can attract submissions, data, and evaluative labor, which can support better verification and additional trust. Under other conditions, the same concentration can increase switching costs, limit independent replication, or obscure the standards by which credentials are awarded. Merton's account of cumulative recognition in scientific institutions supplies a historical point of contact, without determining the direction of the present paper's proposed feedback mechanisms [38]. The formal investigation of these feedback dynamics belongs to the planned Section 7; at this stage, the key analytical distinction is between current control, mechanisms of resource return, and future reproduction of capacities.

The material account also addresses the conditions under which institutional authority is productive. Stable funding for an independent archive can preserve minority or unpopular evidence. Training may improve the calibration of expert assessments. A protected channel for whistleblowing or criticism may

Table 3: Evidence for institutional power and its characteristic inference limits.

Record or method	Possible inference	Principal unresolved issue
Charters and written policies	Recognized permissions, duties, and review jurisdiction	Informal constraints; actual exercise; enforceability
System logs and decision dockets	Executed actions and documented sequences	Unlogged operations; counterfactual effect; motives
Interviews and observation	Perceived dependence, hidden routines, lived burdens	Recall, incentives to disclose, competing accounts
Policy reform or randomized display	Local effects under a specified intervention and design	Selection, spillovers, transport, upstream rule control
Archival reconstruction and process tracing	Plausible mechanisms and temporal dependencies	Missing alternatives; rival causal histories

allow a specialized institution to revise an erroneous ruling without abandoning specialization. Conversely, compulsory reliance on an assessment, threatened withdrawal of livelihood, or exclusion from the relevant forum can make observed agreement ambiguous. The existence of outward compliance can be compatible with conviction, dependence, fear, or strategic accommodation. Documentary evidence about status and sanctions is needed to discriminate among these mechanisms.

2.8 Empirical identification and competing mechanisms

A model of institutional power should organize possible observations while displaying what those observations fail to settle. The methodological task is to move between four levels: *formal authorization*, which can often be reconstructed from charters or rules; *effective capacity*, which demands investigation of technical, financial, and social constraints; *observed exercise*, which may be documented in action logs or decisions; and *causal effect*, which requires a credible comparison with a specified alternative. The same actor can be classified differently across levels. Causal language should correspond to the strongest level actually supported by the evidence.

Consider a fictional organization in which a review committee rejects a proposed contribution after an external certifier changes an eligibility category. The sequence alone permits several explanations: the rule change may have directly excluded the contribution; the contribution may already have failed a substantively justified standard; the certifier's choice may have coincided with an independent budget reduction; or an archival access failure may have prevented the committee from seeing decisive supporting material. The certifier's formal right to change categories is evidence of authority. A documented amendment is evidence of exercise. Neither by itself identifies the effect on the particular rejection. A credible investigation would require a temporally and substantively appropriate comparison, scrutiny of the committee's actual decision procedure, and examination of missing records and alternative grounds.

Table 3 records the distinct inferential questions associated with selected kinds of institutional evidence. It is a proposal for disciplined triangulation rather than a fixed ranking of methodologies.

Identifying influence on an entire evidentiary trajectory can be more difficult than identifying a bounded effect on an individual decision. A rule intervention may redistribute who submits claims, which records survive, and how participants respond to evaluation. Investigators may consequently observe only the subset of actors who remained within the institution. Selection into the record is itself a possible result of institutional power. Apparent consensus can arise from independent corroboration, shared sources, selection, conformity, sanctions, or a mixture of these. An empirical study should document which outcome is observed, whose trajectory is missing, and what alternative processes would produce the same data.

For these reasons, the framework treats a claimed power relation as a *structured research hypothesis* unless its components are independently established. The distinction preserves space for both critical inquiry and exculpatory evidence. The fact that a procedure imposes burdens does not alone prove intentional suppression; the fact that a procedure is formally equal does not alone prove equal access.

Expertise can be legitimately differentiated, and legitimate differentiation can coexist with preventable obstacles to criticism. Ethical analysis requires attention to the quality of decisions, procedural standing, rights, material burdens, and the consequences of institutional error.

2.9 Scope of the formal representation

The section's contribution is a typed, conditional account of trajectory-shaping power. Equation 1 sets the unit of analysis; Equation 3 makes the rule environment inspectable; Equation 4 states the kind of causal contrast that stronger evidence might eventually support; and Equation 7 describes the distance between a formally announced option and a practically reachable one. Proposition 2.3 establishes, within an explicitly limited toy model, why an actor's apparent marginal influence may depend on other gatekeepers. Taken together, these elements suggest an investigation of configurations of power that is finer than status ranking and more cautious than the attribution of institutional motive from isolated outcomes.

Several limits remain active. The relevant actor set can change as participants enter, leave, or form coalitions. Institutional rules can be disputed, unofficial, or inconsistently enforced. Measures of harm and evidentiary quality are often plural and contestable. Some interventions cannot ethically or practically be randomized. Records are generated under the very arrangements being studied, making absences difficult to interpret. The formalism is therefore neither a universal scalar index of domination nor a predictive model of trust formation. Those stronger aspirations would require additional empirical restrictions, normative argument, and validation.

Sections 3 and 4 examine evidentiary visibility and evaluation standards, while Sections 5–9 address credentialing, material dependence, trust feedback, contestability, and research design. Together these analyses connect the present definitions to historically specific mechanisms, while leaving empirical application open. The central methodological result of this section is a vocabulary in which *recognized authority*, *feasible alternatives*, *intervention sites*, *contested rules*, and *causal consequences* can be described separately and then investigated in relation.

3 Evidence Access and the Governance of Visibility

The preceding section distinguished institutional authority, feasible intervention, and causally consequential power. This section examines the evidentiary mechanisms through which such powers may be exercised. Its objective is to explain how records of relational activity become available to particular observers, and how archival custody, classification, disclosure permissions, indexing, retrieval, ranking, and mediated presentation affect the distribution of visibility. The discussion develops a staged model of evidentiary access, examines provenance and source dependence, considers privacy-sensitive access arrangements, and specifies the observations required to distinguish deliberate exclusion from other sources of absence. The approach combines conceptual reconstruction with bounded formal representations and possible empirical research designs. Visibility in the present inquiry is situated: an event may be visible to one observer for one purpose while remaining inaccessible to another under a different authorization or interface.

Research on archives and historical knowledge provides a relevant point of departure. Trouillot's account of the production of historical silences situates power across the creation, assembly, retrieval, and narration of historical sources [62]. Schwartz and Cook likewise examine archives and recordkeeping as institutions that exercise choices about appraisal, description, preservation, and communication [53]. Their analyses warrant attention to archival selection without implying that every missing record was intentionally suppressed. Research on information infrastructure and classification further establishes that categorization and technical arrangements are embedded in work practices, conventions, and organizational relationships [8, 59]. These approaches inform the present account, but the formal visibility model and its proposed inferential tests are developed specifically for this paper.

3.1 Record formation, custody, and the production of archival absences

A trajectory consists of events and relations, some of which leave durable traces. An event may produce a written submission, a code revision, an oral account, a laboratory log, a consent record, or no durable artifact. Creating a record and retaining it are distinct operations. An institution can preserve a complete submission yet detach it from the materials needed to understand authorship, authorization, or dissent; it can preserve a machine-generated derivative while deleting the underlying version from which that derivative arose. Absence at a later review may accordingly reflect initial non-documentation, routine destruction, resource exhaustion, loss through technical migration, lawful restriction, or a discretionary decision. These pathways differ in institutional responsibility and moral significance.

Archival custody introduces obligations that vary by context. Custodianship may entail integrity checks, retention schedules, protection against tampering, migration to sustainable formats, and responsiveness to authorized access requests. It may also entail confidentiality, data minimization, or lawful deletion. The authority to retain a record can diverge from the authority to publish it, and either authority can differ from an affected participant's ability to correct or annotate its description. A historically attentive study should examine who established the archive's mandate, whose labor maintains it, how custodial decisions are funded, and which classes of records are treated as valuable enough to survive. These questions retain significance when an archive is implemented through distributed storage or an automated document service rather than an identifiable physical repository.

The distinction between *absence of a record* and *absence of an underlying event* is central. A statement that an archive contains no evidence of a contributor's participation is a claim about a particular search domain, query procedure, retention regime, and observation point. It is a stronger claim to infer that no participation occurred. Such an inference needs knowledge of the archive's coverage and the probability that participation would have generated and preserved an accessible trace. Where those conditions are unknown, the missing record remains an epistemic limitation rather than an established negative fact. This qualification is especially important where historical participation was documented unevenly across occupational roles, languages, geographical locations, or degrees of institutional privilege.

Archival selection can also be justified. An institution might withhold a disclosure that would reveal a protected participant's identity while permitting an independent reviewer to verify that a relevant document exists and that its content was accurately characterized. A demand for maximal visibility would remove the distinction between the legitimate purpose of accountability and unrestricted redistribution of personal information. The analytical problem is to determine which information must become available, to whom, for what task, through which accountable procedure. These questions remain open even if the archive's technical fidelity is impeccable.

3.2 A staged representation of evidentiary visibility

The context $\mathcal{C}$ in Equation 1 contains the institutional rules, relevant relations, resources, and contextual constraints for a chosen study. Within that context, define a universe $\mathcal{E}_*$ of *candidate underlying events* relevant to a specified inquiry. The universe is a research target; an investigator will typically observe only a subset of its events. For candidate event $e \in \mathcal{E}_*$ and observer o , consider nested indicators $G_{j,o}(e; c) \in \{0, 1\}$ for the stages of documentation, retention, indexing, authorized access, successful retrieval, and encounter. Each later indicator is defined to equal zero if its predecessor equals zero. This nesting is a convention for representing a particular route through an evidentiary system, rather than an assertion that all institutions have the same workflow. An unindexed private record may become visible through direct testimony, for instance; that alternative must be modeled as a distinct route or included through an appropriately broadened access stage.

Equation 8 defines the conditional probability of encounter along one specified sequential route. The equation applies the chain rule to the nested stage indicators; it assumes neither independent gates nor homogeneous observers. The conditional factors $q_{j,o}$ are defined only at stages whose immediate predecessor has positive probability (with $q_{1,o}$ defined unconditionally). If an upstream stage has zero probability, encounter through that route has probability zero by nesting; downstream conditional factors

are then undefined and are not multiplied. Thus the product representation is used on its positive-support domain, with zero-probability routes handled separately.

$$\begin{aligned}
 V_o(e; c) &:= G_{6,o}(e; c), \\
 \Pr(V_o(e; c) = 1 \mid e, c) &= q_{1,o}(e; c) \prod_{j=2}^6 q_{j,o}(e; c), \\
 q_{1,o}(e; c) &:= \Pr(G_{1,o} = 1 \mid e, c), \\
 q_{j,o}(e; c) &:= \Pr(G_{j,o} = 1 \mid G_{j-1,o} = 1, e, c) \quad (j \geq 2).
 \end{aligned} \tag{8}$$

The symbol V_o is restricted to *encounter through the specified route*. It does not measure comprehension, belief, recognition of authorship, or justified trust. A probability in Equation 8 is conditional on an event in the target universe, which may be inaccessible to the investigator. Estimating its factors therefore requires data about the relevant denominator, including unencountered or independently sampled events where possible. Event-specific probabilities also depend on institutional context, languages, queries, and observation opportunities; a numerical estimate for one archive or observer cannot be carried to another without further assumptions.

Proposition 3.1 (Bounded visibility along a nested route). *For the nested indicators defined above and any stage $j \in \{1, \dots, 6\}$, the event of encounter is a subset of the event of passing stage j . Consequently, for fixed e, o, c , the encounter probability is at most the probability of passing any particular stage. In a comparison that holds the upstream route and its event population fixed, appending a further compulsory gate cannot increase the probability of encounter through that same route.*

Demonstration. By nesting, $G_{6,o} = 1$ entails $G_{j,o} = 1$ for every earlier stage. Monotonicity of probability on nested events yields $\Pr(G_{6,o} = 1 \mid e, c) \leq \Pr(G_{j,o} = 1 \mid e, c)$. A further mandatory gate defines an intersection with the existing encounter event, and therefore cannot enlarge that event. This is a set-inclusion result, not an empirical law about institutions that adapt their behavior when rules change.

The proposition clarifies a limit of purely technical remedies. Improving the search interface cannot recover an event that was never documented along the route. Conversely, improved preservation may have little effect on experienced visibility where access permissions, indexing languages, or discovery practices are the binding constraint. In a dynamic system a new access gate might induce archivists to document more or encourage contributors to submit protected evidence; these feedbacks can raise overall visibility by changing the upstream distribution. Proposition 3.1 does not cover such adaptive comparisons. Studies of policy reform must allow for them rather than treating every reform as the insertion or removal of a fixed filter.

Table 4 summarizes the stages as possible sites of institutional authority. Each row marks a characteristic record, an operator or rule, and a diagnostic uncertainty. The table is an analytical guide; actual institutions may combine operations, delegate them to contractors, or allow several parallel routes.

3.3 Classification, provenance, and the interpretation of documentary chains

The classification of evidence affects which questions an archive can answer. A contribution may be indexed under the name of a laboratory, a consortium, a commercial platform, or an individual; a technical intervention may appear as a software change while its scientific contribution remains elsewhere in a narrative record. Multilingual names and professional roles can be represented differently across repositories. Classification systems consequently do analytical work: they make some relations easy to retrieve and require special expertise to reconstruct others. Bowker and Star’s study of classification establishes a methodological reason to examine the histories and consequences of categories rather than assuming that standardized labels are neutral vessels of information [8].

Provenance adds a second dimension. Database provenance research distinguishes information about source locations from information about which source data influenced a derived result [9]. For relational

Table 4: Stages of evidentiary visibility, institutional levers, and characteristic absences.

Stage	Possible institutional lever	Evidence for investigation	Inference still unresolved
Documentation	Record-creation mandate; reporting capacity	Templates, practice manuals, contemporaneous trace	Whether undocumented events occurred
Retention	Custody, appraisal, disposal, migration	Retention schedule, fixity checks, deletion log	Whether an earlier trace existed
Indexing	Categories, language fields, identifiers	Metadata schema, index coverage, change log	Whether classification captured relevant meaning
Authorization	Standing, permissions, protective constraints	Access policy, request and denial log	Whether restriction was lawful and proportionate
Retrieval	Search interface, query handling, interoperability	Reproducible queries, rankings, error traces	Whether alternative queries would retrieve evidence
Encounter	Display, notice, attention opportunities	Exposure logs, direct observation, user reports	Whether the observer understood or credited the record

testimony, such technical provenance must be supplemented by institutional facts about permission, editorial control, interpretive transformation, and conditions of production. A cited document may substantiate an assertion, merely repeat an earlier assertion, or contain a contrary qualification. A generated summary can preserve a stable link to a source while misrepresenting its evidentiary force. The existence of a citation or a chain of transformations therefore supplies a route for verification, not an automatic assessment of reliability or moral credit.

For a presented artifact z , Equation 9 proposes a typed provenance description rather than an undifferentiated claim of sourcehood.

$$\mathcal{L}(z) = (S_z, D_z, T_z, A_z, Q_z). \quad (9)$$

Here S_z denotes identified source artifacts or event traces, D_z the documented derivation or citation relations, T_z the known transformations such as abridgment or translation, A_z the recorded authorization or custodial conditions, and Q_z any explicitly stated uncertainties or challenges. The components may contain missing fields, contested classifications, or multiple incompatible accounts. The description supports checking whether the displayed claim can be traced to an identifiable source. It cannot by itself establish the source’s veracity, independent corroboration, or the adequacy of an evaluator’s normative criterion.

A fictional example shows the distinction. A research committee receives three documents praising a contribution. One is a press release derived from a supervisor’s statement, one is an AI-generated digest of that release, and one is a machine translation of the digest. Counting three documents as three independently corroborating sources would ignore the shared origin. A provenance graph could reveal the common dependency even if the actual claim were correct. Conversely, two genuinely independent records might use identical terminology because they document the same public standard. Source dependence must be established by tracing production and communication, not inferred from textual similarity alone. The subsequent evaluation of source quality belongs especially to Sections 4 and 5 and to the companion study of cognitive mediation; this section addresses the governance of access to the relevant dependencies.

The FAIR Guiding Principles articulate a program for making scientific data findable, accessible, interoperable, and reusable, particularly for machine-supported reuse [64]. Their relevance here lies in the design of durable identifiers, searchable metadata, and stated access conditions. Findability can support accountability by making the existence of a record discoverable even when its contents require

controlled access. Yet a technically reproducible pipeline may reproduce biased descriptions or omit participants excluded from the original documentation. Provenance design should therefore support critical inspection, versioning, and correction as well as machine retrieval. The distinction between technical traceability and warranted attribution remains operative throughout.

3.4 Retrieval, ranking, and mediated encounter

A stored and authorized document can remain effectively invisible when queries, ranking systems, summaries, or presentation conventions make it unlikely to be encountered. Search interfaces determine which fields count as searchable, which synonym and language expansions are supported, whether older versions are shown, and where a critical document appears relative to prominent endorsements. Search-engine scholarship has long examined the political consequences of inclusion and prominence, while platform research has shown why information ordering and moderation are consequential governance decisions [31, 23]. The implications for a particular AI-assisted interface remain empirical questions, particularly because retrieval and generation may create new dependencies on upstream sources and software settings.

Let $R_{o,e}$ denote a rank position assigned to eligible artifact e in a fixed query context, and let $I_{o,e}$ denote actual encounter of the artifact under that interface. Equation 10 applies the law of total probability to make presentation and encounter conditional on one another.

$$\Pr(I_{o,e} = 1 \mid q, c) = \sum_{r \in \mathcal{R}_{\text{rank}}} \Pr(I_{o,e} = 1 \mid R_{o,e} = r, q, c) \Pr(R_{o,e} = r \mid q, c). \quad (10)$$

The set $\mathcal{R}_{\text{rank}}$ includes relevant displayed ranks and an explicit non-display state, so that the equality does not silently condition on inclusion in a result list. The index e here refers to an eligible retrievable artifact rather than necessarily the underlying event in Equation 8. Equation 10 is descriptive; without observation of rank assignment and actual encounter, it identifies no effect of ranking. It also allows encounter probabilities to differ by artifact identity, observer, language, and context. Replacing them with a universal position-bias coefficient would be an additional substantive model assumption.

Ranking can affect attention in two directions. A prominent document might acquire unwarranted credibility through repeated encounter or a polished display. A highly relevant corrective might be missed because a short summary omits its qualifications. Yet prominence may also serve public epistemic aims by directing users to timely, carefully verified records. Whether ordering is justified depends on relevance standards, user purposes, alternative retrieval opportunities, the risk of error, and the ability to inspect a displayed ranking or summary. A procedural audit should distinguish content filtering, algorithmic ranking, human editorial discretion, and user choice. Technical opacity complicates reconstruction, but the mere use of automation establishes neither unfair exclusion nor epistemic benefit.

The interface also changes the object of evaluation. When a user sees only an automatically synthesized answer, the relevant encountered item may be a derivative z rather than the originating documents S_z . Displaying citations can lower the cost of checking sources while leaving the user free to ignore them. In an institution with heavy workloads, summaries may become a practical substitute for reviewing original records. A careful study would ask whether underlying versions were reachable, whether quotation and attribution were accurate, how corrections propagated, and whether reviewers had the time and incentives to follow provenance links. This approach connects retrieval design to evaluative labor, without treating an unobserved psychological response as a measured fact.

3.5 Disclosure permissions, privacy, and protective access

The governance of visibility involves conflicts among epistemic accountability, privacy, safety, professional confidentiality, the protection of vulnerable participants, and collective authority over information. Public release, access by designated reviewers, disclosure of metadata, and confidential verification are

distinct institutional actions. Nissenbaum’s contextual account of privacy emphasizes the appropriateness of information flows within particular social roles and transmission norms [41]. The CARE Principles for Indigenous Data Governance further demonstrate why collective benefit, authority to control, responsibility, and ethics cannot be reduced to unqualified data openness [11]. These bodies of work address different normative traditions and problems; their relevance does not authorize an analyst to replace the claims of affected communities with a generic procedural checklist.

A situated access policy can be represented as a relation between actors, evidence classes, purposes, and permitted disclosure modes. Equation 11 treats permission as indexed to its context.

$$\Pi_c \subseteq \mathcal{A} \times \mathcal{Z} \times \mathcal{P} \times \mathcal{M}, \quad (11)$$

where $\mathcal{Z}$ denotes artifact classes, $\mathcal{P}$ purposes of use, and $\mathcal{M}$ disclosure modes such as full access, redacted access, metadata-only notice, independent attestation, and protected review. Inclusion in Π_c denotes a rule-level permission, not necessarily a technically or economically feasible access path. Feasibility must still be assessed through the intervention menus in Definition 2.1; justified use must be assessed with reference to law, consent, institutional mandates, affected rights, and other applicable norms. The relation can contain time-limited and conditional permissions and may itself be contested or inconsistently implemented.

Consider an entirely hypothetical institute reviewing a contested intellectual-contribution claim involving confidential participant testimony. It may be appropriate to make the existence and date of testimony visible to both sides, allow a protected adjudicator to inspect the underlying record, and restrict broad distribution of personal identifiers. Another situation might require that the affected person receive full access to challenge an adverse inference. Neither outcome is determined solely by the quantity of disclosed information. Procedural justice asks whether the restriction is justified, reviewable, proportionate, and administered by an accountable authority. Epistemic quality asks whether authorized reviewers can test decisive claims, investigate errors, and report what remains uncertain. The two assessments overlap but remain distinguishable.

Power operates through the right to define disclosure categories as well as through individual decisions under those categories. Those subject to a policy may lack knowledge that a record exists, may lack standing to request it, or may encounter a high-cost appeal. A policy can therefore be protective in one respect and exclusionary in another. The analytical standard is specific: identify the information interest, affected actors, decision procedure, alternative routes, practical costs, and opportunities to challenge the restriction. A finding that a record was lawfully withheld does not settle whether related institutional inferences were properly justified; a finding that the record was useful to research does not settle the legitimacy of public release.

3.6 Selection into the record and limits of causal identification

Visibility governance creates an unusually serious research-design problem because the records available for investigation have themselves passed through the mechanisms under study. Observing only retrieved files can conceal the non-creation or earlier removal of other files. Observing only contributors who completed an institutional application can conceal participants deterred by translation costs or sanction risks. This is selection on an outcome of the institutional process, not merely a small sample of otherwise equivalent cases. The presence of an archive enables inquiry, but its own coverage and construction require independent reconstruction.

To state the selection problem, suppose Y denotes a specified evidentiary outcome or document feature and V indicates inclusion in the investigator’s observed record. The observed conditional mean in Equation 12 can differ from the target mean even with perfect measurement of all visible records.

$$\mathbb{E}[Y \mid V = 1, c] = \sum_x \mathbb{E}[Y \mid X = x, V = 1, c] \Pr(X = x \mid V = 1, c), \quad (12)$$

where X denotes a discrete set of relevant characteristics. The equation is a decomposition of the observed conditional mean, rather than an estimator of $\mathbb{E}[Y \mid c]$. If X is continuous, the sum is replaced by

Table 5: Potential observations for distinguishing mechanisms of evidentiary invisibility.

Mechanism under study	Possible evidence or comparison	Principal alternative or limit
Non-documentation	Independent event sample compared with contemporaneous recording practices	Event sampling itself may be selective
Loss during retention	Version and custody histories; fixity and backup records	Incomplete deletion logs; lawful disposal
Category or language mismatch	Matched multilingual queries and manual relevance assessment	Query difficulty, meaning drift, unequal corpora
Permission barrier	Authenticated request outcomes across justified user roles	Legitimate confidentiality, requester differences
Ranking-mediated encounter	Randomized or replayed displays with exposure measurement	User adaptation; original source eligibility
Derivative-source distortion	Source-to-summary comparison with independent assessors	Disputed interpretation and context-sensitive relevance

an integral. Recovering the target mean requires assumptions or external data regarding how V depends on Y , X , and potentially unobserved factors. Where the denominator of unrecorded events is unknown, numerical visibility rates can be unjustified even if counts of accessible files are exact.

For causal questions, let π_0 and π_1 represent two precisely specified disclosure or indexing policies that could be applied to an eligible event population. A possible target is the mean difference in potential encounter indicators, as expressed in Equation 13.

$$\tau_{\mathcal{E}_*}(\pi_1, \pi_0) := \mathbb{E}_{e \in \mathcal{E}_*}[V_o(e; \pi_1) - V_o(e; \pi_0)]. \quad (13)$$

Equation 13 defines a hypothetical estimand. It is not identified simply by comparing two currently accessible databases. Its interpretation requires a stable policy description, a specified observer and query regime, a target population, and a defensible treatment of spillovers and changes in record creation. Institutional reforms may affect both the existence of documents and users' efforts to seek them. Confounding, selective retention, changes in classification, and unequal baseline access can violate the assumptions of a naive before-and-after comparison. The general requirements of causal reasoning discussed by Hernán and Robins are pertinent, though they do not validate this paper's proposed intervention model [28].

The evidence required for visibility studies accordingly comes from more than a downloaded archive. Investigators may combine retention policies and legacy inventories, random audits of records before indexing, query logs with permission safeguards, interviews with archivists and affected participants, comparative language probes, and ethically authorized access experiments. None of these methods is universally superior. An administrative log provides fine-grained action traces but may exclude informal discussion; an interview reveals experienced constraints but cannot alone identify an unrealized counterfactual; a randomized ranking display can estimate an interface effect within its experimental scope while leaving archival non-creation untouched. Triangulation aims to recover the mechanism's boundaries and alternatives.

Table 5 sets out a limited menu of comparisons. A completed analysis should also report the ways the proposed evidence collection can itself change participant exposure, incentives, or privacy risks.

3.7 Historical labor, governance responsibility, and the reach of correction

A historical-materialist analysis of visibility begins with the labor and infrastructure required to produce an assessable record. Documentation can require routine clerical work, specialized instrumentation, translation, secure storage, software maintenance, metadata reconciliation, and legal assistance. Those activities are unevenly remunerated and distributed. A research program may allocate generous resources to producing findings while leaving little capacity to preserve failed attempts, record junior contributors' labor, maintain open documentation, or process correction requests. The resulting archive can reflect material priorities without any single person having intended a particular omission. Such patterns remain hypotheses requiring historically specific institutional evidence.

The distribution of visibility costs can reproduce hierarchies. An actor whose contributions are already highly recognized may have staff to prepare dossiers, standardize names, obtain endorsements, and maintain a public archive. Another actor may possess decisive first-hand evidence yet be unable to translate it, pay access fees, or challenge an erroneous category within a deadline. These asymmetries connect the practical intervention menus of Section 2 to the production of accessible evidence. They also connect to the critical-interaction conditions developed in social epistemology: an opportunity to question a claim has limited practical significance when prospective critics cannot reach the record, speak within the procedure, or survive foreseeable sanctions [35, 21, 20].

Institutional remedies should target the relevant stage. A missing document may call for a better creation requirement or retention policy; a mistranslated category may call for annotation, correction, and parallel-language retrieval; an unjustified secrecy designation may call for confidential independent review; a source-distorting automated digest may call for traceable versioning and human examination. These interventions differ in required resources and authority. A universal demand for open publication can harm vulnerable contributors, while a purely formal right to inspect documents may be unusable without accessible procedures. Institutional analysis should record which corrective route exists, who can invoke it, whose permission is required, how it is funded, and whether a resulting correction propagates to downstream users.

The present paper therefore treats visibility as a *governed relation among records, persons, purposes, and institutions*. Technical operations such as indexing and ranking are among its mechanisms, alongside archival appraisal, access law, custodial duties, professional practice, and the organization of verification labor. It is important to preserve the distinction between enabling knowledge access and authorizing any given use of the information. It is equally important to distinguish the absence of a visible trace from absence of contribution, the existence of a provenance link from independent corroboration, and an estimated interface effect from identification of the whole historical process.

3.8 Implications for the paper's analysis of authority

The section has established a staged model, a typed account of provenance, a context-dependent permission relation, and bounded targets for empirical comparison. Equation 8 represents the dependency of encounter on a specified evidentiary route, while Proposition 3.1 identifies a limited structural constraint arising from nested stages. Equation 9 distinguishes documentary lineage from a warrant for belief; Equation 10 isolates mediated presentation; Equation 11 records the situated nature of access rules; and Equations 12 and 13 expose the gap between observed records and identified causal effects. The models articulate research questions; they provide no empirical estimate of institutional suppression, recognition, or trust.

Several conceptual limits remain. Records may be dispersed across partly incompatible systems; observers can discover information through personal contact or collective organization outside formal archives; multiple competing accounts can persist without a single authoritative source; and visibility itself can expose people to danger. Institutional mandates and privacy norms may conflict, as may different communities' claims to custody and interpretation. The model's tractability depends on specifying a domain and a route, rather than assuming that an entire social history can be reconstructed from a complete or neutral documentary dataset. Evaluation of admissibility, expertise, and institutional decisions also requires norms that cannot be derived merely from the fact that a record was encountered.

These findings provide the immediate foundation for Section 4, which will investigate how institutions set evidentiary standards and exercise authority over evaluation. Visibility governs which claims and supporting histories can enter the field of attention; standards of admissibility and assessment govern the institutional consequences of that encounter. Their interaction is a research object precisely because more accessible evidence can still be excluded by a restrictive rubric, while a credible review process may be unable to evaluate evidence that is unavailable to its participants. Subsequent discussions of credentialing, resource dependence, feedback, and contestation will need both dimensions. The resulting inquiry concerns the conditions under which epistemic authority can be productive, accountable, and

capable of correction in historically situated systems of knowledge work.

4 Evaluation Standards and Institutional Authority

The preceding section examined how institutions govern the visibility of relational evidence. The present section investigates a distinct institutional operation: the conversion of encountered evidence into admissible material, justified assessments, and decisions that carry consequences. Its objective is to specify where authority enters the design and application of evaluative standards, how legitimate specialization can support knowledge, and when the same arrangements can conceal exclusions or block a warranted challenge. The analysis distinguishes the existence of evidence, its relevance under a particular inquiry, its admissibility to a decision process, the inferential quality of an evaluation, and the binding force of the resulting institutional decision. It develops a domain-indexed model of rubrics, a bounded result about ranking reversals, a typed account of delegation and rule-level challenge, and an empirical strategy for investigating the effects of standards without imputing intent from disagreement alone.

Standards are historically constituted practices, not simply numerical weights awaiting assignment. Lamont’s investigation of interdisciplinary academic review documents differences in the criteria and deliberative conventions through which disciplinary actors recognize intellectual quality [33]. Research on commensuration examines the consequential conversion of heterogeneous qualities to common measures, while studies of rankings demonstrate that evaluative metrics can themselves alter organizational conduct [19, 18]. These studies motivate the analytical problem but do not furnish a universal metric for the legitimacy of a rubric. Institutional design and epistemic justification must therefore be investigated jointly, with the scope of each claim made explicit. The formal constructions below are proposed for this manuscript and should not be attributed to the cited scholars.

4.1 Distinguishing the sites at which evaluative authority operates

An institution can exercise evaluative power at several logically separate sites. It may define the jurisdiction of a decision, determine which submissions may be considered, specify what qualifies as evidence, choose the criteria of judgment, appoint and instruct assessors, aggregate their assessments, issue the binding disposition, or provide and constrain a corrective review. A participant may be entitled to submit material but lack a right to question the evaluative criteria. Another may contest a factual error in a score but have no standing to challenge whether the decision category should exist. Thus, apparent openness at the point of submission does not demonstrate openness at the level of rule formation.

The seven institutional rule families discussed in Section 2 provide a useful grammar of these distinctions [14, 47]. Boundary and position rules affect who may serve as reviewer, authority rules determine permissible actions, information rules govern disclosures to decision-makers, aggregation rules specify how judgments become decisions, scope rules delimit possible results, and payoff rules change the costs and returns of participation. The mapping of this grammar to a particular review procedure remains an application to be reconstructed rather than assumed. A rubric is accordingly not equivalent to the institution’s entire rule system: even a technically impeccable scoring guide can operate inside an exclusionary or unreviewable procedure.

Let ι index an institution, d an inquiry domain, and h a specified historical state. Define the *evaluative arrangement* $\mathcal{J}_{\iota,d}(h)$ as the structured object in Equation 14. This is a notation for analytically distinguished components, not a claim that real institutions maintain a neatly separated set of written policies.

$$\mathcal{J}_{\iota,d}(h) := (\mathcal{P}, \mathcal{E}^{\text{enc}}, \mathcal{A}, \Phi, \mathcal{W}, \mathcal{K}, \mathcal{D}, \mathcal{Q})_{\iota,d,h}. \quad (14)$$

Here $\mathcal{P}$ denotes eligible participants and authorized evaluators; $\mathcal{E}^{\text{enc}}$ the evidence actually encountered along a designated route; $\mathcal{A}$ the admissibility procedure; Φ a collection of criterion-specific interpretations of eligible evidence; $\mathcal{W}$ the admissible family of weighting or comparison rules; $\mathcal{K}$ institutional constraints and decision categories; $\mathcal{D}$ the decision procedure; and $\mathcal{Q}$ the routes by which reasons, scores, or underlying rules may be questioned. Each element is context-dependent and may itself have a revision

Table 6: Distinct sites of control within an evaluative arrangement.

Site	Institutional choice to reconstruct	Key uncertainty for inquiry
Jurisdiction and standing	Which claims, persons, and decisions belong in the procedure	Mandate, exclusions, parallel routes
Admissibility	Which traces and modes of testimony may enter consideration	Relevance, privacy, reliability and lawful restriction
Criterion design	Which qualities count as merits or deficiencies	Domain validity, omitted dimensions, purpose
Weighting and aggregation	How differentiated assessments yield comparisons	Disagreement, tradeoffs and veto rules
Delegation and certification	Who interprets evidence and with what authority	Competence, independence, accountable scope
Reason-giving	Which standards and decisive reasons are disclosed	Confidentiality, intelligibility, contestability
Rule-level correction	Who may challenge categories, weights, or precedent	Feasibility, independent review and enforcement

history. The components should be documented empirically as rules-in-use, not inferred merely from a published handbook.

Table 6 summarizes the sites at which an evaluation can be shaped, and the kind of evidence needed to reconstruct each site.

The arrangement distinguishes *standards that describe how to judge* from *authority to bind others with the judgment*. A disciplinary assessor may have justified expertise to assess an argument’s methods without possessing political or legal authority to exclude someone from professional participation. Conversely, a committee may hold lawful authority to decide an application while lacking sufficient domain knowledge to evaluate certain technical evidence without competent assistance. These two situations present different problems. Collins and Evans’s analysis of expertise and its relation to public decision-making provides a reason to keep the distribution of expertise analytically distinct from the allocation of decision rights [13]. Neither expertise nor broad inclusion automatically settles the legitimacy of a particular institutional action.

4.2 Admissibility, relevance, and the separation of evidentiary gates

Admissibility is a decision about what material a designated procedure is authorized to use. It is not, by itself, a judgment that the material is true, reliable, sufficient, or entitled to dispositive weight. A laboratory datum may be admissible yet inconclusive; an authentic private communication may be highly relevant yet subject to a legitimate confidentiality restriction; a source summary may be permissible as an aid to triage but insufficient as the sole evidentiary basis for a consequential decision. Eligibility and evidentiary quality should not be collapsed into a single yes-or-no concept. Similarly, an institution’s exclusion of a source type may be justified for one question and indefensible for another; analysis requires an articulated purpose, jurisdiction, risk regime, and rule history.

For candidate artifact e , decision task d , rule set r , and state h , let $I(e \mid d, h)$ represent the material’s task-relevance predicate and let $L_r(e \mid d, h)$ represent satisfaction of the procedure’s authorized and protective conditions. The indicator in Equation 15 is a deliberately narrow model of formal admissibility among materials already encountered. It does not imply that task relevance and authorization are fully observed or uncontested.

$$A_{r,d}(e \mid h) := \mathbf{1}\{I(e \mid d, h) = 1\} \mathbf{1}\{L_r(e \mid d, h) = 1\}, \quad e \in \mathcal{E}^{\text{enc}}(h). \quad (15)$$

The task-relevance predicate can be revisable: a newly recognized mechanism of contribution may reveal why a previously disregarded record bears on the question. The authorization predicate may reflect confidentiality, due process, retention policy, competence to evaluate a modality, or a justified limitation on collection. In practical research, a coding protocol should separate these reasons and record disputes

about their applicability. A single entry labelled “inadmissible” otherwise obscures whether the obstacle was evidentiary, procedural, protective, or political.

Admission into a dossier, successful cognitive interpretation, and inferential acceptance remain distinct. The visibility probability analyzed in Equation 8 concerns the route by which a person encounters a record. Equation 15 conditions on such an encounter and concerns its standing within a specific institutional assessment. A policy that admits more document classes might enlarge the set available for evaluation while leaving warranted conclusions unchanged; it might equally introduce irrelevant or misleading material. Any normative evaluation of liberalization therefore requires evidence about error costs, protections, and decision quality, not a general presumption that maximal admission is desirable.

4.3 Rubric plurality and the comparability of heterogeneous contributions

Institutions often compress heterogeneous evidence into a finite set of dimensions such as methodological reliability, documented contribution, relevance to a task, replicability, public benefit, or compliance with agreed ethical constraints. Some dimensions are partly commensurable; others involve threshold requirements, context-dependent reasons, or obligations that should not be exchanged for a larger score in an unrelated dimension. The social analysis of commensuration cautions that translating qualitative differences into a common metric is itself a consequential institutional operation [19]. Porter’s history of quantification likewise emphasizes that numerical standards acquire social authority within particular administrative and political conditions [49]. Neither observation entails that quantified assessment is inherently objectionable. Transparent measures can discipline arbitrary decisions, but their adequacy must be judged relative to what they measure, what they omit, and who can correct them.

For a specified eligible item or contribution x , let $\phi_j(x \mid h, d)$ be a normalized, criterion-specific assessment on a common numerical interval, made under documented interpretation procedures. For a *compensatory* rule with nonnegative weights w_j summing to one, Equation 16 gives an illustrative score. All terms must refer to comparable units within the selected decision domain; applying it to incompatible kinds of evidence without justified normalization would have no clear meaning.

$$S_{r,d}(x \mid h) = \sum_{j=1}^m w_{r,j} \phi_j(x \mid h, d), \quad w_{r,j} \geq 0, \quad \sum_{j=1}^m w_{r,j} = 1. \quad (16)$$

An actual institution may instead use lexicographic priorities, noncompensable exclusion criteria, qualitative deliberation, or multiple panels with negotiated outcomes. Equation 16 is consequently a restricted *example family* within $\mathcal{W}$, not the article’s definition of legitimate evaluation. The model’s value is to expose how differences in authorized weights can affect a comparison even when all reviewers agree on the underlying criterion-specific findings.

Proposition 4.1 (Criterion tradeoffs permit rubric-dependent reversal). *Let x and y be two eligible cases compared through Equation 16 with a fixed common criterion vector ϕ , and suppose all weight vectors in the probability simplex Δ^{m-1} are available. There exist two permitted weights w, w' for which $S_w(x) > S_w(y)$ and $S_{w'}(x) < S_{w'}(y)$ if and only if the vector $\phi(x) - \phi(y)$ has at least one strictly positive and one strictly negative component. The existence of such reversals establishes dependence on the rubric, not a defect in either observed contribution or assessor.*

Demonstration. Write $d_j = \phi_j(x) - \phi_j(y)$. The score difference $\sum_j w_j d_j$ belongs to the convex hull of the component differences, namely the interval $[\min_j d_j, \max_j d_j]$. Strictly positive and negative weighted differences can both occur exactly when this interval contains numbers of both signs. Taking weights at the respective simplex vertices establishes sufficiency; convexity establishes necessity. Restrictions on permitted weights can prevent reversal even when the component differences are mixed. The result presupposes fixed criterion meanings and does not show which admissible rubric, if any, is normatively appropriate.

Consider a fictional assessment of two documented research contributions. Under a particular coding protocol, one is evaluated more favorably for reproducibility and the other for responsiveness to an

affected community. An institution choosing primarily one criterion can reverse the ordering reached by an institution choosing primarily the other. One cannot resolve that disagreement by simply asserting that the institution with the higher final score found the contribution’s objective value. It is necessary to ask whether the decision mandate permits both criteria, how they are operationalized, which decision costs attach to error, and whether either involves a nonnegotiable ethical threshold. Conversely, mere disagreement is not evidence that evaluators acted in bad faith or that all interpretations are equally well supported.

The result also illuminates a distinct form of power: some actors can change *which comparisons are possible*. Where a category system ignores contributions expressed through unfamiliar media, languages, or forms of collaborative labor, the missing dimensions may never enter the vector ϕ . Changing only the weights cannot recover a dimension that was never represented. A revision of the criterion set, translation protocol, or unit of attribution may be required. Bowker and Star’s work on classification and its consequences supplies a broader institutional background for investigating such category effects [8]. The proposed formal account is narrower and must be tested within specific evaluation settings.

4.4 Decision authority, accountable delegation, and professional expertise

An expert’s judgment and an institution’s binding decision arise through distinct relations. An assessor may evaluate laboratory methods, historical records, legal relevance, translation quality, or ethical safeguards within a defined competence domain. An authorized body may then weigh multiple assessments, obligations, and legal constraints to issue a decision. Treating a technical recommendation as a complete institutional decision can obscure who bears responsibility for procedural legitimacy, disputed goals, and consequences for affected persons. At the same time, insisting that all participants exercise identical technical judgment can erode necessary specialization. A defensible arrangement should specify the epistemic tasks being delegated, the competence and conflicts of the delegates, the authority retained by the institution, and the routes by which reasons can be critically evaluated.

To make this division visible, let $\mathcal{T}_d$ be the set of assessment tasks associated with decision domain d , and let $B_{a,d}(h) \subseteq \mathcal{T}_d$ denote those for which actor a possesses institutionally recognized authorization. Let $C_{a,d}(h) \subseteq \mathcal{T}_d$ denote the tasks for which competence is supported by specified, revisable evidence. Equation 17 defines a task-sensitive intersection. It does not infer actual competence from a professional title, nor does it give the researcher unilateral power to adjudicate it.

$$\mathcal{T}_{a,d}^{\text{warranted}}(h) := B_{a,d}(h) \cap C_{a,d}(h) \cap \mathcal{T}_d. \quad (17)$$

This expression is useful because authority and competence may fail separately. A person might be capable of independently assessing an object but not legally empowered to issue the relevant determination; another might formally hold office yet require specialist advice on methods outside their expertise. Competence verification itself entails disputed criteria and should permit revision. A more complete study would record how work experience, methodological performance, conflict-of-interest management, local knowledge, and ability to explain one’s reasoning are recognized. The formulation does not imply that competence is binary in practice; membership can be replaced by task-specific calibrated confidence where the evidentiary basis supports it.

When several competent assessors disagree, the rule of aggregation matters. An institution might require consensus, weighted majority, advisory review with a final accountable decision-maker, or separate protections for a dissenting opinion. A committee can also be structurally independent on paper while its members face common incentives, shared sources, or sanction risks. Epistemic objectivity should therefore not be defined by the mere number of signatures on a decision. Longino’s discussion of socially organized critical interaction suggests why opportunities for informed response are epistemically important [35]. Fricker’s work on epistemic injustice supplies reasons to examine systematically unequal credibility assignments [21]. These contributions are relevant without predetermining a single governance architecture.

4.5 Institutional discretion, public reasons, and legitimacy

Not every evaluative standard can be exhaustively codified. Open-textured terms such as “novelty”, “adequate validation”, or “substantial contribution” require interpretation under incomplete information and changing practices. Discretion may be indispensable for attending to unusual evidence and protecting people against mechanical misclassification. It can nevertheless become difficult to scrutinize when the applicable criterion changes after submissions are examined or when decision-makers selectively invoke uncoded requirements. An institutional study should distinguish discretion expressly delegated under a known mandate from *de facto* latitude that cannot be challenged. The ability to exercise judgment is not itself evidence of abuse; the consequential questions concern the grounds, constraints, reviewability, and distribution of its exercise.

Gieryn’s analysis of boundary-work demonstrates why demarcations of scientific authority are historically associated with claims to legitimacy and resources [22]. This invites a question about the authority to define a relevant field or recognized form of expertise, without licensing a conclusion that every boundary is arbitrary. Technical boundaries sometimes protect sound practice or vulnerable participants. Douglas’s treatment of the role of values in science and policy is also pertinent: institutional criteria often incorporate choices about risks and consequences that cannot be eliminated simply by presenting a neutral-looking numerical score [17]. The analysis should identify where scientific evidence constrains assessment and where legitimate policy choices require accountable justification.

For the present paper, *evaluative legitimacy* is not treated as a single observed variable. At least four distinct questions must be addressed: whether an assessor had a justified basis for a claim; whether the procedure was authorized and appropriately constituted; whether affected participants could identify and contest decisive errors; and whether the decision’s use was proportionate to the institution’s mandate. A determination can be procedurally valid yet substantively mistaken. An expert opinion can be well supported but adopted through a procedure lacking appropriate standing or safeguards. A contested decision may prove sound after full review. These possibilities are reasons to preserve differentiated records rather than compress legitimacy into a single reputation signal.

Reason-giving is an important but conditional practice. Institutions may explain which rule applied, how disputed categories were interpreted, what evidence was decisive, and which claims remain uncertain. Yet public disclosure of raw files or identifying testimony is not always permissible. An independent confidential reviewer may inspect protected material, verify that stated standards were applied, and publish a bounded explanation of the result. Such designs require checks on the independence, competence, and enforcement powers of the reviewer. The normative objective is a reviewable relationship between reason and consequence, not an unrestricted disclosure rule.

4.6 Challenges to factual findings and challenges to the evaluative rules

The possibility of correction has levels. A claimant may demonstrate that the committee omitted a document, misquoted a source, assigned a score under the wrong rubric, misunderstood a contribution, or applied a rule that was itself inappropriate to the institutional mandate. These are not interchangeable objections. An appeal limited to arithmetic correction is insufficient when the disputed feature is the criterion system or the decision-maker’s jurisdiction. Conversely, allowing an unlimited reopening of every rule for each routine decision may impose costs, prolong uncertainty, and expose confidential participants to repeated demands. Designing meaningful contestation requires deciding which bodies hear which classes of challenge and under what evidentiary and procedural safeguards.

Let $\mathcal{R}_{\iota,d}(h)$ denote the family of evaluative rules available within institution ι and domain d , with an actual rule $r \in \mathcal{R}_{\iota,d}(h)$. For affected participant i , define a *practically reachable rule-challenge set* in Equation 18 by intersecting institutionally reviewable proposals with the participant’s executable actions and an authority that can give them an effective hearing.

$$\mathcal{Q}_i^{\text{rule}}(r \mid h, d) := \left\{ r' \in \mathcal{R}_{\iota,d}(h) : \begin{array}{l} i \text{ can initiate review of } r \text{ in favor of } r', \\ \text{and a competent body can issue an effective ruling} \end{array} \right\}. \quad (18)$$

The phrase “can initiate” means practically possible under the material, safety, time, and procedural constraints described in Equation 7; it does not mean a published appeal form alone. The alternative rule r' need not be adopted for the participant to possess a meaningful opportunity to request its consideration. A right to challenge a category is accordingly distinct from a right to obtain one’s preferred outcome. It is also distinct from an unlimited right to influence outcomes in matters where one lacks standing.

Rule-level contestation may proceed by independent appellate review, open revision of a scoring guide, professional self-governance, participatory rulemaking, or a jointly accountable body in which affected participants can submit objections without facing retaliation. No universal mechanism is presumed. Where claims depend on protected testimony or collective information rights, a review route may need both confidential evidence handling and representative participation. Where criteria affect diverse forms of knowledge work, an institution may need expertise in multiple domains and explicit translation between disciplinary conventions. The design problem connects the analysis of present authority to Section 8’s forthcoming investigation of institutional knowledge governance; at this stage the concern is what the institution can actually reconsider.

A final qualification is essential. Rule revision can alter future behavior, affect the stock of records, and change which cases seek review. A retrospective decision made under a new rubric cannot automatically be treated as the counterfactual outcome that would have arisen had the new rule governed the original procedure. A reconstructed dossier may lack the evidence that would have been produced under another reporting requirement. An evaluation audit should document which parts of the historical process are held fixed and which are allowed to respond to reform.

4.7 Evaluative comparison, causal identification, and measurement reactivity

Disagreement between institutions is an observation to be explained. It is not itself an estimate of arbitrary judgment, bias, or abuse. Different results can arise from different legitimate mandates, information sets, assessor expertise, prevailing rules, aggregation protocols, error costs, or participant populations. A credible empirical analysis should begin by reconstructing these inputs rather than treating the final decision as a transparent measure of power. Lamont’s study of review practices offers a precedent for closely examining how evaluative conventions and interpersonal deliberation operate in context [33]. Its findings do not identify a causal effect of any particular rubric in the hypothetical institutions considered here.

For a clearly defined pool $\mathcal{P}_*$ of eligible cases and two well-specified rules r_1 and r_0 , an investigator might seek the policy contrast in Equation 19. The outcome $Y_i(r)$ must be defined on a common scale, such as a fixed approval indicator or a downstream decision whose meaning does not change across the rules. The estimand is prospective or counterfactual, and no observational estimate is implied by writing it down.

$$\tau_{\mathcal{P}_*}(r_1, r_0) := \mathbb{E}_{i \in \mathcal{P}_*} [Y_i(r_1) - Y_i(r_0)]. \quad (19)$$

Identifying this contrast by comparing observed institutions would require defensible assumptions concerning exchangeability, selection, consistency of the rule intervention, overlapping eligibility, and interference between cases or assessors. A rule may change applications, evidence production, or professional strategy; it may not be realistic to hold the input population fixed over a long horizon. In a study with randomized rubric assignment to independent panels, one could estimate a bounded *panel-level rule effect* while remaining unable to identify institutional legitimacy or enduring career consequences. In a before-and-after reform, changing caseloads and parallel reforms would need explicit treatment. The causal-inference standards described by Hernán and Robins provide relevant methodological constraints [28].

Evaluation criteria can also affect the behavior they purport to measure. Once a ranking or score carries high stakes, participants may reallocate time toward its visible requirements, sometimes improving performance on valuable dimensions and sometimes diverting effort from unmeasured work. Espeland and Sauder’s study of rankings and reactivity provides an empirical example of the general phenomenon, not an estimate for AI-mediated scholarly evaluation [18]. A trajectory-sensitive study should distinguish

Table 7: Research designs for investigating evaluative authority and their main identification limits.

Design	Target observation or contrast	Principal inferential limit
Rule-and-case reconstruction	Applicable rubric versions, case files, panel mandates, decision reasons	Missing rules-in-use; confidentiality
Matched dossier assessment	Same dossiers presented under specified rubric variants	Panel composition and learning; limited external validity
Decision-process observation	Deliberation, dissent, conflict management, treatment of exceptions	Observation reactivity; partial access to informal influence
Policy reform comparison	Decisions across a documented change in admissibility or weights	Selection shifts, simultaneous reforms, interference
Rule-challenge audit	Practical costs, standing, outcomes and enforcement for contestation	Differential self-selection and retaliation concerns
Longitudinal work trajectories	Shifts in contribution, documentation and recognition after announced criteria	Strategic adaptation and changing opportunities

an institution's evaluation of existing work from the longer-run effects of announcing a new criterion on what work becomes possible, documentable, or rewarded. Observing a better score after a rubric change does not identify a corresponding increase in the underlying epistemic or social value of the production process.

Table 7 sketches a limited set of research designs. Each design must be adapted to the protection of participants and to the feasibility of collecting information about rejected or unrecorded cases. A researcher who examines only successful applicants or publicly certified claims may condition on an outcome shaped by the rules under study, producing a selected dataset that cannot support conclusions about the broader population.

The relation between authority and trust adds another identification problem. A decision bearing a prestigious institution's seal may be accepted because its procedures reliably track evidence, because observers mistake reputation for case-specific competence, because they have no feasible alternative, or because they anticipate sanctions for dissent. These mechanisms can produce identical observed conformity. The cognitive distinctions developed in Paper III prevent expressed confidence or behavioral compliance from being treated as unambiguous epistemic trust. To identify the role of evaluation standards in the production of trust would require additional information about decision-makers' knowledge, feasible alternatives, incentives, access to reasons, and experiences of effective correction.

4.8 Historical-materialist implications and boundaries of the section

Evaluation consumes labor and reproduces institutions. Convening expert panels, translating records across disciplinary vocabularies, designing rubrics, verifying provenance, providing procedural assistance, and investigating appeals all require time, skills, and durable infrastructure. Those costs can be shifted onto applicants, precarious contributors, volunteer reviewers, or communities whose knowledge must be reformatted before an institution will recognize it. The institutionalized evaluation of knowledge therefore participates in production relations: it affects whose work gains access to further resources, which modes of contribution are encouraged, and who can afford to maintain or contest an evidentiary history. This paper's historical-materialist inquiry should reconstruct such material dependencies without claiming that evaluative judgments are reducible to economic interests.

Power over a rubric differs from power over one score. Changing an admissibility rule, appointing the assessors who interpret it, defining the criteria that can be weighed, and controlling the mechanisms of appeal have different consequences for future trajectories. These differences become especially significant when automated systems organize enormous documentary corpora. A machine-generated evaluation can reproduce a preexisting institutional classification efficiently, but speed and consistency do not independently validate the category's relation to the task or the justice of its consequences. Nor does a human review automatically correct a flawed automated rubric if reviewers face the same incentives and lack authority to question the rule. Claims about these mechanisms remain hypotheses until investigated

with suitably discriminating designs.

The present section has made five bounded advances. Equation 14 identifies separable sites of evaluative authority; Equation 15 separates procedural admission from inferential merit; Equation 16 and Proposition 4.1 expose a precise condition for rubric-dependent ordering; Equation 17 distinguishes authorization from evidence of competence; Equation 18 makes the correction of standards an institutional capacity to be investigated; and Equation 19 states a causal question without claiming identification. None supplies a universal ranking of institutions, a proof of intentional discrimination, or a measurement of trust.

Subsequent analysis must specify how credentials, endorsements and testimonial chains acquire their authority. The immediate next inquiry, Section 5, considers certification and the authority of testimony: who may speak on behalf of an institution, how source competence and reputation enter accreditation, and how claims to expertise circulate between people and organizations. The broader investigation will then examine the material conditions of participation, feedback between trust and authority, and institutional routes for revising consequential judgments. The purpose is to understand when evaluation can cultivate warranted reliance while remaining revisable by those whose evidence, contributions, and futures are affected.

5 Credentialing and the Authority of Testimony

This section investigates the institutional conversion of attributed competence and transmitted statements into recognized epistemic authority. Its objective is to distinguish a person's capacity to assess a claim, the documentary grounds for believing that capacity exists, the institutional act of certification, the circulation of endorsements, and an audience's subsequent judgment or compliance. The inquiry draws on social epistemology, the sociology of professions, signaling theory, and the historical organization of knowledge work. It introduces a domain- and history-indexed account of credentials, represents dependence within testimonial chains, establishes a bounded proposition about repeated transmissions, and identifies research designs for separating status effects from warranted evidentiary reliance. Section 4 concerned how institutions govern standards of judgment; the present section examines how standing to speak and be believed is acquired, conferred, restricted, and contested.

Modern specialization makes testimony a routine condition of knowledge production. Hardwig's account of epistemic dependence examines the epistemic importance of relying on others where one cannot reproduce the relevant inquiry, while Goldman's study of expert disagreement identifies the difficulty of assessing rival claims without already possessing the expertise in dispute [26, 24]. These philosophical concerns have institutional histories. Shapin documents historically specific conventions through which social standing and expectations of truthfulness helped make scientific testimony credible, and Abbott examines professional jurisdictions as historically contested arrangements governing expert labor [57, 1]. The present proposal draws an analytical distinction from these works: authority to issue a credential, evidence that its bearer can perform a domain-specific task, and the practical consequences of accepting that credential are related events within a relational history. They need not coincide. The purpose is to investigate their possible alignment, rather than to assume either the reliability or the illegitimacy of professional certification.

5.1 Competence, certification, reputation, and authorized standing

A person may have the demonstrated ability to perform a technical task while lacking the qualification an institution requires for an official decision. Another may possess a valid qualification yet work outside its evidential domain or lack current familiarity with a particular method. A third may be widely recognized because their work has been independently checked; a fourth may be recognized through visibility, sponsorship, or accumulated institutional prestige. These descriptions distinguish competence, credentials, reputation, and legally or organizationally authorized standing. A fifth dimension, actual testimonial reliability in a specified setting, depends on how the speaker acquires information, frames uncertainty, and

Table 8: Distinct attributes often collapsed into an expert’s apparent authority.

Attribute	Potential evidence	Principal interpretive limit
Task-relative competence	Work samples, validated assessment, documented practice	Tasks and technologies change; testing is selective
Formal certification	Issuer, scope, criteria, validity, review and revocation	Certification does not validate every later claim
Public reputation	Recorded citations, endorsements, prior outcomes	Visibility and network structure shape the record
Delegated authority	Institutional mandate, jurisdiction and decision rules	Binding permission differs from epistemic accuracy
Testimonial reliability	Verifiable claims, uncertainty reporting, correction history	Observability, selection and outcome ascertainment vary
Expressed deference	Agreement, obedience, citation and repeated endorsement	Incentives or sanctions may constrain expression

responds to correction. Even demonstrable technical proficiency cannot guarantee truthfulness, while an accurate report can arise from a person without prestigious standing.

Definition 5.1 (Contextual epistemic and institutional standing). For a speaker s , inquiry domain d , and specified relational history h , distinguish: (i) task-relative competence $K_{s,d}(h)$; (ii) the observable accreditation record $G_{s,d}(h)$; (iii) audience-relative reputation $R_{o,s,d}(h)$ for observer o ; (iv) institutional permission or decision authority $A_{\iota,s,d}(h)$ within institution ι ; and (v) testimonial performance $T_{s,d}(h; \mathcal{P})$ in a defined inquiry population $\mathcal{P}$. These labels are analytically separate. The competence and performance variables may be latent, uncertain, or incompletely measured. No numerical common scale across their components is presumed.

The distinctions matter for research and governance. Institutions must sometimes give formal decision authority to particular members, even when dispersed contributors possess relevant practical expertise. Delegation can provide procedural regularity, identifiable responsibility, and protections against arbitrary claims. Yet the institutional right to sign a decision does not establish that every associated testimony is evidentially accurate. Similarly, a recognized expert’s accurate statement in one domain supplies incomplete grounds for judging a claim that depends on different techniques or on local knowledge inaccessible to that expert. The third-wave discussion of expertise in science studies is pertinent because it explicitly investigates different forms of expertise and their proper roles in technical decision processes [13]. This paper uses that concern to motivate a domain-specific test of authorization, not a claim that a single hierarchy of speakers will suit every inquiry.

Table 8 gives an operational separation. It also identifies the documentary evidence needed to study the difference between legitimate authority and deference sustained primarily by institutional status. The descriptions avoid treating absence of a credential as affirmative evidence of incompetence; such an inference would require information about eligibility, access to assessment, and the credential’s predictive validity.

5.2 Accreditation as a structured and revisable institutional event

A credential should be represented as a historically situated assertion by an identifiable issuer rather than an intrinsic property of its bearer. An issuer claims that specified assessment procedures justify a stated standing within a domain. The assertion can be authenticated, evaluated for scope, limited by conditions, and subsequently reaffirmed, revised, expired, suspended, or withdrawn. Records concerning such changes have their own provenance. A digitized certificate with a valid signature may still attest to a narrow qualification; a revoked record may have been valid when used in an earlier decision. Treating these differences as events in an evolving history permits analysis of their downstream consequences without assuming a universal temporal ordering of social states.

Let $\mathcal{C}_{\iota,s,d}(h)$ denote a credential record concerning bearer s , issued or maintained by ι in domain d at a designated state h . Equation 20 specifies the information required for the proposed relational analysis. It is a schema for inquiry rather than an assertion that all real accreditation regimes expose every field.

$$\mathcal{C}_{\iota,s,d}(h) = (\text{issuer, bearer, scope, criteria, evidence, status, provenance, review})_{\iota,s,d,h}. \quad (20)$$

Here scope covers authorized domains, kinds of work, and conditions; criteria name the standard under which the credential was awarded; evidence identifies the permissible basis of assessment; status documents standing relative to the historical state under investigation; provenance connects the record to its issuing and updating actions; and review identifies routes for error correction, appeal, or renewal. Documenting a review procedure alone does not show that the bearer or an affected third party could feasibly activate it. The accessibility of remedy depends on the rights, costs, and sanctions associated with actual participation, a matter developed in Section 6.

A credential's practical reach is the intersection of several conditions. The issuer must be competent or authorized to confer the relevant status under the applicable rules; the credential must cover the precise task or claim; its status must be accepted under the institution's current procedures; and the observer must have access to a sufficiently authentic version of the record. Let $\mathbf{1}\{\cdot\}$ denote an indicator and q the task against which the credential is offered. One context-specific *procedural applicability* condition is Equation 21.

$$U_{\iota,s}(q, h) = \mathbf{1}\{q \in \text{scope}(\mathcal{C}_{\iota,s,d}(h))\} \mathbf{1}\{\text{status}(\mathcal{C}_{\iota,s,d}(h)) \in \mathcal{S}_{\iota,h}^{\text{accepted}}\} \mathbf{1}\{\text{issuer} \in \mathcal{I}_{\iota,h}^{\text{recognized}}\}. \quad (21)$$

The indicator records eligibility under specified recognition rules, not an epistemic probability. It may be zero because a competent bearer holds a qualification from an unrecognized jurisdiction. It may be one while the bearer makes an erroneous assertion. The accepted-status and recognized-issuer sets may themselves be disputed and subject to governance. Moreover, credential authentication is a separate prerequisite for using the recorded fields; it is not silently guaranteed by Equation 21. Explicit attention to these rules guards against a common analytical error: inferring that a formally valid credential has demonstrated reliability for the particular claim being evaluated.

Professional certification also has a history of jurisdictional competition. Abbott's analysis of professional work illustrates how claims over recognized tasks are tied to wider arrangements of training, labor, and institutional control [1]. Criteria for admission to a profession or publication venue can be useful safeguards, while the same criteria can reproduce advantages in access to preparation, costly examinations, accredited institutions, or required sponsorship. Spence's signaling model is relevant as a general account of how observable credentials can convey information under uncertainty and structured incentives [58]. Yet a signal's cost, selectivity, or association with successful incumbents does not by itself prove that the certified person is competent at an unrelated task, that the issuing institution is just, or that the outcome is socially beneficial. Those are additional empirical and normative questions.

5.3 Reliability as a domain-conditioned question about evidence

The epistemic use of a credential depends on the question for which it is invoked. Consider a defined set of cases $\mathcal{P}_*$ for which an external standard can ascertain whether a binary testimonial assertion M_s matches a state Z . The conditional accuracy of reports in Equation 22 is a descriptive target. It is indexed by credential group g , domain d , and observable context x , rather than treated as the bearer's timeless capacity.

$$r_{g,d}(x; \mathcal{P}_*) := \Pr(M_s = Z \mid G_{s,d} = g, X = x, (s, Z) \in \mathcal{P}_*). \quad (22)$$

Even if estimated without error in the selected population, $r_{g,d}$ does not measure the causal effect of possessing a credential. Credentialed speakers and noncredentialed speakers may differ in opportunities, training, topics, selection into evaluation, and the likelihood that their claims can be checked. An investigator may also have difficulty establishing an external benchmark for legal interpretation, theoretical proposals, forecasts, or judgments involving heterogeneous normative commitments. In such cases the

goal should be assessment of a specified quality dimension, with acknowledged uncertainty, rather than manufacture of a binary ground truth.

A credential can also be useful through process assurance. An institution may screen for methodological knowledge, require continuing education, maintain professional discipline, disclose conflicts, preserve work records, and provide a route for correction. These safeguards can give a reasonable basis for conditional reliance even when individual observers cannot reproduce the underlying work. Goldman’s comparative-expertise problem and Oreskes’s account of science as socially scrutinized inquiry both motivate attention to such processes [24, 43]. Neither source should be read as asserting that certification or scientific consensus is infallible. One of the central institutional questions is whether the mechanisms through which a claim was challenged, independently checked, and corrected are accessible enough to support a warranted inference about its present quality.

Evidence of expertise is often transferred across contexts more broadly than its original assessment warrants. A senior researcher’s institutional position might be treated as a proxy for competence in all topics associated with an institute, or a widely cited work might be used to certify a new technical method never independently tested. Such transfers are analytically distinct from fraudulent use of a qualification; they may arise through conventions of delegation or imperfect inference. A trajectory-sensitive investigation should record the domain and task for which evidence of competence was first produced, the actor who reinterpreted it, the criteria of transfer, and any subsequent opportunity for correction. Formal qualification, accumulated experience, and local practical knowledge may properly overlap without being interchangeable.

5.4 The evidentiary structure of testimonial and endorsement chains

A speaker’s statement frequently reaches an observer through several people or institutions. A laboratory issues a report; an intermediary summarizes its findings; a professional association endorses the report; a publication venue certifies that a review procedure occurred; and a search or generative interface presents a compressed citation. At each step, new evidence may be produced, an earlier message may simply be forwarded, or the content may be altered. A chain of ten citations to one unexamined statement differs epistemically from ten independent replications, even if an audience encounters ten visually distinct pages. The dependence must be represented at the level of evidentiary origins and transformations, not merely through the number of observed endorsements.

Let $Z \in \{0, 1\}$ denote a specified claim state, $M = (M_1, \dots, M_k)$ the observed reports, G the available credential records, and D the process determining which reports reach an observer. Equation 23 is the posterior-odds identity for an explicitly specified probability model with nonzero denominators. It includes the joint likelihood of reports and credentials conditional on the selection process rather than multiplying nominally independent endorsement scores.

$$\frac{\Pr(Z = 1 \mid M, G, D)}{\Pr(Z = 0 \mid M, G, D)} = \frac{\Pr(Z = 1 \mid D) \Pr(M, G \mid Z = 1, D)}{\Pr(Z = 0 \mid D) \Pr(M, G \mid Z = 0, D)}. \quad (23)$$

The prior odds are already conditioned on D : observing the fact or mechanism of selection may itself be informative. The expression assumes the conditioning events are well-defined and probabilities are positive where required. It does not assert that real observers update according to the equation, or that the needed probabilities can be identified from archives. In particular, copying, common funding, shared editorial control, selective quoting, and coordinated communication can make the reports strongly dependent. A simple multiplication of individual likelihood ratios would then be incorrect. The cognitive mechanisms by which observers nevertheless respond to such reports belong to Paper III; Paper IV investigates the institutional conditions under which reports and their dependence become visible.

Proposition 5.2 (No incremental evidence from conditionally redundant relays). *Let Z be a binary claim state, M_0 an originating report, $M_1, \dots, M_k$ downstream transmissions, and C a fixed observed context. Suppose that Z is conditionally independent of the full downstream vector $(M_1, \dots, M_k)$ given (M_0, C) .*

For every observed configuration with positive conditional probability,

$$\Pr(Z \mid M_0, M_1, \dots, M_k, C) = \Pr(Z \mid M_0, C). \quad (24)$$

Consequently, observing those downstream transmissions in addition to the original report and context supplies no further Bayesian information about Z within the stated model.

Proof. By the stipulated conditional independence, $\Pr(M_1, \dots, M_k \mid Z, M_0, C) = \Pr(M_1, \dots, M_k \mid M_0, C)$ wherever defined. Substituting into the conditional Bayes formula gives a common multiplicative factor in the numerator and denominator, which cancels. The result concerns the joint vector of relays, so it does not require or imply independence of the relays from one another. $\square$

Equation 24 expresses this redundancy for the complete downstream vector, conditional on the stated original report and context. The proposition is deliberately bounded. A downstream investigator who independently examines new samples, challenges methods, or observes facts unavailable to the original reporter may produce evidence about Z after conditioning on M_0 . A transcription that introduces informative error correction, or a trustworthy institution that authenticates a disputed original document, may likewise change the observer's knowledge of the report's identity or provenance. In these cases the conditional independence premise fails or the conditioning information changes. The theorem therefore neither dismisses professional review nor assumes every citation is evidentially redundant. It states which dependency must be checked before testimonial count is interpreted as additional support.

A corresponding data-processing constraint can help separate transformation from genuinely new observation. If, conditional on context C , the relevant system obeys the Markov chain $Z \rightarrow M_0 \rightarrow M_1$, with no independent access to Z at the relay stage, Equation 25 follows from the conditional data-processing inequality. The conditional mutual information is defined for a specified joint distribution; the inequality says that processing an existing report cannot improve its information about the underlying claim when the chain assumption holds.

$$I(Z; M_1 \mid C) \leq I(Z; M_0 \mid C) \quad \text{if } Z \rightarrow M_0 \rightarrow M_1 \mid C. \quad (25)$$

This inequality does not measure semantic fidelity, fairness of summaries, or the actual knowledge of a limited human observer. A clearer summary can increase a reader's comprehension even when it contains less Shannon information about Z than the originating material. Similarly, authentication can itself introduce new information by inspecting signatures or custody records, in which case an expanded model must represent the new observation. The distinction is particularly useful for AI-mediated summaries: linguistic fluency, official styling, and repeated links may make a claim appear well supported while adding little independent evidentiary basis.

5.5 The organization of endorsements and recognized credibility

Endorsement pathways can be represented as typed relations linking issuers, speakers, organizations, claims, and source records. At least four different relations deserve separate documentation: certification of a person's training or standing, affirmation of a particular claim, attestation to the integrity of a review procedure, and authorization to speak on behalf of an institution. The first concerns the bearer, the second a proposition, the third a procedure, and the fourth delegated representation. Combining these into an undifferentiated endorsement edge produces false equivalences between professional membership and independent corroboration of a specific argument.

A journal's acceptance of a research article, for example, may give evidence that a specified editorial process was completed. It does not imply that every referee independently reproduced the study or that every factual proposition is correct. An institution's appointment of a spokesperson establishes authority to convey its position; it need not establish that the person originated or verified every component of the underlying record. Similarly, a certificate that someone contributed software to a project cannot by itself establish that the entire resulting product has been validated. A trajectory representation should carry the *object of endorsement* and the *verification operation* explicitly, alongside institutional authority and source lineage.

Table 9: Objects of institutional endorsement and their evidentiary limits.

Event or relation	Immediate institutional assertion	Potential support	Important unresolved question
Qualification award	Bearer met specified award criteria	Task-related preparation	Predictive validity and domain transfer
Professional appointment	Bearer occupies an authorized role	Decision standing	Competence for a particular claim
Review certification	Submission passed stated procedures	Process assurance	Independence, scope, and rigor of checks
Claim-specific endorsement	Endorser supports designated assertion	Corroboration, if independently checked	Original evidence and shared origins
Contribution declaration	Person reports a specified project role	Role-level provenance	Verification, quality, and authorship rules
Institutional communication	Message is authorized by an organization	Authenticity of the organization's statement	Epistemic grounds for the statement

Table 9 maps illustrative endorsement events to the kind of evidence they could, under conditions, supply. An observed relational edge can have several functions simultaneously, but those functions should be reported separately. The names in the table refer to generic classes of activity; no particular institution's procedures are assumed.

Prestige adds a further layer. Merton's analysis of recognition and cumulative advantage in scientific communication provides a classic reference for the unequal rewards associated with standing [38]. Reputation can be an informative summary of repeatedly successful work, but it can also reflect unequal initial opportunities, gatekeeping, and recognition cascades. A source's name may therefore operate simultaneously as a useful heuristic and a mechanism of inherited authority. Fricker's analysis of testimonial injustice gives a distinct ethical reason to examine credibility deficits associated with social prejudice, while Shapin's historical account shows that conventions of credibility can be culturally and institutionally situated [21, 57]. It would be equally ungrounded to infer that every prestigious source is unreliable or that every less-recognized source is epistemically superior. The relevant question concerns the provenance, domain suitability, and institutional consequences of the differential weight assigned to their testimony.

This differentiation matters particularly when multiple organizations endorse one another. An accreditation body may authorize training providers; providers may nominate experts to the body; experts may serve on publication or award committees; and favorable evaluations may increase both individual standing and the collective reputation of the network. Such arrangements can provide useful coordination, professional continuity, and enforceable standards. They can also make assessments difficult to challenge when the same actors dominate qualification, dispute resolution, and access to jobs or publication channels. The existence of reciprocal endorsement is an observation about network structure; establishing bias or conflicts requires additional evidence about interests, procedures, incentives, and how independent criticism was handled. Paper IV's primary concern is the location of these decision and challenge capacities, rather than a blanket presumption concerning the merits of any particular association.

5.6 Contribution records, authorial credit, and AI-mediated testimony

Scholarly credentials increasingly coexist with detailed representations of collaborative production. The ANSI/NISO CRediT standard specifies fourteen contributor roles to record kinds of work involved in

published research, including conceptualization, methodology, data curation, software, investigation, validation, and writing [40]. Role classification can improve the visibility of tasks obscured by a single author list. Yet a role label is a structured claim about participation, not independently a measurement of effort, a certification of work quality, a legal determination of authorship, or a substitute for institutional standards. The differences among recording, verification, recognition, and allocation of benefits should remain explicit.

In an AI-mediated research trajectory, the creation of a text, figure, model, or report may involve contributors who designed an inquiry, selected hypotheses, configured computational systems, curated records, checked results, and interpreted limitations. Different institutions may apply different authorship requirements and different degrees of permissible tool assistance. It follows that documenting participation should begin with task-level evidence and the applicable attribution rules, rather than automatically crediting whoever possesses a prestigious credential or whoever appears most frequently in the final artifact’s metadata. The opposite shortcut is equally problematic: the presence of generative software does not settle how the research questions, evidentiary judgments, and accountability duties were distributed among human participants.

A useful conceptual record distinguishes an event of production e , an attributed contributor s , a role ρ , and a supporting trace v , with separate statuses for the report and its verification. Equation 26 expresses that distinction. It is intentionally a schema of documentary relations, not a self-verifying measure of contribution.

$$\mathcal{L}(e, s, \rho, v; h) := (\text{claim}(s, \rho, e), \text{source}(v), \text{verification}(v, h), \text{attribution-rule}(h)). \quad (26)$$

For example, a repository history may show that a contributor committed a software change, while a methodological log may indicate who specified a validation test; neither alone supplies a complete account of conceptual origination. A signed role declaration may improve traceability without establishing the underlying event beyond dispute. A review committee should be able to identify which evidence and rules connect each role to a conclusion. With privacy-sensitive work, publicly disclosing every trace would be inappropriate; a governed audit route, appropriately restricted metadata, or a protected independent assessor may be necessary. The epistemic objective is to keep the grounds for warranted recognition reconstructable and contestable under suitable rights.

AI-mediated testimony also introduces the possibility of *authority laundering*, understood here as a hypothesis concerning communication pathways, not an accusation about a specific system. A fluent synthetic summary may present its source as an institutional consensus even where the underlying record consists of one preliminary report. Conversely, a reliable institutional statement may lose crucial caveats when repeatedly summarized. A model-generated citation may point to an extant document while misdescribing what that document supports. Identifying the mechanism requires tracing source selection, transformation, endorsement and the user’s actual exposure; visual appearance alone does not establish either error or deception. The conditional redundancy result in Proposition 5.2 applies only under its stipulated dependence model. A generative system that genuinely retrieves further independent measurements would require a different model.

5.7 Expressed deference, coercive conformity, and the possibility of dissent

Recognition of expertise is distinct from expressed agreement. An observer may accept testimony because the source has a sound record, express agreement to preserve a job or funding relationship, or comply with an authorized decision while remaining skeptical of its evidentiary premises. The same institutional outcome can therefore emerge through mechanisms with different epistemic and ethical significance. The preceding analysis of evaluation standards identified decision authority; the present analysis adds the conditions under which a speaker can disagree with credentialed authorities without suffering a disproportionate loss of professional participation.

Let B_o represent observer o ’s private evidentiary judgment in a defined experimental or interpretive setting; let A_o represent an observable public agreement indicator; let L_o capture specified costs, con-

straints, and anticipated consequences; and let Q_o indicate the available route for contesting the authoritative statement. A descriptive model of public agreement may take the conditional form of Equation 27. It encodes variables to be measured, not an assumed psychological law or a causal decomposition.

$$\Pr(A_o = 1 \mid B_o, G, L_o, Q_o, X_o) = f_\theta(B_o, G, L_o, Q_o, X_o), \quad (27)$$

where G includes relevant certification or displayed authority cues and X_o represents other observed context. Under sanctions or constrained alternatives, an association between credentials and public agreement need not identify internal belief. Conversely, an actor may endorse a valid professional determination out of procedural obligation without implying personal agreement on every premise. To distinguish mechanisms, empirical designs would require protected elicitation, clear records of feasible options, and careful treatment of risks to respondents. Neither an interview answer nor an anonymous survey should be presumed to reveal private belief without distortion.

Legitimacy is not equivalent to unanimity. Socially distributed expertise can produce credible public knowledge when counterarguments are heard, methodological errors can be corrected, and dissent is assessable on its merits. Longino’s work on the social character of objectivity and Oreskes’s discussion of expert consensus motivate attention to the practices by which criticism is received, rather than counting agreement alone [35, 43]. Protected disagreement need not imply that every claim deserves the same institutional standing. Review remains subject to standards of relevant evidence, proportionality, and competence. A robust institution may maintain demanding credentials and simultaneously provide viable procedures for demonstrating exceptional competence, challenging an erroneous exclusion, or requesting independent review.

The possibility of retaliation makes the institutional inquiry more delicate. A contributor may have a formal right to appeal but face a credible risk of losing access to training, references, research equipment, or future appointments. Such costs depend on the particular material situation, not merely the published policy. Section 6 examines these conditions more extensively. At the present stage, the main conclusion is that public agreement, documentary endorsement, and observed reliance are insufficient on their own to distinguish warranted trust from institutionally compelled conformity. The analyst should reconstruct the actor’s feasible options and the relevant evidentiary record before offering a causal or normative interpretation.

5.8 Empirical discrimination of credibility and status mechanisms

A credible study of credentialing must distinguish several questions. One concerns descriptive reliability: do reports by bearers of a defined certificate perform better on an externally verifiable task in the population actually studied? A second concerns the effect of *displaying* the same credential on a reader’s evaluation of an otherwise fixed report. A third concerns the consequences of changing the rules that govern who can acquire or challenge the credential. A fourth concerns downstream sanctions and the capacity for participants to disagree. These targets are neither mathematically nor empirically interchangeable.

For the second question, consider a preregistered design where evaluators receive an identical claim record E with one of two legitimately constructed metadata displays g_1 and g_0 . Let $Y_o(g)$ denote a fixed, well-defined assessment outcome under display g . For the eligible experimental observer population $\mathcal{P}_o$, Equation 28 defines a potential-outcome contrast for the credential-display intervention.

$$\tau_{\mathcal{P}_o}^{\text{display}}(g_1, g_0 \mid E) := \mathbb{E}_{o \in \mathcal{P}_o}[Y_o(g_1; E) - Y_o(g_0; E)]. \quad (28)$$

Randomization of displays, when ethically and practically feasible, can identify the effect of the specified display assignment under consistency, adequate implementation, and suitable no-interference conditions. It cannot by itself tell whether the observed response arose from a justified prior concerning the issuer, inappropriate prestige deference, cognitive fluency, fear of consequences, or misunderstanding of the displayed information. Nor does it identify the effect of actually *earning* a credential on competence, which involves education, selection, professional networks, and changing opportunities. Factorial designs may

separate issuer name, domain scope, authentication evidence, and procedural-review information, while preserving the exact wording and quality of the underlying claim.

Empirical findings from peer-review studies provide a relevant but bounded precedent. In a field experiment at a particular computer-science conference, Tomkins, Zhang, and Heavlin compared reviewing conditions in which author identity and affiliation were available or concealed and reported status-related differences in reviewer behavior [61]. The result motivates careful tests of credential-display effects, but its institutional setting and design do not establish the effects of every credential, nor do they explain any particular person's motives. Historical changes to anonymity or authentication policies also alter who submits, what reviewers can infer from subject matter, and the composition of eligible reports. A contrast between institutions with different credential rules will therefore be vulnerable to selection and confounding unless the relevant institutional history can be reconstructed.

Researchers should also measure whether credentials predict task performance using declared validation sets, separating development from evaluation data and recording missing or selectively reportable outcomes. For some expert tasks there is no decisive truth label; alternatives include blinded evaluation of reproducibility, calibration of forecasts, decision quality under stated loss functions, or the accuracy of narrowly defined component operations. Credibility should be treated as a multidimensional and revisable inference. A single scalar that collapses qualification validity, epistemic accuracy, deliberative integrity, legal authority and social justice would obscure the very relations Paper IV seeks to investigate.

A study of endorsement networks can begin by reconstructing who originated information, who independently inspected it, who translated or summarized it, and who authorized its final publication. Network density alone is insufficient to identify epistemic independence. For example, several endorsers may share a primary dataset, a methodological training lineage, an editorial relationship, or a common funder. Conversely, two reports by collaborators may include genuinely independent instruments or procedures. Validation would require origin-level documentary access, enough methodological detail to assess dependence, and sensitivity analysis for missing edges and unrecorded encounters. In restricted settings, ethical data access can be maintained through independent auditors, secure protocols, or aggregated disclosure; full public trace publication is not a universal solution.

Hypothesis 5.3 (Domain fit and credential display). When the claimed expertise domain is made explicit and observers have sufficient task information, a credential that is relevant to the claim's methods may produce a different assessment effect from a prestigious credential in an unrelated domain. The direction and magnitude of that difference are empirical questions that may vary with observers, cases, and institutional stakes.

Hypothesis 5.4 (Origin visibility and apparent corroboration). For otherwise matched testimonial presentations, making their shared evidentiary origin legible may reduce the additional confidence attributed to nominally distinct endorsements. The hypothesis concerns observer response and can fail even when the reports are formally dependent; it requires a design that distinguishes comprehension from mere exposure to provenance labels.

The first hypothesis can be tested with domain-matched and mismatched credential descriptions whose validity is explained to participants; the second can be tested with authenticated source-lineage displays, with attention to measurement-induced demand effects and differential familiarity. Neither design should place participants' actual certification, career standing, or protected access at risk merely to create experimental leverage. The need for valid randomization must be weighed against the possibility that withholding source qualifications or misleading participants could produce harmful decisions. An investigator can instead use consented vignettes, archival reform studies, or naturally varying institutional records when appropriate, stating the resulting identification limits.

5.9 Historical-materialist implications for epistemic authority

Accreditation systems organize the labor that produces and validates knowledge. Training, examinations, mentoring, peer assessment, continuing professional development, documentation, and corrective review

require labor and resources. Some of that labor is compensated; some is borne by precarious researchers, volunteer reviewers, assistants, and the communities whose local expertise must be rendered legible to external assessors. The value of a credential consequently arises within a material infrastructure of qualification, recognition, and institutional enforcement. Access to that infrastructure is uneven, and its requirements shape who may enter recognized research and professional work. These observations motivate historical-materialist inquiry without establishing that all professional boundaries are devices of extraction or that credentials have no legitimate epistemic function.

Credentialing can reduce verification burdens by allowing an institution to rely on a documented assessment process. Such delegation may be socially beneficial where no individual has the resources to independently validate every specialized statement. It can also shift the burden of proving competence onto those with less recognized training, smaller networks, or fewer opportunities to produce institutionally legible records. A historically situated analysis must therefore compare the costs of unregulated uncertainty with the distributional effects of particular certification rules. The relevant outcomes include access to work, quality of evidence, opportunities for correction, and the social allocation of verification labor. These are distinct quantities, and their normative importance depends on the purposes and affected participants of the institution under study.

The immediate mechanism linking credentialing to power is the authority to decide which histories count as evidence of competence, who is admitted to examinations or reviews, whose testimony can receive formal recognition, and who may revise an adverse classification. A credential is thus simultaneously a potential information resource and a rule-mediated condition of participation. Once connected to pay, research funding, employment, or legal standing, certification can shape the capacities of actors to produce the very evidence on which later certification depends. That feedback remains a hypothesis requiring institutional reconstruction and longitudinal observation; its dynamics will be developed in Section 7, after Section 6 has investigated material dependence more directly.

The section has established several bounded results. Definition 5.1 separates competence, certification, reputation, and authorization. Equations 20 and 21 describe the structure and procedural applicability of a credential without conflating eligibility with truth. Equation 22 identifies a population-dependent reliability question. Equation 23 makes testimonial dependence explicit, and Proposition 5.2 shows why redundant relays add no evidentiary strength once the source and relevant context are already known. Equation 26 separates participation claims from their verification, Equation 27 distinguishes public agreement from its possible determinants, and Equation 28 identifies a narrowly defined display intervention. These constructions do not demonstrate that an actual institution uses its credentials unjustly, that observers follow Bayesian norms, or that any model parameter has been measured.

A credible epistemic institution has reasons to cultivate skilled testimony, reliable credentials, intelligible provenance, and protected avenues for correction. Their joint organization is an empirical and ethical question. The next section examines the costs and dependencies through which individuals gain access to these provisions. It will ask which participants can afford to become legible as competent, preserve evidence of their contributions, challenge an endorsement, or decline an authoritative instruction. That transition places certification within the material conditions of knowledge production and allows the subsequent discussion of trust and institutional reproduction to remain sensitive to both competence and power.

6 Material Dependence and the Conditions of Participation

This section examines how material resources and institutional dependence condition the exercise of epistemic rights. Its objective is to distinguish a formally permitted act of producing, checking, disputing, or withdrawing from knowledge work from an act that a particular participant can undertake under the resources, risks, and dependencies actually confronting that participant. The argument combines a bounded representation of feasible actions and remedy pathways with historical-materialist analysis of scientific labor, employment, research funding, archival infrastructure, and the institutional allocation of verification costs. It then develops a proposition about barriers that persist under a resource subsidy

and sketches research designs able to discriminate several mechanisms without equating observed compliance with epistemic agreement. The preceding sections describe authority over trajectories, visibility, evaluation, and testimony. The present section identifies material conditions under which persons can exercise or challenge those powers.

A rule allowing every researcher to request underlying data can coexist with differences in affordable compute, access to translated documentation, secure employment, expertise in the necessary method, caregiving time, and legal assistance. An appeal process may formally accept submissions from all affected people while imposing a deadline, filing fee, technical evidence standard, or publicity risk that differentiates the ability to submit. Such differences bear on knowledge as well as distributive and procedural justice. They can shape whose observations enter the record, who can replicate a result, who can correct an attribution, and whose challenges survive long enough to be heard. Material constraints need not imply deliberate exclusion; their institutional effects warrant investigation even when no individual actor intended the resulting disparity.

6.1 Formal permissions and realizable epistemic actions

The distinction between resources and substantive opportunities has an established history in capability-oriented accounts of freedom [56]. Here it provides a limited analytical motivation, while the formalization is specific to the paper’s relational institutional model. A formal permission identifies an action that institutional rules recognize as eligible. A practically realizable action requires a compatible pathway through applicable permissions, available means, commitments, and tolerable exposure to risk. These two conditions can differ substantially. Neither the present construction nor a list of material inputs supplies a universal index of flourishing, justice, or scientific quality.

Let i denote a situated participant, h the institutionally documented relational history, and a a candidate action. Examples include submitting an original study, auditing a source, requesting a correction, filing an appeal, giving testimony, or declining further participation. Let $\mathcal{A}_i^{\text{form}}(h)$ be the actions for which i has formally recognized standing. For each a , let $\mathcal{X}_i(h, a)$ denote possible implementation plans, $\mathbf{b}_i(h)$ available resources by type, $\mathbf{r}_i(h)$ resources reserved for existing obligations and minimum continuity, and $\mathbf{c}_i(x; h)$ the resource demands of plan x . The components could refer to money, available hours, compute capacity, translation assistance, or access tokens; comparisons are componentwise within separately specified units. Let $\rho_i(x; h)$ describe an exposure measure under a declared risk model and $\bar{\rho}_i(h)$ the participant’s feasible exposure limit. The operational set in Equation 29 is intentionally conditional on a chosen inventory of feasible plans and measured capacities.

$$\mathcal{A}_i^{\text{eff}}(h) := \{a \in \mathcal{A}_i^{\text{form}}(h) : \exists x \in \mathcal{X}_i(h, a) \text{ such that} \\ \mathbf{c}_i(x; h) \preceq \mathbf{b}_i(h) - \mathbf{r}_i(h), \quad \rho_i(x; h) \leq \bar{\rho}_i(h)\}. \quad (29)$$

The set is descriptive relative to the specified constraints and should not be interpreted as a measurement of what people ought to tolerate. A high measured risk tolerance might reflect lack of safer alternatives rather than genuine independence. Likewise, an investigator who omits social obligations or the cost of obtaining information will overstate the participant’s effective opportunities. Risk need not be reducible to a probability, and scarce resources need not have defensible exchange rates across their components. The representation permits such complications to be recorded through different risk constraints, path requirements, and resource dimensions.

Equation 29 implies the inclusion $\mathcal{A}_i^{\text{eff}}(h) \subseteq \mathcal{A}_i^{\text{form}}(h)$ by definition. The reverse inclusion requires the substantive assumption that each formally authorized act admits at least one compatible plan within the participant’s resource and risk capacities. Comparing two persons with the same formal rights therefore requires more than comparing their recognized permissions. The capacity to contest may differ even when the official appeal form, deadline, and nominal fee are identical. In historical reconstruction, the relevant resources and commitments should be indexed to the situation under study, without presuming a fixed or ontologically primitive progression from a single past to a single future.

Institutional arrangements can improve effective participation without simply increasing personal resources. An archive might provide trained assistance, a secure disclosure channel, affordable remote

Table 10: Material conditions affecting the exercise of epistemic participation. The entries describe possible mechanisms for inquiry; their presence and effects require case-specific evidence.

Condition	Potentially constrained action	Evidence for inquiry
Protected working time and income	Replication, response to reviews, or pursuit of appeal	Contracts, time records, workload, financial assistance
Compute, equipment, and documentary custody	Independent audit or independent production of evidence	Access logs, service terms, audit records, equipment queues
Training, language support, and procedural advice	Comprehension of standards and preparation of challenge	Guidance offered, translation availability, legal support
Funding and career dependence	Dissent, refusal of instructions, reporting an error	Decision rights, grant renewal arrangements, grievance protection
Care, disability-related, and mobility resources	Attendance, documentation, sustained participation	Accommodation procedures, available remote routes, actual burden
Independent review and protection from retaliation	Submission and continued pursuit of remedy	Jurisdiction, confidentiality, protection rules, observed pathways

access, or accessible explanations of evaluation criteria. A research institution might preserve employment while allegations are independently reviewed, fund replication work, or ensure that a person can withdraw without surrendering unrelated entitlements. Such changes may expand $\mathcal{X}_i$, change $\mathbf{c}_i$, reduce ρ_i , or alter the formal set itself. The categories should remain distinguishable when an intervention is evaluated: cheaper filing, extended deadlines, protected standing, and independent appellate authority target different mechanisms.

Table 10 makes the practical scope of participation concrete without claiming that every institution manifests every barrier. Accessibility can improve through accommodation and redesign without presuming a single standardized participant. The ability to produce or challenge evidence may be distributed across teams; in that case the relevant unit might be an organization, a participant-network, or a coalition rather than one individual with an imagined self-sufficient resource bundle. Such collective capacities should be represented explicitly rather than silently attributed to an isolated person.

6.2 Verification labor and the maintenance of evidentiary infrastructures

The production of public evidence relies on work whose contributions are unevenly visible. Researchers collect and interpret records, while librarians, archivists, research assistants, technicians, data stewards, translators, maintainers, reviewers, and participants in affected communities often preserve the conditions of intelligible inquiry. Professional arrangements may distribute this labor across stable employment, temporary contracts, unpaid participation, contracted services, or volunteer effort. These distinctions affect costs, incentives, authority over the record, and who can afford to continue a dispute. A historical-materialist investigation asks which labor processes generate evidentiary capacity, who controls their conditions, how they are financed, and whose contributions are recognized or appropriated. The empirical answer may differ across universities, civil-society archives, companies, and public agencies.

Prior work on the ecological character of information infrastructure makes clear that access and maintainability depend on situated organizational practices [59]. OECD analysis documents concern about fixed-term and uncertain career pathways in academic research and examines policy options for more sustainable employment and governance [44]. These sources motivate inquiry into how institutional rules allocate the labor of verification; they do not supply a general numerical estimate of the labor burden in the present framework. A researcher who creates a publicly available dataset, for example, may still need to undertake continuing error correction, documentation, response to requests, and version preservation. Public accessibility can therefore be sustained by costly recurring work even when use of the published file is free of charge.

Let $\mathcal{T}(h)$ be a documented set of labor episodes needed to maintain or contest a specified evidentiary record, with actor $j(\tau)$, episode type $k(\tau)$, and recorded hours $\ell_\tau \geq 0$. A bookkeeping identity for

observed hours is

$$L_k^{\text{obs}}(h) = \sum_{\tau \in \mathcal{T}(h)} \mathbf{1}\{k(\tau) = k\} \ell_{\tau}, \quad k \in \{\text{produce, preserve, verify, translate, remedy}\}. \quad (30)$$

Equation 30 is an accounting device, not a value theory or a causal model. It covers only recorded episodes with a declared classification convention; informal mentoring, emotional work, opportunity costs, and unreported maintenance can remain absent. Several labor categories may overlap in practice, requiring a primary coding rule or explicitly fractional allocations if additive totals are desired. Monetizing the hours would require further normative and empirical decisions about pay, opportunity cost, heterogeneous skills, and the distribution of unpaid work. In particular, a total labor count cannot by itself establish the epistemic value of a contribution.

Control over infrastructure also matters. A person authorized to evaluate evidence may lack access to compute required for reproduction, while a facility administrator may govern queue priority, data retention, and the admissibility of access requests without serving on the formal evaluation committee. The location of a bottleneck is therefore frequently relational: a funder, a custodian, a professional association, and a platform may jointly determine the viability of verification. A record of their actions, dependencies, and the available alternatives is more informative than a single institutional label such as “open” or “closed.” Some access limits safeguard confidentiality, participant welfare, Indigenous data sovereignty, or commercial and security interests. Analysis must distinguish the grounds and proportionality of restrictions from their material effects, while protecting legitimate confidentiality [11, 41].

Contested cases make the distribution of verification labor especially consequential. A contributor may be required to produce a detailed provenance account while the institution that holds the decisive documents can respond with a brief summary. A claimant with limited time may face a succession of document requests, technical formats, and unexplained reversals. Conversely, an unfounded allegation may impose considerable evidentiary and professional costs on the person asked to respond. The just allocation of evidentiary obligations requires consideration of the parties’ control over records, the severity of possible consequences, and the institutional purposes of review. It cannot be inferred from the moral status of claimant or respondent alone.

6.3 Precarious contracts, financing, and dependence on decision-makers

Funding decisions, contractual renewal, laboratory access, professional recommendations, and the possibility of continued employment may be controlled by actors whose testimony or evaluation a participant could otherwise question. Dependence can arise without a direct prohibition on dissent. The participant may formally retain the right to criticize a method while reasonably anticipating loss of access to critical equipment, administrative delays, stalled contract renewal, or exclusion from future collaboration. A dependent actor might nonetheless exercise voice; other actors may express agreement sincerely. The task is to study the conditions of choice rather than classify every instance of assent as either genuine or coerced.

Hirschman’s distinction among exit, voice, and loyalty provides a useful vocabulary for the range of institutional responses to dissatisfaction [29]. In knowledge institutions, exiting may involve abandoning an archive, laboratory, journal, employer, or research network; voice may include methodological criticism, complaints, appeals, or collective organizing. The nominal option of leaving a specific organization does not imply an available alternative capable of sustaining livelihood, legal status, research continuity, or community commitments. Likewise, “loyalty” may express commitment to shared aims while potentially altering the willingness to exercise dissent. A concrete inquiry should distinguish these configurations, including protected internal correction, independent external challenge, and strategic silence.

For a narrowly specified binary comparison, let v denote a feasible act of voiced challenge and q a feasible act of acquiescence. Conditional on a participant’s information $\mathcal{I}_i$, write $B_i(v, q \mid \mathcal{I}_i)$ for the perceived benefit of voice relative to acquiescence, $C_i(v, q)$ for incremental material and procedural costs,

and $S_i(v, q)$ for the participant's assessed incremental exposure to adverse sanctions or lost opportunities. Equation 31 defines a decision margin; it is a descriptive illustrative representation, not an asserted universal psychological law.

$$\Delta_i^{\text{voice}} = B_i(v, q \mid \mathcal{I}_i) - C_i(v, q) - S_i(v, q), \quad v, q \in \mathcal{A}_i^{\text{eff}}(h). \quad (31)$$

If a particular actor follows the stipulated maximization rule, voice is selected when the margin is positive; ties and mixed strategies require an additional behavioral specification. A challenge outside $\mathcal{A}_i^{\text{eff}}$ may be unavailable regardless of expected benefit. An external observer generally cannot recover the three terms separately from the observed choice. An observed decision to endorse an institution is consequently compatible with approval, uncertainty, strategic dependence, risk aversion, or the absence of viable alternatives. The earlier distinction between epistemic trust and visible deference in Section 5 thus has a material counterpart. Conversely, participation in a dispute is not proof that the participant's claim is substantively correct.

Organizational inequality can arise through interlinked routine practices even when a single discriminatory instruction is difficult to locate. Acker's framework of inequality regimes offers one way to study these interdependencies, while requiring attention to the particular organizational setting [2]. Fixed-term contracts, grant-mediated hierarchies, language requirements, academic status, and allocation of routine maintenance may interact to shape participation. The OECD report on academic precarity identifies institutional and policy responses including human-resource governance and employment arrangements; it should not be treated as an estimate of the effects of any individual policy in the fictional cases presented here [44]. The empirical questions include who can authorize resources, who is required to document work, who may safely refuse, what employment protections apply, and how these arrangements differ within and between organizations.

Formal standing and practical dependence can also move in opposite directions. A specialized researcher may possess substantial expertise and a formal committee seat but be financially dependent on one grant sponsor. A junior technician may have little authority over funding yet control indispensable practical knowledge about an instrument. A community archive may provide accessible evidence while lacking formal recognition from a credentialing institution. These are analytically heterogeneous relations, and an actor's authority in one domain should not be projected onto every relevant activity. A trajectory-level record must distinguish the source of power, its scope, the specific dependency, the decision rights involved, and the occasions on which a practical alternative was available.

6.4 Material accessibility of appeals and corrective pathways

A right to contest an evaluation matters institutionally when at least some affected parties can initiate, sustain, and obtain an intelligible response to a relevant challenge. The design of remedy may require notice, procedural guidance, access to pertinent records, opportunities to respond, and independent review. The requisite safeguards depend on the risks and obligations of the setting: publication corrections, employment grievances, licensing appeals, and disputes involving sensitive personal data need not use identical procedures. The costs of an appeal include fees and lawyer time, but also preparation of technical evidence, lost work, translation, travel, risk of disclosure, and the opportunity costs of waiting. Some costs fall on institutions; others are shifted to participants through administrative conventions.

Ahmed's qualitative investigation of complaints in universities describes the discrepancy between written policies and the institutional paths complainants actually encounter [3]. Its relevance here is conceptual and methodological: the posted presence of a process cannot establish that the process is feasible, safe, or capable of producing a reasoned correction in all settings. Nor should the existence of difficulties in documented cases justify a universal claim that complaints are futile. The framework developed here makes the pathway itself an empirical object, with opportunities for a comparison of procedures and participant capacities.

A compact pathway representation clarifies the difference between resource insufficiency and formal exclusion. Consider a finite directed graph $G = (V, E)$ with a filing state s and a state t representing

arrival at substantive independent review. An edge e is an institutional transition. For person i , let $\alpha_i(e) \in \{0, 1\}$ indicate whether the transition is authorized and usable independently of the scalar filing resource considered below. Let $c_i(e) \geq 0$ be its monetary-equivalent *within this deliberately one-dimensional submodel* and $b_i \geq 0$ the corresponding available budget. The reachable remedy indicator in Equation 32 captures an existence claim, not the probability of winning or the adequacy of review.

$$R_i(G, b_i) = \mathbf{1} \left\{ \exists \pi \in \Pi_{s,t}(G) : \prod_{e \in \pi} \alpha_i(e) = 1 \text{ and } \sum_{e \in \pi} c_i(e) \leq b_i \right\}. \quad (32)$$

Here $\Pi_{s,t}(G)$ contains directed paths connecting s to t . When no path exists, the indicator is zero. Path costs exclude irreversible risks and nonmonetary resource constraints, which were represented more generally in Equation 29. A more realistic application would track several costs, time-dependent transitions, contingent eligibility, and intermediate outcomes. Arrival at review is distinguished from a favorable decision, implementation of remedy, or subsequent correction of the public record.

Proposition 6.1 (A blocked remedy cut persists under a budget-only subsidy). *Suppose the finite graph G , its directed edges, and the usability indicators $\alpha_i(e)$ are fixed. If a set $K \subseteq E$ intersects every s -to- t path and $\alpha_i(e) = 0$ for each $e \in K$, then for every finite budget $b_i \geq 0$ and increment $\delta \geq 0$,*

$$R_i(G, b_i + \delta) = 0. \quad (33)$$

Proof. Every path $\pi \in \Pi_{s,t}(G)$ contains an edge in K . At least one factor in $\prod_{e \in \pi} \alpha_i(e)$ is therefore zero, so no path satisfies the usability condition in Equation 32, irrespective of its cost or the available budget. If $\Pi_{s,t}(G)$ is empty, reachability is also zero by definition. Hence increasing b_i alone cannot change the indicator. $\square$

Equation 33 is a conditional impossibility result, confined to the specified fixed-route model. A payment waiver can help when finance is the binding barrier, yet it cannot grant legal standing, supply a withheld authorization, or create an independent appellate authority when every available route requires a forbidden transition. The result does not imply that money can never change standing: greater resources may permit legal advocacy, relocation, acquisition of a credential, or development of alternative institutions. Such responses change G , α_i , and possibly the relevant participant or forum, violating the fixed-structure premise. Similarly, an observed nonuse of appeal is insufficient to determine whether the decisive constraint was lack of standing, expense, confidentiality, fear of sanctions, inadequate notice, satisfaction with the initial decision, or some combination of these.

An alternative view of reachability separates access and outcome conditional on access. For a declared population $\mathcal{P}$ and institutional arrangement g , define the empirical target

$$\Pr_g(\text{correction} \mid \text{eligible}) = \Pr_g(\text{review reached} \mid \text{eligible}) \Pr_g(\text{correction} \mid \text{review reached, eligible}), \quad (34)$$

where “correction” entails arrival at the relevant review stage in the defined workflow. Equation 34 is the elementary product rule, not a causal decomposition or an evaluation of whether a correction was warranted. Its denominator must be specified carefully: eligibility itself may be contested or unrecorded, and the set of people who attempt review can be selected by resources, confidence, legal knowledge, or anticipated outcome. A procedure that shows a high rate of correction among accepted appeals may still be inaccessible to many potential appellants. Conversely, a low correction rate can be compatible with good initial decisions, high procedural barriers, weak grounds of appeal, or a mixture of mechanisms.

6.5 Differentiated burdens and the distribution of institutional responsibility

The allocation of evidentiary burdens has an ethical dimension distinct from whether a particular claimant prevails. Suppose one party controls a laboratory’s logs while another can access only the published summary. A rule demanding the same documentary proof from both can impose unequal effective burdens. On the other hand, compelled disclosure of sensitive research data may jeopardize third-party privacy

or safety. Fair procedure requires specifying why evidence is requested, which actor can reasonably produce it, whether secure alternatives exist, and how a decision can be challenged without creating disproportionate risk. Formal equality of procedural text and equal practical opportunity are different evaluative objects.

Young’s account of structural injustice and prospective political responsibility helps direct attention toward distributed conditions of disadvantage that may arise without a single liable decision-maker [65]. A responsibility to improve institutions is analytically distinct from an allegation that a named actor intended or caused a particular wrong. The relevant relationships might include a funder designing short-term incentives, an archive allocating inadequate staff, a committee relying on rigid deadlines, and a platform presenting only compressed sources. Assessment should trace each actor’s actual discretion, knowledge, authority, and feasible corrective role. Epistemic justice also depends on credibility practices and the ability of situated knowers to enter deliberation [21, 37], but it does not license treating every disputed judgment as an injustice.

One conceivable allocation principle is to place a greater share of verification responsibility on an institution when it exclusively controls decisive records and possesses the corresponding technical capacity, subject to proportionality, privacy, and the risks to people involved. This is a normative design proposal, not a theorem derived from the feasible-set equation. Another principle favors independent assistance when an individual’s livelihood depends on the organization whose decision is challenged. Both can conflict with the need to protect personnel from unfounded complaints and to conserve limited research resources. A workable institutional arrangement may require secure evidence custody, confidential review, disclosed standards, bounded deadlines, and separately accountable adjudicators. The costs of such safeguards should be studied together with their benefits, rather than being assumed negligible.

The material availability of dissent also bears on how consensus should be interpreted. Shared conclusions can result from independent appraisal, convergence on a well-supported theory, common reliance on a source, the exclusion of certain voices, or strategic behavior under sanctions. Observed agreement alone rarely identifies these histories. Where public challenges expose a precarious participant to asymmetric loss, institutions may need protected channels for uncertainty, minority interpretations, and correction of errors. Such protections can also be misused or impose burdens on respondents. The appropriate inquiry therefore concerns the quality of reasons, evidence management, protection against retaliation and abuse, and review of the process itself.

6.6 Identification strategies for participation and material dependence

Research on material conditions should separate descriptive disparities, causal effects of specific arrangements, and judgments about institutional legitimacy. A cross-sectional comparison of complaint rates between employment groups, for instance, may confound exposure to problematic decisions, capacity to identify a challengeable error, access to documentation, willingness to complain, and expected consequences. Successful applicants may differ from nonapplicants before an assistance scheme begins. Moreover, the effect of a resource intervention may vary with the quality of the underlying claim and with access to decision-makers. The empirical question should therefore specify both an intervention and an outcome, along with the population to which an estimate could apply [28].

For a defined eligible population $\mathcal{P}$, let $Z_i \in \{0, 1\}$ denote the availability of a specified procedural assistance package, such as funded document support with no change in standing rules, and $Y_i(z)$ an indicator that person i reaches a specified review stage under intervention status z . The average effect in Equation 35 is an estimand, not an observed result.

$$\tau_{\mathcal{P}} = \mathbb{E}[Y_i(1) - Y_i(0) \mid i \in \mathcal{P}]. \quad (35)$$

Identification from randomized allocation would require credible implementation, well-defined treatment and outcome, appropriate handling of attrition, and attention to interference when institutional staff or appellate queues respond to treatment assignment. The effect of offering assistance may differ from the effect of receiving it. A package combining fee waiver, protected confidentiality, advice, and automatic standing may be practically useful but does not isolate the causal contribution of each component.

Table 11: Illustrative designs for investigating the material conditions of epistemic participation, including contrasting explanations that require separate tests.

Empirical contrast	Potentially informative evidence	Key identification limitation
Eligibility versus reached review	Rules, case-flow records, support access, and denominator of affected parties	Silent eligible cases and unobserved claim quality
Assistance-package offer versus control	Prospective randomized or phased support, where ethical and feasible	Interference, compliance, and bundled treatment mechanisms
Fixed-term versus protected employment	Contracts, renewal authority, reported and recorded voice	Sorting, exposure, job role, and strategic reporting
Source custody versus access to correction	Independent provenance review, custody and retrieval logs	Withheld records and legitimate confidentiality constraints
Procedural reform before versus after	Policy versions, appeals, delays, protection and outcomes	Concurrent institutional changes and changing case mix

Nonrandomized reforms require stronger assumptions about selection, background trends, and concurrent institutional changes. No such effect has been estimated in this manuscript.

Several complementary forms of evidence can help distinguish institutional mechanisms. Procedure maps and documentary audits can identify explicit barriers, while administrative time-series and independent case reviews can examine changing workloads, retention, and correction outcomes. Qualitative interviews can reconstruct experienced costs, anticipated sanctions, and alternative paths not recorded in a formal rulebook. Comparative institutional histories can illuminate how funding arrangements and professional jurisdictions evolved. Confidential surveys may elicit perceived safety or willingness to challenge; their interpretation must account for reporting bias and the consequences of participation. The evidentiary limitations of each approach should remain explicit.

Table 11 shows why a single observed indicator seldom establishes the source or normative meaning of participation disparities. Within a specified population and institutional setting, the following hypotheses are sufficiently narrow to guide a future research design without purporting to be general laws.

Hypothesis 6.2 (Effective assistance at a material bottleneck). For otherwise eligible individuals whose appeal pathway is usable and whose binding constraint is the resource requirement reduced by a specified support intervention, offering that intervention will increase the probability of reaching the defined review stage, provided there is uptake and no countervailing change in sanctions, queues, or case handling.

This hypothesis requires independent measurement of the bottleneck and of reachability. Treatment heterogeneity is expected when participants differ in legal standing, privacy needs, underlying claims, or pre-intervention capacity. A study may find a null effect if assistance fails to target the binding constraint, even when the assistance itself is genuinely provided.

Hypothesis 6.3 (Security of participation and protected critical voice). Where participants face meaningful employment or resource dependence, a credible reduction in expected retaliation, with informational access and procedural standing held sufficiently stable, will increase the share of participants willing to raise an independently specified concern through a protected channel.

A change in reports may reflect altered exposure, perceived protection, knowledge of channels, or reporting incentives rather than a change in the incidence of underlying errors. Verification of the hypothesis would therefore require complementary measures of reporting propensity, case quality, channel familiarity, and actual protection. The hypothesized direction is conditional, not a universal prediction for all employment relations or appeals systems.

6.7 Material organization of epistemic power and the scope of this inquiry

The historical-materialist contribution of this section is the identification of relations of production and reproduction through which epistemic authority becomes practically exercisable. Research infrastructure, access rights, wages, grant conditions, professional jurisdiction, and administrative labor organize the conditions under which evidence can be produced, encountered, evaluated, and challenged. Their distribution can grant capacities to some actors while making other actors dependent on the same institutions they would need to contest. The resulting asymmetries are historical and revisable. They do not imply a universal path of institutional development, a single hierarchy of epistemic value, or a necessary convergence of all participants' interests.

The formal constructions give a limited but disciplined vocabulary. Equation 29 distinguishes institutional permission from feasible action; Equation 30 records a subset of the labor required to sustain evidence; Equation 31 shows why observed assent can be consistent with different incentives; and Equation 32, together with Proposition 6.1, identifies the difference between a costly route and a route blocked by a nonfinancial rule. These are analytic representations with explicit assumptions, not measurements of actual institutions. The section also identifies institutional improvements whose appropriate use must be judged through evidence, context, rights, and the distribution of risks.

Material participation links the epistemology of trust to the structure of power without collapsing the two. An authoritative decision may be correct even if some affected people had little capacity to challenge it, while an inclusive process can reach an erroneous conclusion. Nevertheless, opportunities for scrutiny and protected correction can contribute to responsible institutional knowledge-making, and persistent material barriers may constrain what the observable record warrants an observer in inferring about genuine agreement. The following section develops feedback between trust, reputation, and institutional power. Its dynamic claims will have to remain conditional on the differentiated capacities and material constraints established here, rather than presuming that formal rights or declarations of trust directly measure the distribution of authority.

7 Trust, Institutional Reproduction, and Power Transformation

This section examines how institutional distributions of epistemic authority may change through repeated practices of endorsement, delegation, verification, contestation, and correction. Its objective is to give a conditional account of feedback between trust-related judgments and the allocation of powers over relational evidence. Sections 6 and the preceding analysis distinguish formal standing, actual participation, visibility, and evaluative authority. The present section brings these mechanisms into a provisional dynamic framework. It first separates judgments, public signals, and material allocations; then specifies an illustrative feedback model with an exact stability result; examines repair, protected challenge, and institutional learning; and considers exit, alternative authorities, and research designs for identifying changes in power. Historical-institutional analysis is used to interpret the mechanisms, while the mathematical models delimit possible consequences under explicitly stated conditions. Neither the existence of feedback nor its direction is presumed to be universal.

Institutional trust has at least two consequences that are often conflated. An individual may grant evidentiary weight to an expert because the expert has repeatedly provided reliable analysis. The same individual, or an institution acting in their name, may also support a decision rule granting that expert control over subsequent standards, credentials, and records. The former concerns an assessment of a source within a domain. The latter concerns a distribution of institutional authority that can subsequently determine which sources are accessible and assessable. An attribution can be warranted while its institutional consequences are excessive, or a procedurally legitimate delegation can coexist with imperfect evidentiary performance. Analyses of political trust and trustworthiness provide a relevant precedent for separating judgments of an authority from the properties of its performance [34]. The present argument adds an explicitly trajectory-sensitive representation of how these distinctions can matter for later documentation and recognition.

7.1 Institutional state variables and trust-related signals

A feedback account requires an indexed succession of institutional review situations without taking a single chronological ordering to be an ontological primitive. Let k index successive, institutionally identifiable review or decision occasions within a reconstructed history h . The indexing is operational: two activities that overlap, or occur in different jurisdictions, may have to be modeled through a partially ordered event structure rather than a common clock. Let j index a recognized source, organization, or decision forum and i an affected observer or participant. Define a state vector X_k whose components have distinct observation and measurement procedures. Equation 36 gives one possible bookkeeping representation.

$$X_k := (\tau_k, \mathbf{d}_k, \mathbf{w}_k, \mathbf{b}_k, \mathbf{a}_k, \mathbf{c}_k, \mathbf{q}_k). \quad (36)$$

Here $\tau_{ij,k}$ is a participant-specific epistemic assessment of source j concerning a specified kind of claim; $d_{ij,k}$ is an observable or elicited declaration of endorsement; $w_{j,k}$ is a vector of delegated or de facto powers over such acts as accreditation, ranking, access, or the adoption of standards; $b_{j,k}$ records material capacities; $a_{ij,k}$ records opportunities to obtain or use evidence; $c_{ij,k}$ records feasible contestation opportunities; and $q_{j,k}$ records independently specified performance or correction-relevant observations. The symbols denote types of information rather than mutually convertible scales. In particular, a numeric account of institutional power would require a defined aggregation of powers across domains, supported by an explicit normative and empirical justification. A scalar illustration introduced later deliberately drops these distinctions and cannot be read as their measurement.

Trust judgments are domain- and task-sensitive. A successful source may be a credible guide to one method while lacking appropriate authority concerning another. Likewise, formal delegation may authorize a decision without showing that the decision is reliable. Suchman's distinction among pragmatic, moral, and cognitive forms of organizational legitimacy is useful here because different audiences can recognize institutional standing for distinct reasons [60]. In the present model, legitimacy claims, epistemic reliability, and authority allocations are separate inputs and outcomes. The existence of a social norm of deference should accordingly be investigated rather than encoded as evidence of accurate judgment.

The public endorsement signal $d_{ij,k}$ has several possible generating processes. It may communicate sincere confidence, strategically protect employment or access, reproduce an earlier testimonial chain, or express assent to a procedure despite disagreement with the underlying claim. A conditional mixture representation makes this measurement problem explicit. With $Z_{ij,k}$ denoting an unobserved mode of expression, Equation 37 states the observed conditional distribution.

$$\Pr(d_{ij,k} = 1 \mid H_k) = \sum_{z \in \mathcal{Z}} \Pr(d_{ij,k} = 1 \mid Z_{ij,k} = z, H_k) \Pr(Z_{ij,k} = z \mid H_k). \quad (37)$$

The recorded history H_k may include documented incentives, disclosure rules, past actions, and public statements. Equation 37 is the law of total probability, provided the latent modes form an exhaustive measurable partition. It yields no unique decomposition from an endorsement rate alone. The latent classes, their prevalence, and the conditional response probabilities remain unidentified without further evidence or restrictions. For example, in an imaginary academic review body, a unanimous vote under credible retaliation risks and an identical vote under independent scrutiny could have sharply different epistemic implications, even where the same vote total is recorded. This ambiguity connects the material dependence analysis of Section 6 to the power feedback developed here.

Table 12 locates candidate indicators and their principal ambiguities. The model has an empirical role only if an inquiry specifies the actor, decision domain, unit of analysis, and applicable review situation for each variable. A high score on one dimension supplies no general-purpose ordering of institutions. A cross-jurisdictional comparison should also document divergent meanings of an appeal, a credential, or a public statement before applying common indicators.

Table 12: Distinct states and signals in institutional trust feedback. The specified measurement tasks prevent one category from silently substituting for another.

Construct	Potential evidence	Main interpretation risk
Epistemic assessment	Task-scoped probabilistic judgment; reasoned evaluation	Reported confidence depends on elicitation and incentives
Public endorsement	Recorded votes, citations, nominations, testimonials	Compliance, affiliation, and repeated relays resemble belief
Delegated authority	Decision rights, accreditation mandate, control of rubrics	Formal jurisdiction differs from effective control
Material capacity	Staffing, archival systems, time, budgets, secure access	Available budgets omit opportunity and labor costs
Contestability	Protected channels, standing, decisions on objections	Formal appeal rights may be inaccessible or ceremonial
Observed performance	Independent checks, correction outcomes, later validation	Measured success depends on selection and assessment rules

7.2 Reputation, resource allocation, and conditional reinforcement

Institutional authority can affect the distribution of future evidence even where the original delegation responded to justified performance. An expert’s past success may attract invitations and funding; those resources can improve documentation and permit more extensive verification; the resulting visibility can generate further endorsements. Conversely, a contribution may remain less frequently evaluated when its producers lack access to the dominant review system. Merton’s analysis of scientific recognition describes a related cumulative advantage in reward and communication [38]. Pierson’s account of increasing returns and path dependence shows why sequence and institutional timing can matter under specified reinforcing processes [48]. These works motivate the mechanisms without establishing that each case follows a self-amplifying law.

A general transition kernel can represent this conditional dependence without imposing a particular sign on its components. Let E_k collect admissible new evidence, I_k the operative institutional rules, and U_k the background changes that an investigator measures or explicitly leaves unmodeled. Equation 38 describes the evolution of the typed state.

$$X_{k+1} = F_k(X_k, E_k, I_k, U_k). \quad (38)$$

Equation 38 is a structural placeholder for candidate transition mechanisms, not an estimated Markov process. In particular, an arbitrary F_k offers no empirically testable restriction. A substantive study must specify which components are treated as inputs, the relevant delays, how actors influence each other’s data, and which alternative transitions are plausible. The transition can depend on longer histories not summarized in X_k ; if so, the proposed state vector must be augmented, and the one-step representation should not be interpreted as a sufficiency claim.

For a narrower analytic illustration, suppose one scalar $w_k \in [0, 1]$ represents a standardized share of decision influence within a fixed forum. Let $\ell(x) = (1 + e^{-x})^{-1}$ be the logistic response. Assume a stylized mechanism under which a larger existing share tends to produce more visible endorsements and a fraction of endorsements is converted into later authority. With nonnegative parameters b, α, θ and a response threshold κ , Equation 39 defines a single-domain map.

$$w_{k+1} = f(w_k) := b + \alpha \ell(\theta w_k - \kappa), \quad 0 \leq b, \quad 0 \leq \alpha, \quad b + \alpha \leq 1. \quad (39)$$

The intercept b collects power secured independently of the visible endorsement channel, α scales the channel’s institutional effect, and θ describes responsiveness of endorsements to incumbent influence. The threshold κ sets the location of that response. These parameters are hypothetical and lack a common empirical interpretation outside the specified scalar measurement. The map also holds rules and competing actors fixed. It therefore has no general claim to model the actual dynamics of universities, archives, or public agencies.

Proposition 7.1 (Contraction of a bounded endorsement feedback). *For Equation 39, suppose $0 \leq \alpha\theta < 4$ and $0 \leq b$, $0 \leq \alpha$, $b + \alpha \leq 1$. Then f maps $[0, 1]$ to itself, has a unique fixed point in $[0, 1]$, and every sequence generated by $w_{k+1} = f(w_k)$ with $w_0 \in [0, 1]$ converges to that point.*

Proof. For all real x , $0 < \ell(x) < 1$ and $\ell'(x) = \ell(x)(1 - \ell(x)) \leq 1/4$. Thus $f([0, 1]) \subseteq [0, 1]$ under the stated range restrictions, and $|f'(w)| \leq \alpha\theta/4 < 1$ for $w \in [0, 1]$. The mean value theorem shows that f is a contraction of the complete metric space $[0, 1]$. The contraction mapping theorem yields the unique fixed point and convergence from every initial state in that interval. $\square$

Proposition 7.1 specifies a regime in which an endorsement-mediated feedback channel approaches a unique influence level, even when incumbent influence positively affects new endorsements. Thus a positive local feedback need not produce unbounded cumulative concentration or multiple historical regimes. For $\alpha\theta > 4$, the derivative may exceed one in parts of the interval; multiple fixed points become possible for some choices of b and κ , though they are neither guaranteed nor inferred from an increasing response curve alone. The equality case $\alpha\theta = 4$ requires separate analysis; the stated proposition makes no strict-contraction claim there. Multiple feedback pathways, strategic changes to evaluation rules, and participant exit may alter the map altogether. The result constrains a toy model; evidence of institutional lock-in would still require an appropriate historical or empirical test.

7.3 Correction, answerability, and institutional learning

A correction can change epistemic judgment while leaving institutional authority intact. A corrected archive entry may improve future attribution; a review body's public explanation may make it easier to evaluate its standards; and a transparent response to criticism may strengthen warranted reliance even as a particular decision is reversed. Alternatively, a formal review procedure might leave ordinary practices untouched. Meyer and Rowan's work on institutionalized forms provides a basis for investigating gaps between ceremonial policies and operative routines [39]. Bovens's account of accountability distinguishes the actor whose conduct is at issue, the forum empowered to ask questions and pass judgment, and the possible consequences [7]. Both suggest the importance of examining what actually happens to a challenged decision and its evidentiary records.

Let $R_{j,k}$ denote a recorded correction request concerning j , $V_{j,k}$ an admissibly verified finding about the relevant record, and $P_{j,k}$ an implemented procedural response. Here a response can include a changed rule, an amended record, protected access to missing evidence, or a reasoned rejection supported by independent review. A local transition in epistemic evaluation can be written as a conditional distribution. Equation 40 distinguishes the request itself from verification and implementation.

$$\Pr(\tau_{ij,k+1} \in B \mid H_k, R_{j,k}, V_{j,k}, P_{j,k}) = K_{ij,k}(B \mid H_k, R_{j,k}, V_{j,k}, P_{j,k}), \quad (40)$$

for measurable sets B in the specified judgment scale. The kernel $K_{ij,k}$ in Equation 40 is an object to estimate or constrain, rather than a law saying that correction always raises or lowers trust. A participant may have increased confidence in an institution's corrective process while assigning lower confidence to a particular original claim. A separate response variable may be needed for each object of evaluation. More requests can indicate improved access, deteriorating decisions, growing participation, or some combination. Raw complaint counts consequently lack a stable interpretation in isolation.

A useful institutional distinction separates the reversibility of an individual outcome from the reversibility of a rule that generated it. An accreditation decision might be amended for one applicant while the underlying standard remains unavailable for challenge. Conversely, a new independent review process may change later cases without retroactively repairing past losses. A longitudinal study should identify the object corrected, the standing of affected persons, the labor needed to implement the correction, and the availability of remedies for harms that remain. The conditional pathway through which correction changes institutional power can involve renewed confidence, disciplinary learning, reduced asymmetry, or strategic resistance. The present framework retains those as competing mechanisms.

Table 13: Candidate feedback regimes and evidence needed to discriminate them. These are conditional mechanisms, not exhaustive institutional types.

Mechanism	Possible trajectory	Distinguishing observations
Performance-responsive delegation	Verified competence influences bounded decision rights	Independent outcome checks and documented scope of mandate
Status-amplifying delegation	Existing prominence increases invitations and future visibility	Selection records, resource allocation, and controls for prior quality
Protected correction	Substantiated challenges change records or procedures	Case histories, implemented remedies, recurrence of similar errors
Ceremonial accountability	Public review structures coexist with unchanged operative rules	Actual decisions, access to reasons, correction implementation
Dependence-constrained endorsement	Public assent persists amid costly dissent or exit	Protected elicitation, sanction exposure, employment conditions
Alternative authority formation	Excluded actors develop parallel assessment and archival capacity	Independent infrastructures, new entry routes, inter-forum recognition

Table 13 identifies mechanisms that could generate similar immediate observations but different subsequent institutional trajectories. The table is an analytic guide for case selection and measurement. Institutions may display several regimes simultaneously, differentiated by domain, affected population, or task. The relevant ethical assessment should ask whether corrective institutions provide defensible procedures and proportionate protection, and whether affected persons can actually use them. Procedural regularity, epistemic accuracy, and distributive justice can move together or apart.

7.4 Withdrawal, plural authorities, and thresholds of public voice

Power transformation can occur through actors' withdrawal of reliance, the exercise of voice within an organization, or the construction of alternative institutions. Hirschman's account of exit, voice, and loyalty identifies responses to organizational decline and provides a starting point for distinguishing continued membership from satisfaction [29]. Withdrawal of public support may be costly where a credential, income stream, research permit, or source archive is controlled by the institution that is challenged. Several actors may independently doubt an evaluation while continuing to express agreement because their perceived costs of speaking remain high. Apparent consensus can therefore persist until a coordination threshold is reached, and the resulting public transition need not correspond to a sudden change in individual beliefs.

To represent this possibility, define $s_{i,k} \in \{0, 1\}$ as participation in a particular protected public challenge, $m_{i,k}$ as the accessible proportion of other participants already engaged, and ϑ_i as a situated threshold. Let $F_{i,k}$ indicate that the relevant act lies in the effective participation set defined in Section 6. The simple conditional rule in Equation 41 represents a threshold process only when the institutional meaning of m and the constraints F have been specified.

$$s_{i,k+1} = \mathbf{1}\{F_{i,k} = 1\}\mathbf{1}\{m_{i,k} \geq \vartheta_i\}. \quad (41)$$

Granovetter's threshold models demonstrate how collective behavior can depend on the distribution of participation thresholds, rather than on aggregate preference alone [25]. Equation 41 adapts that formal intuition to a narrower epistemic setting. Its application would require observations of who could receive invitations, who had standing, whose participation was visible, and whether speaking opportunities were protected. Participants may also act because of duties, solidarity, or professional commitments; a single threshold representation does not exhaust these motives. In particular, silence cannot identify agreement, and a sudden increase in challenges does not prove that the underlying institutional error became more frequent.

Alternative authorities may emerge through independent repositories, interdisciplinary assessment networks, open contribution records, mutual verification, or accountable professional associations.

These arrangements may broaden the available grounds for judgment and reduce dependence on a single gatekeeper. They can also create fresh barriers, inaccurate reputational signals, and new concentrations of authority. Ostrom's work on conditional cooperation and institutional contexts suggests that cooperation and norm formation depend on local rules and actor heterogeneity [46]. The point here is to keep plural institutions available as an empirical possibility, while examining their own governance and their relations to incumbent structures.

An independent authority should be evaluated through the quality and contestability of its evidentiary practices, its protection of participants, and the extent to which its claims can be inspected. Simple numerical plurality is insufficient: several apparently different institutions may depend on the same source records, accreditation authorities, or funding gatekeepers. Conversely, a well-governed specialist authority may legitimately exercise concentrated decision rights within a narrow competence domain. Assessing the power structure therefore requires a typed map of dependencies and actual remedy pathways. The transformation of institutional power concerns which actors can alter the rules and evidentiary infrastructure, as well as which actors temporarily receive the highest number of endorsements.

7.5 Historical-materialist mechanisms of authority reproduction

Institutional feedback has a material basis in the labor and infrastructure through which knowledge is made durable. A scholar's work becomes assessable through submissions, translation, curation, storage, peer assessment, editorial decisions, and maintenance of searchable records. Authority over any of these activities can influence which work appears reproducible and which claims seem widely supported. Funding and employment arrangements affect the duration for which an investigator can sustain a line of inquiry, meet documentary standards, and respond to requests for verification. The prior section analyzed these conditions as constraints on participation. Here they also enter the processes that reproduce the authority of the organizations allocating resources.

Historical-materialist explanation should distinguish the creation of scientific and interpretive value from its recognition and circulation. A prestigious forum may perform valuable coordination, support specialized scrutiny, and maintain infrastructure that would otherwise be difficult to sustain. The same arrangements may channel invitations, citations, and research support toward already recognized participants. The mechanism must be specified at the level of labor processes and institutional rules, including who sets documentation standards, who pays the cost of producing compliant evidence, and which kinds of contribution can be credited. Merton's recognition mechanism [38] and Pierson's path-dependence account [48] provide relevant but nonidentical perspectives on cumulative effects. The present relational approach treats actual reproduction pathways as historically contingent and vulnerable to interruption or transformation.

Power in this setting can be productive, protective, or exclusionary depending on its exercise and the rights it constrains. A well-resourced archive may preserve fragile evidence and ensure safe access to sensitive records. A capable standards body may reduce arbitrary decisions by clearly specifying admissibility and evaluation rules. Yet each may also impose access fees, eligibility demands, or interpretive conventions whose burdens fall unequally. Assessment should include how authority was constituted, what it enables, how its bearers are held answerable, and which affected people can participate in revision. The distinction between beneficial institutional specialization and unjustifiable dominance requires substantive normative argument and evidence. It cannot be inferred from the mere numerical concentration of decision rights.

The coexistence of multiple institutional timescales deserves attention. Reputational changes can follow a highly publicized review, while employment contracts, professional credentials, and archival arrangements persist through much longer sequences of decisions. A rule may change rapidly in formal text but become effective only when staffing, information systems, and the work practices of reviewers change. Institutional change can also be partly reversible: an appeal process may be strengthened and later weakened, or a previously excluded contribution may receive belated recognition without repairing the earlier loss of opportunity. The model's review index k marks events at which such conditions can be

examined and does not assume monotonic improvement, inevitable decline, or a single social direction of history.

7.6 Research designs and identification of feedback regimes

The dynamic concepts developed here invite longitudinal research, but repeated measurements alone cannot establish causal feedback. A visible rise in a forum’s authority may reflect improved performance, control over recognition channels, changes in institutional funding, selection of prominent cases, or contemporaneous regulatory reform. Past authority can also affect which performance is independently assessed. These features raise problems of confounding, interference, post-treatment selection, and outcome measurement. A responsible research design should specify the intervention of interest, the institutional population to which the result would apply, and the history over which power is observed.

One possible estimand compares two well-defined institutional procedures for handling evidence-based challenges. Suppose $g^{\text{protected}}$ is an intervention that provides protected standing, accessible records, and independent review, while g^{ordinary} denotes a documented status-quo procedure. Let $Y_{j,K}(g)$ be a pre-registered outcome such as an independently verified correction rate or a power-distribution index at a later review occasion K . Equation 42 defines a population-average contrast.

$$\Delta_K := \mathbb{E}_{j \sim \mathcal{P}} [Y_{j,K}(g^{\text{protected}}) - Y_{j,K}(g^{\text{ordinary}})]. \quad (42)$$

Equation 42 is a causal target only after the population $\mathcal{P}$, outcomes, intervention versions, and institutional interference structure have been specified. Individual institutions may share credential standards, staffing networks, and professional audiences, so usual independence assumptions can be implausible. If the protection procedure changes who can be observed, a difference in recorded complaint resolution may partly reflect measurement and selection. A quasi-experimental reform study, a transparent comparative case reconstruction, or a randomized interface experiment could address different parts of the question, with different identifying assumptions. None by itself identifies the entire path from private judgment through endorsement and delegation to later authority.

A further assessment can compare reported confidence with performance within an explicitly described prediction task. If $p_{ij,k}$ is a pre-outcome probability elicited from an observer for a binary, independently assessed claim $Y_{j,k} \in \{0, 1\}$, Equation 43 defines a mean squared probabilistic error over a declared inclusion set $\mathcal{S}$.

$$\text{BS}(\mathcal{S}) = \frac{1}{|\mathcal{S}|} \sum_{(i,j,k) \in \mathcal{S}} (p_{ij,k} - Y_{j,k})^2, \quad |\mathcal{S}| > 0. \quad (43)$$

Equation 43 measures a feature of forecasting performance for the selected tasks. It does not measure moral legitimacy, the justice of a credentialing process, or the adequacy of institutional governance. The selection of evaluated claims matters, since powerful forums may be asked to address systematically different questions, and validation labels may reflect downstream institutional standards. Calibration plots, the distribution of case difficulty, missing outcomes, and access to independently reviewable evidence should accompany comparisons. Controlled study of status cues can then investigate whether endorsement and delegation decisions remain sensitive to incumbent authority after legitimate domain-relevant evidence is held fixed.

Hypothesis 7.2 (Feedback through visibility and delegation). In institutional settings where visibility-based endorsements materially influence later delegation, an exogenous increase in a source’s visibility will raise subsequent formal or de facto influence, conditional on baseline performance and the governing allocation rules. The size and sign of this effect may vary with the credibility and independence of the visible evidence.

Hypothesis 7.2 is a proposed mechanism, not a prediction of uniform reinforcement. It could be tested through reforms that change visibility without simultaneously altering merit criteria, with careful attention to spillovers and selection. The null or a reversed effect would be informative about the institutional conditions and could challenge an overly simple cumulative-advantage explanation.

Hypothesis 7.3 (Protected correction and rule responsiveness). Where participants can safely submit independently checkable counter-evidence and where review forums are required to record reasons and implement warranted remedies, procedural responsiveness to substantiated challenges will exceed that observed under comparable arrangements lacking these protections, subject to case-mix and implementation differences.

Hypothesis 7.3 concerns implementation and reasoned response, not a presumed rise in the number of complaints, public endorsement, or perceived trust. Its empirical evaluation should separate admissible challenges, validated findings, implemented changes, and subsequent recurrence. A fair and effective review system can uphold an original decision after careful scrutiny. A lower reversal rate is therefore not automatically evidence of poor accountability. Normative evaluation must consider the rights, costs, protective obligations, and differing interests of those involved.

Historical records could also support process tracing of a small set of changes: who controlled an archive before a reform; which evidentiary categories were recognized; how a group obtained standing; whether a contested rule changed; what work made the revision effective; and whether subsequent allocation decisions incorporated the new standards. In a parallel quantitative design, administrative records could measure application opportunities, independent review outcomes, funding changes, and disparities in access across participant groups. These materials would permit assessment of a set of pathways, while remaining open to rival explanations such as shifts in case quality or external legal requirements. An ethical protocol should avoid exposing individual whistleblowers, vulnerable applicants, or confidential research participants through the effort to increase institutional transparency.

7.7 Implications for epistemic authority and institutional change

The analysis identifies three distinct questions for the study of trust and power. The first concerns whether a source has warranted epistemic credibility for a stated task. The second concerns whether the resulting delegation of authority is legitimate, limited, and accountable. The third concerns how the allocation of authority changes future opportunities to produce, encounter, verify, and challenge evidence. Equations 36–38 specify a provisional organization of these questions, while Proposition 7.1 supplies a bounded stability result under unusually simple feedback conditions. More complex transitions can amplify, dissipate, or redirect influence, and identifying the regime requires evidence about actual institutional rules and histories.

Reproduction and transformation are related possibilities within the same relational framework. Warranted expertise can support cooperative inquiry and reliable coordination; dependence, barriers to correction, and closed evaluation rules may reproduce epistemic asymmetry; protected criticism and alternative infrastructures may change the feasible distribution of authority. The direction of change remains conditional on material resources, public incentives, institutional learning, and the responsiveness of remedies. Section 7 therefore prepares the subsequent examination of contestability and knowledge governance, where answerability, protected standing, and the practical design of institutional correction mechanisms will become direct objects of evaluation.

8 Contestability and Institutional Knowledge Governance

This section investigates the institutional conditions under which evidence-bearing decisions can be questioned, reviewed, corrected, and governed with due regard for epistemic competence and the rights of affected persons. Its objective is to connect the trajectory-shaping capacities developed in Section 2, the visibility arrangements of Section 3, the evaluative authority of Section 4, and the material constraints of Section 6 to feasible governance mechanisms. The analysis proceeds through the standing and scope of challenges, the independence and answerability of review, the treatment of protected evidence, the design of remedies, and the labor required to maintain responsive institutions. A restricted informational proposition clarifies one benefit of controlled auditing while also specifying why this benefit provides no general license for disclosure. The resulting claims are institutional design hypotheses and analytical

comparisons; they neither establish a universal governance optimum nor demonstrate that any particular institution has failed to honor its obligations.

The normative motivation is simultaneously epistemic and political. Knowledge institutions organize expertise and costly collective scrutiny, and their specialized authority may enable reliable inquiry. Yet the authority to define admissible objections, regulate archives, name legitimate contributors, and enforce outcomes can also determine which mistakes remain consequentially uncorrected. Longino’s analysis of criticism in scientific inquiry and Fricker’s account of epistemic injustice direct attention to the social conditions of recognition and objection [35, 21]. Ostrom’s institutional analyses provide a complementary framework for examining rules, participation, and low-cost ways to resolve disputes without treating a single centralized architecture as universally appropriate [47, 45]. In the present inquiry, *contestability* denotes a situated institutional capacity to bring relevant counter-evidence or a challenge to governing standards before a competent forum under practicable and accountable procedures. Its ethical adequacy must be assessed in relation to the particular rights, evidentiary burdens, and consequences at stake.

8.1 The objects and standing of institutional challenge

A challenge may concern the accuracy of a record, the provenance attached to it, the interpretation of its meaning, the evidentiary standard used in a decision, the authority of the decision-maker, or the rule under which future cases will be assessed. These objects require distinguishable responses. An archive can correct a mistaken attribution without changing a promotion rule. An academic tribunal can acknowledge a procedural defect while affirming a substantive finding after lawful reconsideration. A standards body can revise a rubric without awarding a retrospective remedy to everyone previously evaluated under it. Describing every challenge as an appeal against an outcome would conceal the capacities by which institutions govern the production and recognition of evidence.

Let c denote a specified case, i a person or representative organization seeking review, h the documented decision history, and g a review procedure. Write $\mathcal{O}_c$ for reviewable objects, including an item, decision, rule, and relevant institutional conduct. Equation 44 defines an effective challenge menu whose membership depends jointly on standing, admissibility, material accessibility, and applicable protections.

$$\mathcal{Q}_i^{\text{eff}}(h; c, g) = \left\{ (o, e, r) \in \mathcal{O}_c \times \mathcal{E}_c \times \mathcal{M}_c : \begin{array}{l} \text{Stand}_g(i, o) = 1, \quad \text{Adm}_g(e, o) = 1, \\ \text{Feas}_i(h; e, r, g) = 1 \end{array} \right\}. \quad (44)$$

Here $\mathcal{E}_c$ is the domain of candidate evidentiary submissions, $\mathcal{M}_c$ is the domain of requested review or remedial actions, and the three predicates are context-dependent institutional assessments. The set in Equation 44 is a classificatory device, not a mechanical test of legal entitlement. Standing might be held by a directly affected person, a research collective, an authorized representative, a participant exercising a public-interest review function, or another body under an applicable mandate. An institution must therefore specify who may challenge which decision and under which rules. Neither unrestricted standing nor automatic exclusion of indirect stakeholders follows from the model.

The accessibility predicate includes the capacity to secure necessary records, obtain competent interpretation, prepare a statement in an intelligible language, meet deadlines, and participate without disproportionate exposure to retaliation. Section 6 established that formal permissions and practical opportunity may diverge. Here that divergence becomes a design concern: a hearing to which a participant has nominal access may still be unusable when the record is withheld, the burden of proof is incompatible with the participant’s informational position, or the procedural cost exceeds available resources. Conversely, evidentiary relevance cannot be conferred solely by sincere belief, novelty, or disadvantage. Review forums must be permitted to reject unreliable submissions through publicly defensible procedures.

Institutional challenges also concern epistemic categories themselves. A form might accept only conventional authorship roles while a contribution was distributed across data stewardship, community translation, infrastructure maintenance, and hypothesis development. The representation of such work can be negotiated by changing documentary fields, describing role-specific evidence, or creating an

Table 14: Objects of challenge, procedural responsibilities, and evidence of practical access. Each row represents a distinguishable institutional review task, not an obligatory universal procedure.

Review object	Possible institutional response	Observations required to assess effectiveness
Record or provenance	Audit origin and amendment history; preserve both corrected entry and review trail	Access logs, source comparisons, reasoned amendment, notice to affected users
Contribution evaluation	Reconsider evidence under a declared task-specific rubric	Reasons, competence of reviewers, available counter-evidence, consistent treatment
Admissibility standard	Examine exclusions, evidentiary burdens, and justified exceptions	Rule text, excluded submissions, rights affected, comparative burden
Decision-maker authority	Review delegation, conflicts, competence, and recusal	Mandates, appointment records, dependencies, substitute reviewers
Institutional rule	Convene authorized rule revision with appropriate participation	Agenda-setting rights, stakeholder standing, amendment record, implementation
Protective restriction	Test confidentiality and safety rationales through competent limited-access review	Risk assessment, access controls, reviewer accountability, redaction rationale

interpretive route for exceptional cases. An account of testimonial and hermeneutical injustice gives reasons to scrutinize who has participated in defining those categories [21, 37]. It does not entail that every asserted contribution is valid or that every contested rubric is unjust. A review procedure should support both fair reception of a claim and warranted rejection when its grounds are insufficient.

8.2 Procedural stages and the identification of effective remedy

The central governance problem involves a sequence of distinct procedural opportunities. To register a substantive correction, a person typically needs a recognized route to present the challenge, an opportunity for the relevant materials to enter evaluation, a competent consideration of those materials, and implementation of the resulting disposition. Let S , E , V , and I be binary indicators for successful standing or filing, evidentiary admission, review completion, and implemented disposition, respectively, for a pre-specified eligible case population $\mathcal{P}$. Each success indicator is defined conditionally on the earlier stages having occurred. Equation 45 is a chain-rule decomposition of *procedurally complete review*, $C = SEVI$, under a fixed procedure g .

$$\begin{aligned}
 \Pr(C = 1 \mid g, \mathcal{P}) &= \Pr(S = 1 \mid g, \mathcal{P}) \\
 &\quad \times \Pr(E = 1 \mid S = 1, g, \mathcal{P}) \\
 &\quad \times \Pr(V = 1 \mid S = E = 1, g, \mathcal{P}) \\
 &\quad \times \Pr(I = 1 \mid S = E = V = 1, g, \mathcal{P}).
 \end{aligned} \tag{45}$$

Equation 45 does not assume independence among its stages. It also makes no claim that a completed review must overturn the challenged decision. An implemented disposition may be a documented correction, a protective order, a new hearing, a justified affirmation of the original decision, or another response permitted by the governing rules. The stages must be measured over comparable cases, with an explicit observation window. High completion rates can coexist with mistaken adjudication, while low initial filing rates may result from justified confidence, fear of sanctions, informational exclusion, or a low incidence of actual error. Counts alone cannot distinguish these causes.

Table 14 locates remedies by their actual object. A procedural guarantee may be violated without a substantive finding being false; an evidentiary error may be corrected without restoring lost income, time, or professional opportunity. Consequently, remedy assessment benefits from distinct variables for

recognition of an error, correction of the official record, revision of the operative procedure, restitution where appropriate, and recurrence of the same type of failure. The procedural idea of answerability developed by Bovens requires an identifiable forum capable of questioning, judgment, and some consequence for an accountable actor [7]. Such a forum gains practical meaning through specified powers, staffing, enforceability, and rights of participation rather than through the presence of an appealing organizational label.

Ostrom’s work on conflict resolution in self-governed arrangements motivates examination of accessible and appropriately scaled dispute-resolution routes [45]. The relevant design task is to identify when a complaint can be resolved locally by evidence correction, when it requires independent disciplinary review, and when the authority to set the rules themselves must be reconsidered. A single universal appeals body could become a new bottleneck. Conversely, fragmented bodies can make it impossible to determine who is responsible for a particular injury. Institutional specificity, clear jurisdiction, and mechanisms for transferring records between competent forums therefore matter as much as the number of nominally available channels.

8.3 Reviewer independence, competence, and accountable reasons

Independence is relational and task-specific. An external reviewer can be formally separate from the challenged office while depending on the same funding stream, unpublished evaluative data, professional ranking, or archival custodian. Independence must therefore be examined along several dimensions: appointment and removal powers, control of records, remuneration, professional conflicts, freedom to publish a reasoned disposition, and practical protection against retaliation. No numerical count of reviewers demonstrates independence when their source information and governing instructions are shared. Nor does independence guarantee competence; a forum independent of a specialist body may be insufficiently equipped to assess a complex scientific question.

For each review forum f concerning case c , define a profile $\mathcal{I}(f; c)$ with components recording declared appointment control, evidentiary custody, material dependence, review competence, and authority to implement a disposition. Equation 46 represents these components without collapsing them into an arbitrary scalar score.

$$\mathcal{I}(f; c) := (A_{f,c}, D_{f,c}, M_{f,c}, K_{f,c}, J_{f,c}). \quad (46)$$

The components in Equation 46 are attributes for investigation, with measurement protocols to be selected before comparison. A high rating in one dimension may coexist with weakness in another. In particular, a body empowered to deliver binding remedies may be constrained in independent fact-finding, while a skilled scientific auditor may have no enforceable authority to correct a personnel decision. Shared professional communities can contribute necessary domain expertise as well as conflicts of interest; treating every connection as disqualifying would make legitimate expert review difficult to organize.

An accountable decision should generate a reason record traceable to the evidence and governing rule. Such a record can identify the decision and its scope, which evidence was considered, what material was excluded and why, how disagreements were addressed, who was authorized to decide, and which subsequent opportunities exist for correction. The level of detail depends on stakes, rights, privacy, and evidentiary complexity. Onora O’Neill’s critique of crude transparency and proliferating performance controls helps distinguish an institutional ability to give reasons from an indiscriminate demand to display information [42]. Heald similarly distinguishes different directions and functions of transparency, including their relationship to surveillance [27]. Reason-giving thus involves disclosure to appropriate audiences under accountable conditions, rather than treating every record as a public resource available without limits.

The social reception of procedures also requires empirical caution. Tyler’s work identifies relationships among procedural treatment, perceived legitimacy, and cooperation in legal settings [63]. The present paper adopts neither an invariant psychological causal effect nor a direct transfer of those findings to research institutions. Perceived legitimacy, independent evidence of substantive accuracy, and the right to contest an outcome remain different outcomes. A legitimate forum should be evaluated by

the quality and enforceability of its practices as well as by the confidence it elicits; an institution could be trusted for inappropriate reasons or distrusted despite substantial procedural safeguards.

8.4 Protected dissent and unequal capacities to sustain criticism

Dissent in an epistemic institution can involve technical disagreement, an objection to a historical attribution, evidence of potential misconduct, or a request for rule change. Distinct forms of dissent may demand different confidentiality safeguards and different protections for people whose conduct is criticized. In a hierarchical setting, a person may have the right to raise a concern while expecting reduced access to future data, career opportunities, publication channels, or immigration and employment stability after doing so. Such fears are relevant to the effective participation set in Section 6, even when a particular threat cannot be independently verified. Protected reporting arrangements, representative advocacy, and carefully governed confidential hearings are candidate mechanisms for making criticism feasible.

For a defined eligible population and observation interval, let $D_i(g)$ represent a person's potential decision to submit a specified kind of concern under procedure g , and let $Y_i(g)$ represent a subsequent outcome such as independent verification or the severity of retaliation. A contrast for a protected reporting regime against a documented baseline is defined in Equation 47.

$$\Delta_{\text{voice}}(\mathcal{P}) := \mathbb{E}_{i \sim \mathcal{P}} [D_i(g^{\text{protected}}) - D_i(g^{\text{baseline}})]. \quad (47)$$

Equation 47 is an estimand and not an empirical finding. A positive effect could arise because people are safer, more familiar with the process, or newly eligible; it would not imply that underlying error increased. Conversely, a rise in substantiated cases under protection could reflect improved observation rather than worse institutional performance. Identifying a causal effect would require consistent intervention versions, a clearly specified eligible population, potential-outcome comparability under a chosen design, and attention to interference when colleagues' participation influences other participants' choices. Confounding by institutional reform, changes in staffing, and differential retention are major concerns.

Ahmed's inquiry into institutional complaints illustrates why documented complaint procedures may be difficult to navigate even where formal channels exist [3]. A theory of epistemic governance should treat the labor of sustaining a challenge as an object of examination. Preparation may require repeated requests for records, translation, legal interpretation, safe preservation of evidence, and participation in lengthy meetings. The difficulty of these tasks can select which disagreements reach an official record. Protective capacity must also extend to persons accused by a complaint, through proportionate procedures, protection of sensitive details, and meaningful opportunities to answer material allegations. Governance grounded in ethics and justice depends on the integrity of both criticism and response.

8.5 Evidence disclosure, confidentiality, and independent auditing

Contestability raises a difficult information-governance problem. A challenge sometimes requires sensitive records concerning research participants, confidential submissions, personnel evaluations, or disputed private communications. Public disclosure may harm affected individuals or expose an institution's legitimate protective information. Blanket concealment, however, may prevent reviewers and participants from assessing whether governing rules were followed. Nissenbaum's contextual account of privacy encourages examination of actors, information types, and transmission norms [41]; Heald's analysis similarly cautions against treating transparency as a context-independent good [27]. An appropriate arrangement may therefore provide controlled access to authorized independent reviewers, redacted explanations to affected participants, and public aggregate reporting of procedural performance, each subject to its own justification.

A narrow informational fact helps specify what a privileged auditor could gain from accessing a fuller record. Let T be a finite-valued state relevant to evaluating a claim, X the audit record, and Z a

public or restricted summary generated solely from X through a specified stochastic channel. Assume $T \rightarrow X \rightarrow Z$ is a Markov chain, the auditor and summary-only reviewer share a prior distribution, and both may choose from the same finite action space $\mathcal{A}$ using any randomized decision rule. For a fixed bounded loss $L(T, a)$, define the optimal expected losses by Equation 48.

$$\begin{aligned} R_X^* &:= \inf_{\delta_X: X \rightsquigarrow \mathcal{A}} \mathbb{E}[L(T, \delta_X(X))], \\ R_Z^* &:= \inf_{\delta_Z: Z \rightsquigarrow \mathcal{A}} \mathbb{E}[L(T, \delta_Z(Z))]. \end{aligned} \tag{48}$$

The notation $X \rightsquigarrow \mathcal{A}$ permits a randomized decision rule; expectations in Equation 48 include its randomization. Under these restricted assumptions, additional information cannot worsen the best attainable decision-theoretic performance, as the following proposition states.

Proposition 8.1 (Conditional informational advantage of controlled review). *Suppose T , X , Z , and $\mathcal{A}$ are finite; the joint law satisfies $T \rightarrow X \rightarrow Z$; and both decision-makers can use arbitrary randomized rules with the same bounded loss L . Then $R_X^* \leq R_Z^*$ for the optimal risks in Equation 48.*

Proof. For any admissible summary-based rule δ_Z , a record-based decision-maker can first simulate Z from the known conditional channel $\Pr(Z \mid X)$ and then apply δ_Z . The Markov assumption guarantees that the resulting joint distribution of the state and chosen action matches the summary-only distribution. The record-based feasible rule family therefore contains an emulation of every summary-based rule, so its infimum expected loss cannot exceed the summary-based infimum. The inequality follows without assuming that either rule is unbiased, accurate in every instance, or implementable without cost. $\square$

Proposition 8.1 is a restricted instance of the comparison of statistical experiments associated with Blackwell [6]. It addresses the *potential decision value of information*; it does not compare privacy harm, legal duties, reviewer incentives, cyber-security risks, procedural delay, or an institution’s capacity to make independent judgments. A privileged reviewer may misuse records, reach a worse actual decision than a summary-only reviewer, or operate under a different effective action set. Adding such costs or constraints can reverse the welfare ranking. Moreover, if a summary incorporates other information about T unavailable to the auditor, the assumed Markov chain may fail. The proposition thus supports a conditional institutional possibility: appropriately authorized confidential review may permit scrutiny of evidence withheld from public circulation, provided reviewer competence, independence, audit logs, and subsequent answerability are secured. It offers no argument for universal access to the underlying record.

Automated evaluation systems can complicate this architecture because source provenance, decision logic, and model updates may be distributed among several operators. Kroll and colleagues examine technical methods through which algorithmic decisions may be made more accountable [32]. Selbst and colleagues emphasize that technical abstraction can overlook consequential sociotechnical relationships [55]. For relational evidence, a responsible audit must therefore account for both computational operations and the institutional circumstances of data collection, review authority, and affected rights. A computationally reproducible score is compatible with a defective admission rule, a biased population of records, or an inaccessible review procedure. The relevant audit target is the entire accountable decision arrangement, with technical verification occupying a defined role.

8.6 Institutional design options and distributional consequences

A governance arrangement may combine independent appeals for specified high-stakes decisions, peer or community review of technical records, accessible complaint assistance, transparent review standards, confidential audit access, and structured participation in rule revision. Each mechanism has design costs. Independent assessors require material support without dependence on parties to the dispute; protected submissions require secure storage and clear rules for access; open consultation can become procedurally exhausting; and strong confidentiality can make external verification difficult. These tensions are matters

Table 15: Governance instruments, candidate benefits, and foreseeable limits requiring institutional evidence. These are design options rather than findings of effectiveness.

Arrangement	Intended capability	Risk, cost, or evaluative limit
Independent case review	Reconsider an evidentiary or procedural decision outside the original chain	Shared records, reviewer capture, limited remedy jurisdiction
Protected reporting	Permit criticism where retaliation or dependence inhibits voice	Safeguarding both complainant and respondent; secure follow-up
Structured reason records	Make rules, evidence, authority, and review routes inspectable	Disclosure hazards, superficial templating, documentation burden
Restricted evidence audit	Examine sensitive source records under accountable authorization	Security, reviewer conflicts, differential access, auditability
Participatory rule revision	Enable affected actors to contest the standards applied to future cases	Unequal time, representation disputes, delayed decisions
Remedial implementation tracking	Link justified decisions to actual correction or restoration	Enforcement limits, long-term maintenance, incomplete repair

for context-sensitive comparison rather than a formula in which every design principle is maximized simultaneously.

Table 15 suggests that institutional quality is multi-dimensional. A procedure can be impartial but slow, accessible but inadequately resourced, formally independent but poorly informed, or technically transparent while exposing confidential contributions. The research task is to specify relevant thresholds, acceptable rights constraints, affected populations, and unavoidable tradeoffs before evaluating institutional alternatives. Formal evaluation should pay attention to distribution: the same fee, translation requirement, or waiting period can impose substantially different burdens on an established professional and on an investigator whose livelihood depends on a short-term contract.

The organization of the work matters as well. A complaint process requires people capable of securely collecting evidence, retaining correspondence, preventing lost files, explaining rights, maintaining independent review schedules, and implementing corrections. These are forms of labor whose cost and governance can determine whether a declared remedy is effective. Archives and research infrastructures can distribute such functions among commons-based institutions, public bodies, and professional organizations, with different accountabilities and degrees of specialization. A historical-materialist analysis asks who supplies the labor and resources, who controls the resulting records and decision rights, which costs are shifted onto participants, and how the arrangements persist or change through subsequent institutional histories.

The idea of collective governance does not eliminate the need for legitimate expertise or bounded decision powers. Specialized safety review, scientific peer assessment, and confidential handling of vulnerable participants' records can be justified by reasons that survive scrutiny. Equally, expertise can be used as a pretext for insulating decisions from correction. The normative inquiry should evaluate whether authority remains proportionate to its purpose, whether alternative expert perspectives can be heard, and whether an institution is capable of revising its own evaluative standards. Procedural justice is understood here as a situated relationship among affected rights, warranted knowledge, agency, accountability, and feasible repair.

8.7 Comparative assessment and empirically discriminating hypotheses

Research on epistemic governance should avoid treating the number of received complaints, reversals, or public reports as a direct index of fairness. A new review process may initially surface errors previously unrecorded, while a coercive environment may suppress the number of visible objections. More corrections can signal better detection, more underlying errors, broader standing, or a change in counting rules. Longitudinal designs should track the entry population and the transitions in Equation 45, the distribution of filing burdens, case complexity, verified outcomes, and changes in record availability. Comparison

across institutions requires attention to the different kinds of decisions and rights at stake.

For institutional units j exposed to a documented governance intervention g , define $Y_{j,K}(g)$ as a later outcome such as independently verified accuracy of a corrected record or the proportion of substantiated defects receiving an implemented remedy by review occasion K . A target causal contrast is stated in Equation 49.

$$\Delta_K^{\text{gov}}(\mathcal{P}) := \mathbb{E}_{j \sim \mathcal{P}} [Y_{j,K}(g^{\text{review}}) - Y_{j,K}(g^{\text{statusquo}})]. \quad (49)$$

Equation 49 requires well-defined interventions, consistent outcome measurement, and defensible assumptions about selection, confounding, and institutional interference before it can be estimated causally. An audit reform may alter the chance that a defect is found and thus change the measured numerator and denominator simultaneously. Researchers should where feasible use independently adjudicated samples and report missingness and uncertainty explicitly. In some settings, comparative historical reconstruction is more ethically acceptable than randomized denial of an appeal right. Randomized user-interface tests may still isolate the effect of a reason display, a translation aid, or notification of a review channel, but they cannot alone identify a full institutional power transformation.

Hypothesis 8.2 (Procedurally protected criticism and effective participation). In institutional settings where the principal barrier to a justified challenge is a documented risk of retaliation or prohibitive participation costs, a review process combining protected standing and effective assistance is expected to increase access to a completed review, relative to an otherwise comparable procedure without those safeguards. The direction and magnitude of any effect are conditional on actual implementation, eligible-case composition, and the adequacy of independent review.

Hypothesis 8.2 does not predict more institutional error or more successful reversals. Its appropriate outcomes include the ability to file, completeness of reasons, procedural timeliness, and verifiable protection. Interviews, administrative records, and controlled survey instruments may triangulate mechanisms, provided identifiable complainants are not exposed by the research itself. Variation across employment and resource conditions is of particular interest because Section 6 predicts that an otherwise identical formal procedure may remain inaccessible to participants with different material constraints.

Hypothesis 8.3 (Controlled audit and substantiated error correction). For case classes where review requires sensitive records unavailable to ordinary decision-makers, an independent, qualified, and accountable restricted-access audit is expected to improve the detection or correction of substantiated evidentiary errors relative to a summary-only review, when the additional access is usable and its governance costs do not outweigh the gains. The hypothesis does not predict superior performance when independence, expertise, or security assumptions fail.

Hypothesis 8.3 extends the narrow informational ordering of Proposition 8.1 to a testable institutional question with additional conditions. A feasible design might compare blinded case reviews conducted with differently scoped access permissions, after lawful consent or authorization and independent risk assessment. Actual correction rates, false-positive allegations, delays, participant protections, and data breaches would all need to be monitored. The proposition alone establishes none of these outcomes. Moreover, auditor access can alter what participants disclose in later cases, introducing behavioral feedback absent from its fixed information structure.

8.8 Scope of contestable knowledge institutions

Contestability links epistemic authority to its capacity for publicly defensible correction under protected and practicable conditions. It concerns the right objects of challenge, intelligible reasons, independent and competent review, proportionate confidentiality, implemented dispositions, and the power to reconsider higher-order rules. The analysis preserves the possibility of justified specialized authority while identifying conditions under which its decisions remain revisable. In this sense, accountable knowledge governance is an ongoing organization of inquiry and responsibility rather than a static collection of institutional declarations.

The section's formal elements have a deliberately limited status. Equation 44 records an effective menu whose accessibility must be investigated; Equation 45 identifies transitions that administrative reporting commonly conflates; and Proposition 8.1 establishes an informational inequality within an explicitly restricted decision problem. None establishes an empirically measured institutional effect or an automatic ethical ranking of governance regimes. Section 9 develops research strategies for distinguishing these mechanisms from alternative explanations across historical trajectories, institutional case comparisons, and bounded interventions. Section 10 synthesizes how evidentiary authority, participation, and contestability jointly condition trust without reducing trust to institutional approval or mere compliance.

9 Research Designs for Power and Epistemic Authority

The analytical models developed in Sections 2–8 distinguish access to relational evidence, the authority to evaluate it, the practical conditions of participation, and the subsequent reproduction of institutional power. This section specifies research designs capable of investigating those distinctions while identifying their inferential limits. Its objectives are to define observable units and target quantities; reconstruct institutional histories through documentary and interpretive evidence; formulate ethically bounded interventions and reform comparisons; and establish rules for missing records, interference, measurement, and normative interpretation. Historical reconstruction, statistical identification, and participatory inquiry are treated as complementary but irreducible methods. The present section states research proposals and evaluation criteria. It reports no collected institutional dataset, randomized experiment, or estimated effect.

9.1 Units, target populations, and inferential claims

A relational institution may be described at several resolutions. An *institution* j holds rules, records, personnel, decision rights, and material capacities that can change through its history; a *decision episode* d concerns a particular application, claim, challenge, or accreditation; an *affected person or collective* i may supply evidence or experience a decision; and a *documentary event* e records an action through a particular custodial and interpretive process. These units are nested or linked, but the links are often many-to-many. One participant may encounter multiple institutions; an institutional decision may affect persons who never file a claim; and a shared archival service may create correlated access constraints across sites. A credible study must choose a primary level of inference and retain the other levels as explicit context.

A research register can record event identifiers, source custody, institutional role, access permissions, known ordering relations, and dates where reliable. The existence of a date field does not certify a record's completeness or timing. Discrepant time stamps, retrospective entries, duplicated reports, and changed classification systems should be preserved as documentary uncertainties. Historical sequence can be represented as a partially ordered collection of recorded events, with unresolved ordering retained when the evidence does not justify a total chronology. The observation window should be defined by documentary availability and an explicit research purpose rather than assumed to mark the natural beginning or end of an institution's relational history.

Three forms of inferential statement must be kept separate. *Descriptive claims* concern the occurrence, distribution, or recorded sequence of practices among a specified set of cases. *Causal claims* compare the consequences of well-defined institutional arrangements under assumptions sufficient to identify a contrast. *Normative judgments* appraise institutional conduct in light of justified standards, rights, purposes, and effects on persons. Evidence about a causal disparity can inform normative inquiry without determining the appropriate normative standard; conversely, a justified procedural entitlement does not require a measured causal improvement in aggregate performance to merit recognition. The comparative institutional inquiry should make all three forms of claim explicit.

Table 16: Distinct empirical constructs and measurement hazards in institutional epistemic inquiry

Construct	Candidate observation or bounded measurement	Principal inferential hazard
Documentary availability	Independent inventory of eligible source records; custody and retrieval audits	The inventory itself can exclude missing or destroyed records
Actual evidentiary encounter	Access log linked to a specific decision episode; consented observation	Retrieval does not establish comprehension or inspection
Institutional authority	Recorded delegation, admissibility rule, decision or veto capacity	Written authorization may differ from exercised capacity
Credentialed standing	Criteria, issuer, scope, expiry and appeal route	Accreditation is not identical to demonstrated competence
Epistemic assessment	Task-specific accuracy judgment and source evaluation	Expressed judgment may reflect demand effects or sanctions
Public endorsement and reliance	Verifiable declaration; decision or delegation action	Compliance and strategic speech can resemble trust
Effective contestability	Eligibility, filing, independent consideration and implemented outcome	Filing or reversal counts have endogenous denominators
Material participation	Time, cost, language support, secure access, protection and exit options	Surveyed burdens omit deterred nonparticipants

Table 16 proposes a deliberately non-interchangeable measurement vocabulary. In particular, survey agreement, documentary accuracy, formal accreditation, and practical access to an appeal should never be silently combined into a single trust score. Existing research on accountability and institutional documentation motivates attention to what is produced at each organizational stage [7, 50]. Each entry in the table requires study-specific construct validation, including testing whether alternative descriptions or languages alter its meaning.

9.2 Reconstructing institutional trajectories through documentary inquiry

Comparative reconstruction is appropriate where the central research question concerns the emergence of a rule, the custody of evidence, the transfer of authority, or the changing effective capacity to object. Its evidentiary materials may include dated policy instruments, anonymized decision memoranda, correspondence logs, archival classification histories, meeting minutes, budgets, authorized interviews, and documented amendments to review procedures. These materials have different epistemic strengths. An approved budget may establish authority to spend without showing that verification labor was performed; a rule document can establish formal standing without showing whether eligible participants could exercise it; an interview can reveal experienced pressure without itself identifying a population causal effect.

Process tracing makes these distinctions consequential by assessing causal-process observations in relation to competing accounts of an institutional sequence [12]. For example, a decline in visible objections following a change of leadership is compatible with improved initial decisions, higher filing costs, altered records classification, staff departures, or retaliation expectations. A design should state what traces each candidate account would tend to leave, whose custody would hold them, and whether the absence of those traces is informative under the archival production process. The probability that a trace enters the observable archive belongs to the argument, not merely to a footnote about incomplete data.

Case selection requires equal care. Selecting institutions because they experienced a celebrated reversal or unusually visible controversy conditions on a later outcome that the proposed mechanisms may themselves influence. Typical, diverse, deviant, and otherwise strategically selected cases can each support distinct within-case questions, although none automatically yields representative estimates for a wider population [54]. A comparative design should document its case universe, inclusion process, absent cases, archival-access differences, and the role of public attention in discovery. A purposive sample may be strong for identifying plausible sequences and weak for estimating how common a mechanism

is. These two tasks should not be conflated.

A hypothetical research programme could examine three anonymized kinds of institution: a professional accreditation body, a shared public-knowledge repository, and a research organization with an internal appeals process. Within each setting, the investigator would reconstruct a sequence from the first recorded claim through evidence access, evaluation, challenge, and final disposition, including parallel cases with no filed challenge. The institutional differences could illuminate which interfaces are organized similarly. They would not support an inference that those institutions share the same ethical duties, regulatory environments, or plausible reform choices. Access would require permission and an appropriate confidentiality protocol; no present investigation of such institutions is claimed here.

The underlying power mechanism may also reside upstream from decisions. Funding conditions, staffing levels, contractors' maintenance responsibilities, proprietary retrieval systems, and qualifications for reviewer appointment can determine the set of practically feasible actions even when the formal rule does not change. Historical-materialist inquiry therefore examines the production and reproduction of evidentiary capacity itself: who performs documentation and translation, whose time is available for scrutiny, who pays for secure archives, and which actors can exit an evaluative relationship. The resulting descriptions can specify structural dependencies that a narrow decision-level experiment would hold fixed by design.

9.3 Estimands for institutional change and evidentiary correction

A causal analysis requires a treatment that is sufficiently specified for the relevant institutional context. Let $g^{(1)}$ denote a defined review configuration, such as an independently staffed appeals channel with fixed notification, access, and enforcement procedures; let $g^{(0)}$ denote the documented alternative. A label such as "transparency" or "participation" alone does not specify a reproducible intervention. For an institutional unit j in target population $\mathcal{P}$, an outcome $Y_{j,K}(g)$ is defined at a stated follow-up occasion K , assuming that the competing arrangements and the outcome could be meaningfully specified for that unit. Equation 50 gives one target contrast.

$$\tau_K(\mathcal{P}; g^{(1)}, g^{(0)}) = \mathbb{E}_{j \sim \mathcal{P}} [Y_{j,K}(g^{(1)}) - Y_{j,K}(g^{(0)})]. \quad (50)$$

Equation 50 is a definition, not an identified estimator. A possible outcome is the fraction of independently substantiated errors receiving implemented correction among a stable audit-defined cohort of eligible cases. Another is timely access to an independently reviewed decision for that cohort. The definition of the cohort matters: an open filing channel may enlarge the population of reported cases, changing the observed severity distribution even if the underlying error rate remains constant. Institution-level and person-level effects also need not agree when institutional workloads differ substantially.

Observed administrative counts typically multiply several conditional transitions. For an eligible defect E , let D represent detection, F filing, V a substantively completed review, and M implementation of a justified remedy. Under a sequential coding protocol that requires these stages for a case to be counted, the chain rule yields Equation 51; no independence assumption is involved.

$$\Pr(M, V, F, D \mid E, g) = \Pr(D \mid E, g) \Pr(F \mid D, E, g) \Pr(V \mid F, D, E, g) \Pr(M \mid V, F, D, E, g). \quad (51)$$

Equation 51 demonstrates why the count of corrected records alone is ambiguous. A rise can follow improved detection or increased underlying error prevalence; a fall can follow deterrence of filing or improved accuracy before review. The final factor concerns an implemented remedy, which may be infeasible despite a correct review judgment. Where some remedies occur without filing or where several routes operate in parallel, the event definitions and transition structure must be rewritten rather than forced into this particular chain.

Independent case verification is accordingly a central design element. Researchers might draw a stratified random sample from a pre-specified universe of decisions and have competent reviewers assess source accuracy under a lawful restricted-access procedure. That process can estimate errors under

the review protocol, including among decisions that generated no complaint, but its own reliability and disagreement must be reported. Sampling only resolved complaints yields a different target population. Blind replication, reviewer-reason records, sensitivity to alternative admissibility standards, and documentation of irresolvable disagreements provide more meaningful evidence than an unqualified claim of objective correctness.

Archival outcomes can be missing for reasons connected to authority, such as confidentiality restrictions or loss of records. For a binary outcome $Y \in \{0, 1\}$, suppose an eligible target population has observed-outcome fraction $1 - m$ and observed positive rate q , with missing fraction m known from a complete eligibility register. With no assumption about missing outcomes, Equation 52 supplies a worst-case identification interval for the population rate μ .

$$(1 - m)q \leq \mu = \mathbb{E}[Y] \leq (1 - m)q + m. \quad (52)$$

The endpoints follow because the unknown positive rate among missing cases lies between zero and one. They do not require missing-at-random assumptions. The framework of causal inference as a missing-data problem provides a broader foundation for separating observation from assumptions about unobserved quantities [16, 28]. If the total eligible population is itself unknown, even the fraction m is unidentified and Equation 52 cannot be applied directly. Sensitivity analysis should disclose both sorts of uncertainty.

9.4 Randomized interfaces and bounded audit studies

Controlled experiments can test relatively narrow mechanisms while reducing confounding by assignment. Candidate manipulations include the visibility of a verified source chain, the presence of an institutional credential, the presentation of reason-giving and review rights, or the cost of accessing a translated record. The safest early designs use constructed cases, authorized records, and consenting participants whose decisions have no effect on real livelihoods or entitlements. Field correspondence studies demonstrate how randomized presentation signals can uncover unequal response patterns, while also illustrating how the treatment is limited to the signal that was manipulated [5]. Methods for auditing algorithmic systems similarly emphasize carefully defined probes and the distinction between system output and its institutional production [52, 50].

Consider a fictional evaluation task in which participants assess the same verified evidentiary record. In a two-by-two design, $A = 1$ makes an institutional status cue visible, while $B = 1$ supplies a clearly traceable source and independent corroboration notice. The four conditions should have identical underlying evidence content, and displayed statements must be accurate within the simulation. For a pre-specified task outcome Y such as correctness of identifying unsupported contributions, Equation 53 defines the interaction contrast between the two factors under a coherent potential-outcomes interpretation.

$$\iota_Y = \mathbb{E}[Y(1, 1) - Y(1, 0) - Y(0, 1) + Y(0, 0)]. \quad (53)$$

Equation 53 describes effect modification on the chosen outcome scale. Its value depends on how the outcome is defined and does not uniquely determine which cognitive mechanism produced the interaction. Random assignment and consistency of treatment versions can identify the factorial intention-to-treat contrasts for consenting participants, subject to attrition and any spillovers. To assess whether participants give weight to warranted evidence, the experiment should record performance on independently adjudicated items and false acceptance of deliberately unsupported assertions, alongside subjective confidence. High confidence by itself provides weak evidence of warranted evaluation.

A second experiment could evaluate a protected review interface. Eligible volunteers would encounter otherwise equivalent simulated decisions with either an ordinary filing explanation or an improved notification and practical assistance package. Outcomes would distinguish ability to locate the procedure, comprehension of standing, simulated completion, perceived retaliation risk, and later recall. A study that randomizes notifications can identify the effect of the notification package; it does not identify the impact of actually eliminating retaliation or implementing a judicially enforceable remedy.

Actual protected access depends on personnel, confidentiality, sanctions, and implementation conditions beyond the simulation.

Institutional audit experiments carry ethical and legal constraints. Covert submissions may consume reviewer time, expose sensitive information, or influence consequential decisions. They require ethics review, lawful authority, proportionality, risk assessment, and a plan to repair any interference. For vulnerable complainants, randomized withdrawal of an existing appeal right is especially difficult to justify; observational reform analysis or fictional-case experiments are generally more suitable. Independent quality assessment should make contested normative thresholds and reviewer conflicts visible without revealing protected contributors. An internal audit can help create documentary accountability, yet independence and effective remedy remain distinct institutional properties.

9.5 Reform comparisons and the limits of quasi-experimental identification

Policy reforms provide possible opportunities for studying institutional power beyond artificial settings. Examples include a documented change in reviewer appointment rules, introduction of an independent archive-access channel, or provision of translation and legal assistance for appeals. Because reforms often follow crises, budget shifts, legal disputes, or leadership changes, their timing and adoption are rarely as-good-as random. Studies should reconstruct those accompanying processes before selecting an estimator. A conventional before-and-after difference can confound the reform with any co-occurring change in the institution or its affected population.

When comparable institutions adopt a reform at different occasions, a group-by-time treatment effect can be a defensible target under clearly stated assumptions. Let G_j be institutional adoption cohort, t an observation occasion after cohort g adopts the policy, and $Y_{jt}(g)$ the outcome under the documented treatment history, with $Y_{jt}(0)$ the outcome under a never-adopted history over the relevant window. Equation 54 defines a cohort-specific effect on the treated.

$$\text{ATT}(g, t) = \mathbb{E}[Y_{jt}(g) - Y_{jt}(0) \mid G_j = g], \quad t \geq g. \quad (54)$$

Equation 54 is not identified by adoption dates alone. A research plan must justify no anticipation, a suitable parallel-trends condition for the untreated potential outcomes, stable outcome definitions, and a comparison group not already affected by the relevant treatment history. Under heterogeneous effects and staggered adoption, an ordinary two-way fixed-effects coefficient may mix inappropriate comparisons; cohort-time estimands and transparent aggregation have been developed partly to address these limitations [10, 51]. An insignificant pre-trend test cannot establish the necessary counterfactual. Investigators should report trends, plausible violations, sensitivity analyses, and changes in the institutional case mix.

Contamination is especially relevant in knowledge institutions. A shared reviewer can transmit new standards to an untreated organization; a public decision can reshape accreditation elsewhere; a reformed repository can change the source evidence retrieved by every institution using it. These are possible *interference* pathways, not nuisance observations to be ignored. A representation of exposure across linked institutions is given in Equation 55. Here $\mathbf{g}_{-j}$ is the configuration of other institutions, and h_j is a pre-specified exposure mapping determined by defined network relations.

$$Y_{j,K} = Y_{j,K}(g_j, h_j(\mathbf{g}_{-j})). \quad (55)$$

Equation 55 acknowledges that one institution's outcomes may depend on other institutions' interventions. Research on causal interference supplies frameworks for defining direct and indirect effects under particular assignment and exposure assumptions [30]. The mapping h_j is a model choice that must be defended empirically. Network boundaries, the timing of information circulation, and the observability of contacts can remain incomplete. Where spillovers cannot be bounded meaningfully, researchers may need to replace unit-level causal claims with more restricted descriptions or system-level intervention questions.

Table 17: Research-design choices for trajectory-shaping institutional power

Design	Appropriate primary object	Boundary of justified inference
Comparative process tracing	Origins, custody, authority transfer, informal and formal rule changes	Causal sequence credibility varies with trace selection and alternative accounts
Independent record audit	Undetected errors, access obstacles, decision-to-remedy pathways	Coverage, reviewer reliability and archival missingness govern validity
Randomized display or fictional case	Credential salience, evidence presentation, notification comprehension	Narrow effect of the assigned display for its study population
Reform comparison over time	Consequences of a documented policy change	Conditional on counterfactual-trend assumptions, selection, timing and spillovers
Network or cross-institution inquiry	Circulation of rules, reputations, sources and personnel	Requires meaningful exposure mapping and records of interdependence
Participatory institutional evaluation	Normative priorities, lived burdens, rights and practical remedies	Consultation is not identical to representative preference or legal authorization

9.6 Institutional measurement, normative plurality, and practical inference

A study of epistemic authority should not evaluate all institutions through one unexamined numerical measure of success. Peer evaluation, public repository governance, professional licensing, and confidential complaint review have different legitimate objectives. Even within a domain, affected parties may reasonably disagree about how accuracy, timeliness, independence, privacy, accessibility, and repair should be prioritized. Such disagreements may concern rights that are poorly represented by compensatory weighted averages. Institutional comparisons should therefore disclose which measures are descriptive, which criteria are normative, who is authorized to define them, and which constraints are treated as non-compensable.

One feasible approach is to construct a *criterion dossier* for each study: the stated institutional purpose, scope of authority, affected rights, evidence requirements, candidate outcomes, rule for contested interpretations, and a protocol for revising the criteria. The dossier can accompany qualitative accounts and quantitative estimates without converting every dimension to one score. Participants with fewer resources should have actual opportunities to challenge the dossier, subject to confidentiality and equal regard for all affected persons. Consultation outcomes need not be described as universal agreement. A documented disagreement can itself identify a consequential governance choice.

Methodological triangulation requires preserving what each method can establish. Process tracing may identify credible pathways of rule change while lacking population prevalence; a randomized display study may identify a presentation effect without measuring material dependence; a quasi-experiment may estimate a local reform effect conditional on parallel-trends assumptions while leaving normative legitimacy unsettled. Administrative data can measure recorded procedural completion while omitting intimidated non-filers. Interviews can disclose experienced exclusion or competence that formal instruments miss, while purposive recruitment and recall can affect interpretation. Agreement across methods increases confidence only to the extent that their error mechanisms and evidentiary sources are sufficiently distinct. Repeated use of the same institutional ledger by several analysts does not yield independent corroboration.

Table 17 summarizes proposed designs and their strongest defensible inferences. It is intended as a planning matrix, not a hierarchy of evidence. A good design may combine methods sequentially, beginning with archival reconstruction to refine the intervention, continuing with ethically permissible bounded experiments, and returning to institutional fieldwork to assess implementation and unanticipated consequences. The sequence should remain revisable when new records contradict the proposed mechanism.

A minimum reporting protocol should specify the case population; level of analysis; source-

provenance and access restrictions; the exact intervention or comparison; definitions of accuracy, review, and remedy; the observation and follow-up windows; plausible missing-data processes; unit dependencies; disagreements among adjudicators; model sensitivity; and the rights implications of producing the evidence. Consent and lawful confidential access should be assessed before the collection of identifiable material. Where sharing primary records would expose vulnerable individuals, research reproducibility may rely on disclosed protocols, synthetic examples, redacted metadata, authorized secure review, and auditable transformation logs rather than unrestricted data release. Open scientific practice and responsible protection are jointly relevant design commitments.

Hypothesis 9.1 (Practicable challenge routes and completed review). For a pre-specified population of eligible cases facing documented informational and material filing barriers, a reform that combines intelligible reasons, affordable assistance, protected standing, and independent review is expected to increase the probability of substantively completed examination relative to a comparable procedure lacking those supports, provided the reform is implemented as specified. The prediction concerns access to review, not a presumed rise in institutional error or automatic validation of the challenger's claim.

Hypothesis 9.1 calls for the measurement of eligible cases, including those without a complaint, before drawing conclusions from filing rates. Multiple outcomes should be assessed separately: comprehension, successful submission, independent examination, and justified implemented correction. A rise in submissions with no change in implemented remedies might reflect improved access, lower underlying merit, constrained review capacity, or administrative reclassification. The design must permit those possibilities to be empirically distinguished.

Hypothesis 9.2 (Source independence and status-sensitive authority). In bounded evaluation tasks with fixed evidentiary content, institutional status cues are expected to alter some observers' expressed assessments, while independently checkable provenance may reduce reliance on unsupported endorsements under specified comprehension and incentive conditions. Neither effect is predicted to be universal, and the interaction may vary with expertise, trust calibration, the accuracy of displayed credentials, and the decision's consequences.

Hypothesis 9.2 can be investigated through the factorial structure of Equation 53, measuring assessment accuracy as well as stated confidence. An observed status-cue effect would not show that the credential is epistemically irrelevant: credentials may legitimately carry domain-specific information. Researchers must distinguish signals that accurately convey competence from cues experimentally detached from the underlying quality of evidence. A null average effect may also conceal heterogeneity among observer groups or tasks; subgroup comparisons should be specified in advance and reported with uncertainty.

9.7 Research programme and epistemic limits

A programme on institutional epistemic power can advance through modest, independently checkable steps. The first stage is conceptual and archival: establish a justified inventory of evidentiary sites and the rights-bearing populations affected by them. The second is measurement: examine whether the indicators distinguish formal rules, practical access, actual encounter, endorsement, independent verification, and remedy implementation. The third is mechanism discrimination: compare rival accounts within traced histories and use bounded interventions where ethical and feasible. The fourth is carefully delimited causal evaluation: examine documented reforms using defensible counterfactuals and explicit sensitivity analysis. The fifth concerns institutional learning: return findings and contested interpretations to authorized, protected processes of review while tracking whether justified corrections are implemented.

The programme remains contingent on scarce records, legitimate confidentiality, institutional cooperation, changing vocabularies, and the unequal distribution of the labor required to verify knowledge. Some questions may remain answerable chiefly through historical interpretation; others may support approximate quantitative estimates; still others concern rights and responsibilities that cannot be resolved

by a performance statistic. Methodological honesty requires recording failures of access and identification as findings about the inquiry's limits without converting them into allegations of suppression. Evidence of an institutional disparity warrants scrutiny, whereas identifying an actor's intent or a rule's causal effect requires additional proof.

The proposed studies supply empirical interfaces for the mechanisms of Sections 2–8. They preserve distinctions among making a record, encountering it, endorsing an interpretation, exercising a decision right, and delivering a remedy. Their central contribution is a research architecture that specifies which kinds of evidence could support or challenge the framework, how institutional power complicates the observation of that evidence, and how accountable inquiry might responsibly proceed despite those complications. Section 10 synthesizes the theoretical, epistemic, and ethical implications without treating these proposed studies as completed experiments.

10 Conclusion

The inquiry has examined how institutions shape the evidentiary conditions under which persons, contributions, and knowledge claims become credible, recognizable, and open to consequential judgment. Its principal contribution is a provisional account of *trajectory-shaping epistemic power*: the situated capacities through which actors can alter the formation, preservation, encounter, evaluation, accreditation, and contestation of evidence-bearing relational histories. The analysis proceeds at the intersection of political theory, social epistemology, institutional research, and historical-materialist inquiry. It offers an integrated vocabulary for specifying possible mechanisms, conditional formal results for a limited set of representations, and research designs for evaluating competing explanations. The conclusion draws together the paper's central results, distinguishes their epistemic standing, examines their ethical implications, and identifies the boundary with the subsequent investigation of circulation. The framework remains a proposal for critical development; no claim of general empirical validation follows from the present discussion.

10.1 Institutional mediation of evidentiary trajectories

An evidentiary history is produced and made available through a succession of heterogeneous practices. A contribution may leave a documentary trace, that trace may enter an archive, an index may permit retrieval, an access rule may authorize consultation, and a presentation system may select a particular description for evaluation. Each stage can change what a subsequent observer has reason to believe. Section 2 represents institutionally situated powers over these stages as typed capacities associated with actors, contexts, rules, and feasible interventions. The representation preserves the distinction between holding an authorization, possessing the resources to exercise it, intervening in a particular case, and demonstrating a causal effect of the intervention. Such distinctions enable inquiry into power with greater precision than an undifferentiated ranking of powerful and powerless actors.

The staged visibility model of Section 3 identifies additional questions that are obscured when the presence or absence of a record is treated as the whole empirical issue. Preservation, indexing, lawful access, successful retrieval, and actual encounter have different observational signatures. The bounded-visibility result in Proposition 3.1 follows from the specified nested sequence of gates; it establishes no universal ordering among different, non-nested routes through which evidence may become accessible. A researcher can therefore examine whether a particular account of invisibility concerns record formation, legitimate restrictions, resource shortages, platform selection, or another mechanism. Finding a missing item at a single stage remains insufficient to determine which account is correct.

The institutional character of evidentiary mediation also changes the interpretation of apparently individual judgments. A reviewer may reach a coherent conclusion given a supplied record while the procedures that assembled the record remain incomplete, contestable, or unequally accessible. Conversely, a compressed account may be proportionate to its practical task and justified by the need for privacy, efficient review, or the protection of vulnerable participants. The relevant inquiry concerns the fit between

the task, the records made available, the information excluded, the responsible decision rights, and the possibilities of accountable correction. A conclusion about wrongful exclusion requires additional evidence concerning duties, available alternatives, consequences, and the governing normative standards.

These observations support a limited but important synthesis: institutions can shape the *grounds of epistemic judgment* before an individual observer begins to assess a claim. The model identifies candidate intervention sites and traceable questions about those sites. It does not imply that each intervention is deliberate suppression, that every omitted trace is relevant, or that greater exposure invariably produces more warranted belief. The organization of evidence must be studied as both a productive condition of knowledge and a possible location of exclusionary power.

10.2 Evaluative authority, expertise, and testimonial warrant

Institutional epistemic authority can serve defensible collective purposes. Expert specialization reduces the cost of evaluating complex claims, documented certification can communicate domain-relevant competence, and procedures for weighing evidence can support consistency across decisions. Sections 4 and 5 distinguish these possible epistemic functions from the social consequences of status, the distribution of standing, and the capacity to define or modify evaluation rules. The analytical object is therefore the relationship among a claim's evidentiary support, the competence of the evaluator, the scope of a credential, and the institution's authority to make a consequential decision.

Evaluation rules are neither interchangeable with evidence nor fixed independently of their historical purposes. An institution may establish admissibility requirements, choose dimensions along which contributions are compared, assign weights to those dimensions, delegate judgment, and determine which decisions can be challenged. Proposition 4.1 shows, within a restricted multidimensional scoring representation, how two admissible rubrics can reverse the relative ordering of cases when the cases exhibit suitable tradeoffs. This establishes sensitivity to evaluative choices under the proposition's assumptions. A reversal alone does not prove that an evaluator is biased or that either rubric is unethical. Those conclusions require an account of what the institution is legitimately attempting to assess and whether the chosen procedure is appropriate to that purpose.

A parallel distinction concerns testimony. The authority of a report depends partly on whether its source is competent for the relevant question, whether the report reliably conveys its underlying evidence, and whether successive endorsements supply genuinely additional information. Proposition 5.2 demonstrates that a relay adds no Bayesian information under the stated conditional-redundancy assumption. This conditional result clarifies the limitations of treating many repetitions as independent corroboration. It leaves room for meaningful additional testimony when an intermediary independently checks facts, introduces a distinct observation, or makes a new and assessable inference. Institutional endorsements may legitimately summarize such work, while the mere visual accumulation of recognizable names cannot establish its presence.

Declarations of confidence may reflect evidentiary conviction, credible expertise, conformity, or material dependence. Decisions to rely additionally reflect error costs, alternatives, and institutional duties. Observed endorsement, justified epistemic trust, authorized deference, and actual reliance therefore require separate operational measures. Paper IV examines the institutional conditions structuring these measures; the companion cognitive inquiry addresses how observers process encountered evidence without presuming that institutions determine private judgment.

Legitimate authority remains an essential possibility within the analysis. Claims concerning expertise should be tested within their actual domains, with attention to reliability, the reasons furnished for decisions, correction procedures, and the capacities of relevant communities to scrutinize governing rules. A system that substitutes status for substantiated warrant may be fragile even when the status-bearing institution performs valuable coordinating work elsewhere. A system that rejects every institutional signal would ignore the genuine epistemic contribution of training, accountability, and specialized review. The proposed distinction concerns the conditions under which authority carries warranted information and remains answerable for its use.

10.3 Material participation and the realization of corrective rights

The analysis of epistemic power requires attention to the material organization of knowledge production. Records are generated, curated, translated, secured, interpreted, and repaired through labor performed under unequal institutional arrangements. Researchers and other contributors may have formally identical permissions while facing different access to equipment, legal assistance, paid time, stable employment, documentation practices, technical expertise, and protection against retaliation. Section 6 treats those resources and exposures as conditions of *effective participation*: the actions that a person can practically undertake within an institution, conditional on the applicable rules and material circumstances.

The difference between a nominal entitlement and its practical realization is analytically consequential. The existence of an appeals office does not establish that an affected person can find it, obtain the necessary records, prepare an intelligible challenge, receive an independent hearing, or secure implementation of a justified correction. The procedural stages examined in Section 8 therefore include standing, filing, admissibility, substantive review, determination, and implemented remedy. The model of effective routes in Section 6 further shows why resources attached to one stage need not remedy a distinct institutional exclusion. Proposition 6.1, in particular, establishes the persistence of a blocked route under a subsidy that changes only the specified budget constraint. It is a conditional property of that remedy representation, not a general argument against financial support or evidence that any actual appeal system is obstructive.

Historical-materialist inquiry adds an explanatory dimension to these distinctions. The distribution of research employment, organizational recognition, infrastructure ownership, and verification costs can reproduce the ability of some groups to maintain and defend their evidentiary histories. Labor essential to preserving trustworthy records may be weakly recognized by prevailing attribution or reward arrangements. Access to a prestigious evaluator may itself require prior resources, professional affiliations, and familiarity with specialized institutional languages. These relationships can generate patterned disadvantages even when no single decision-maker intends the overall result. The appropriate unit of responsibility may accordingly include organizational design, resource provision, and system-level processes as well as individual decisions.

Discriminating research must account for filing assistance, case merit, selective eligibility, review quality, retaliation, and administrative recording. Low complaint rates may indicate satisfaction or inaccessible procedures. Researchers therefore need eligible-case populations and evidence about procedural exits. The burden of reconstructing disputed histories should be assessed in relation to each actor's access to records and institutional responsibilities, with safeguards for confidential information.

An ethical assessment of knowledge institutions must thus consider whose time, income, health, relationships, and future opportunities are placed at risk by the procedures used to establish credibility. Formal equality can provide a common legal or administrative baseline; its practical adequacy depends on the structure of feasible participation. This conclusion does not supply a single universal measure of fair resource distribution. It identifies the material and procedural variables that an account of epistemic justice should make contestable and empirically visible.

10.4 Trust feedback and the transformation of institutional power

Institutional evaluation often has consequences that extend beyond an individual decision. Recognized authority can influence later resource allocations, the selection of future reviewers, the discoverability of endorsed work, and the cost of contesting prevailing assessments. Section 7 formulates these relationships using distinct state variables for private epistemic assessments, public endorsement, delegated authority, and material capacity. The distinction matters because recorded agreement may be amplified by genuine confidence, shared informational sources, organizational dependence, or a credible threat of disadvantage. A causal account requires evidence about these channels rather than relying on the aggregate level of expressed trust.

The conditional feedback analysis also avoids a predetermined history of ever-expanding authority. Proposition 7.1 establishes stability for a restricted bounded update under its stated contraction condi-

tion. Its importance lies in illustrating that positive reinforcement can coexist with bounded trajectories and locally stable arrangements. Other models may exhibit multiple regimes, path-dependent allocation, fragile consensus, periodic correction, or abrupt institutional reorganization. The paper does not derive a universal dynamic law for epistemic power from one stylized recurrence. Nor does stability provide a normative endorsement: a persistent authority regime may support competent collective inquiry, entrench contestable inequalities, or combine these features.

Critical participation, institutionally protected disagreement, corrections to the evidentiary record, and competing centers of expertise can alter the rules governing later evaluations. Such change can occur through revisions of admission criteria, revised accreditation practices, adjustments to access rights, independent investigation, or the redistribution of the resources needed for participation. Whether these processes improve the quality of judgment depends on the reliability of their evidence, the responsiveness of institutional decision-makers, and the consequences for affected parties. Public dissent alone does not establish error, just as institutional continuity does not establish epistemic success.

The relationship between trust and power is therefore potentially recursive while remaining empirically underdetermined in any particular setting. Endorsement can support resource allocation and thereby change future evidentiary visibility. More accessible evidence can modify the grounds of trust. Successful correction can strengthen confidence in a review procedure while revising confidence in the original decision. Coercive conditions can preserve outward agreement even as private assessments diverge. These mechanisms may operate together, with different weights across tasks and populations. Longitudinal study must document the relevant institutional sequence, shifting decision rights, and possible rival explanations before inferring which feedback process operated.

The present synthesis permits the study of institutional transformation without equating change with progress or persistence with failure. A justifiable institution may retain certain safeguards and expertise while changing the allocation of review authority or the treatment of excluded evidence. Attention to the conditions of correction provides a more specific normative and empirical object than an unrestricted preference for either institutional continuity or novelty.

10.5 Inferential limits and conditions for critical assessment

The formal results of this paper are conditional statements about specified models. The regime-dependent influence proposition in Section 2 concerns interacting gatekeepers; the visibility bound in Section 3 concerns a nested observation route; the evaluation reversal in Section 4 depends on multidimensional tradeoffs; the testimonial result in Section 5 depends on conditional redundancy; the blocked remedy result in Section 6 depends on a restricted feasible path; and the feedback proposition in Section 7 depends on an assumed update map and parameter range. Proposition 8.1 adds a conditional comparison of optimal attainable decisions under differing information sets. None of these results proves a corresponding mechanism in an observed institution without the appropriate mapping of variables, evidence concerning assumptions, and consideration of alternative explanations.

A central inferential danger is the conflation of trace absence, institutional influence, intentional exclusion, and normative wrongdoing. An inaccessible document may have been lost, withheld to satisfy legitimate privacy duties, never created, rendered undiscoverable by poor metadata, or deliberately concealed. A reviewer influenced by a credential may be using a valid signal of domain-specific competence or deferring to prestige unrelated to the question. A changed institutional outcome may reflect a different eligible population, altered case composition, or independent shifts in practice. The research designs in Section 9 accordingly require explicit units, counterfactual targets, selection assumptions, and accessible records of process. Where these are unavailable, the appropriate outcome may be a bounded inference, competing historical interpretations, or a documented inability to identify a causal effect.

The framework also has possible failure conditions. Its proposed typed distinctions would have limited explanatory utility in a domain where the relevant sites of decision are indistinguishable in practice, their indicators cannot be measured reliably, or simpler models predict the same institutional outcomes with greater accuracy and interpretive economy. The hypothesized importance of provenance indepen-

dence would be weakened in particular settings by well-designed comparisons showing that properly understood source independence does not change evaluative reliability or reliance in the proposed circumstances. Predictions about practical contestability would be challenged by evidence that removing a documented bottleneck yields no improvement in eligible participants' substantive access, after accounting for other constraints and credible alternative explanations. A trust-feedback specification would require revision if observed institutional sequences contradict its assumed update mechanism or relevant parameter restrictions. These possibilities should inform prospective measurement and model comparison rather than be reinterpreted automatically as hidden confirmations of the theory.

Multiple research approaches remain necessary. Documentary process tracing can reconstruct sequences of rules and decisions but may not identify unrecorded counterfactual outcomes. Randomized displays of credentials or provenance can isolate bounded presentation effects while leaving broader institutional change untested. Quasi-experimental comparisons can estimate specified reforms under defended assumptions, with risks arising from selective adoption, spillovers, composition changes, and changing practices of record-keeping. Participatory and qualitative inquiry can identify neglected categories of experience and responsibilities, while also requiring attention to researcher position, recruitment, and interpretive disagreement. Normative analysis can evaluate the justification of procedural rules, although empirical accuracy alone does not determine what those rules ought to be.

The illustrative scenarios throughout this manuscript are hypothetical and non-identifiable. No institution has been investigated as a case study for the paper, no original participant data have been collected, and no causal effects of institutional power have been estimated. Bibliographic engagement and conditional model development warrant theoretical discussion; claims about the prevalence, magnitude, or direction of actual institutional mechanisms require further evidence. A future audit should test not only whether the equations are internally consistent but whether the constructs remain operationally separable across disciplinary, linguistic, organizational, and historical settings.

10.6 Institutional responsibilities and epistemic justice

The normative question arising from the analysis concerns the conditions in which knowledge institutions can exercise necessary authority while preserving proportionate access to evidence, accountable judgment, and feasible correction. A plausible institutional response would begin by specifying the scope of each delegated decision right, identifying the evidence on which decisions may properly rest, recording the reasons for material determinations, and establishing a review route suited to the significance of the decision. These practices can make institutional authority more intelligible without requiring all expertise or sensitive records to be made publicly available.

Contestability should include the ability to challenge relevant descriptions of fact, to question the appropriateness of evaluative criteria, and to obtain consideration of evidence that could materially affect a determination. For many contexts, this entails intelligible notices, usable documentation, assistance calibrated to actual burdens, appropriately independent reviewers, and authority to implement justified remedies. These are institutional design candidates whose merits depend on jurisdiction, resources, participant rights, and the consequences of error. More elaborate procedures may create costs, delays, and new forms of gatekeeping; an analysis of proportionality must consider those burdens as well as potential gains.

Privacy and accountability also require differentiated solutions. The controlled-review proposition of Section 8 establishes a weak informational advantage for an ideally optimizing reviewer under the stipulated inclusion of information and unchanged decision problem. It says nothing by itself about the actual competence of an auditor, the quality of the added evidence, the risks of disclosure, or the legitimacy of a particular access regime. Institutions can investigate combinations of confidential examination, data minimization, auditable reasons, access logging, and review of restricted findings. The governing aim is an accountable balance among evidentiary warrant, the rights of affected participants, and the protection of information entrusted to an institution.

Epistemic justice further concerns who bears the work of maintaining trustworthy evidence and who

gains the opportunity to benefit from it. Documentation, multilingual mediation, software maintenance, accessibility provision, and correction of erroneous records often operate as background conditions for visible scholarly and professional achievements. The organization of this labor affects the practical possibilities of attribution and review. Governance reforms should therefore examine the incentives and resources through which evidentiary infrastructures are sustained, alongside the normative responsibilities of those authorized to make consequential judgments.

An ethically defensible design cannot be inferred from one scalar indicator of transparency, trust, complaint volume, or correction frequency. Different institutional purposes and distributions of risk may support distinct procedural configurations. The framework suggests a disciplined evaluative question: whether participants can identify the relevant authority, encounter or securely challenge the evidence used, understand the reasons for a decision, and pursue a proportionate correction when warranted. The answer should be assessed in relation to a specified population and context, with attention to those whose contributions remain difficult to document or whose dependence renders formal choices ineffective.

10.7 Programme boundary and future investigation of circulation

The present paper occupies a defined position within a broader programme on relational evidence, recognition, trust, and value circulation. Paper II examines the structural legibility and possible encounter of heterogeneous relational events. Paper III investigates how observers attend to, remember, interpret, and rely on encountered evidence. Paper IV has concentrated on the institutional powers that shape evidentiary trajectories, recognized authority, and the conditions of effective criticism. The sequence separates mechanisms that can interact while preserving their distinct questions and standards of evidence.

Paper V is reserved for a further inquiry into the circulation of representations, commitments, and possible forms of relational currency. The epistemic authority established by an institution may enable a claim, credential, or contribution record to travel between organizations; the recipient may treat that record as reliable testimony, a signal of competence, an authorization, or an item eligible for a separate conversion process. Investigating how such representations circulate and acquire consequences requires attention to interoperability, conversion rules, commitments, and the distribution of returns. Those processes connect to institutional power without being exhausted by it. Nothing in Paper IV establishes that heterogeneous contributions have a common exchange value, that trust is a monetary quantity, or that successful recognition ensures equitable circulation.

A future circulation analysis may draw upon the present distinctions to ask who controls a conversion interface, what is retained or discarded when a relational history is summarized, which claims can be contested after transfer, and how the benefits and costs of recognition are distributed. The present framework provides candidate variables for such inquiry: source provenance, authorization scope, practical participation, dependency, and remedy. The existence and properties of any proposed relational currency remain to be argued and investigated in their own right.

The paper's concluding claim is consequently bounded. Knowledge institutions participate in constituting the practical evidentiary conditions under which authority and trust are formed, exercised, and revised. These conditions can be analyzed through historically situated and typed relations of power, while their legitimacy depends on purposes, rights, evidentiary warrant, material capacity, and accountable avenues of correction. The resulting formalism is a preliminary map of possible mechanisms, not a comprehensive theory of social reality. Its value lies in making consequential institutional distinctions explicit, furnishing conditional questions that can be tested, and preserving room for criticism when a representation, institutional rule, or empirical explanation proves inadequate.

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Research Ethics and Source Provenance

Research status. The manuscript contains all ten planned research sections. An initial integrated audit of formal assumptions, construct consistency, selected source metadata, cross-references, and empirical identification has been documented in the accompanying source package; comprehensive source-interpretation review, field validation, and external scholarly assessment remain outstanding. The argument offers an exploratory theoretical model, with no original fieldwork, participant experiments, or validated causal estimates.

Source status. The accompanying verification ledger records earlier publisher or bibliographic checks for the cited works. The v1.1 audit independently spot-checks selected primary metadata; it does not establish a complete text-level re-verification of every source. Their detailed arguments, applicability, and interpretation require continued scholarly review. The presence of a cited work does not establish the paper's own proposed power-trust mechanisms.

Illustrations. All institutional scenarios in this paper are fictional, general, and non-identifiable. The framework makes no allegation concerning any actual institution or individual.