Trajectory-Based Credibility under Symbol Inflation

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Abstract

As symbolic surfaces become compatible with increasingly heterogeneous production histories, the evidential basis of credibility can migrate from isolated outputs toward temporally extended histories. This paper develops *trajectory-based credibility* to analyze that migration. A trajectory situates a present surface within an event-structured history of action, revision, interaction, commitment, and consequence, preserving distinctions about development and agency that a terminal output may underdetermine. Trajectory evidence occupies an intermediate position between scalable symbolic inference and costly direct co-experience, making relational bandwidth a central constraint. The framework develops historical resistance, agency legibility, credibility depth, institutional translation, record burden, and trajectory inequality as target-relative dimensions of this evidential architecture. It further shows how strategic adaptation can convert trajectory systems into new symbolic infrastructures subject to renewed diagnostic pressure. Generative AI enters as one accelerator within the broader condition of symbol inflation. The paper concludes with an empirical program for measuring when trajectory evidence improves target-relevant discrimination and when its burdens, inequalities, or strategic distortions exceed that evidential gain.

Keywords: trajectory-based credibility; symbol inflation; relational history; agency legibility; evidential depth

Discussion Paper Note

This paper develops a constructive companion to *Symbolic Diagnosticity under Symbol Inflation*. Its objective is to examine how credibility practices can draw on temporally extended evidence when a portable symbolic surface gives limited access to the history relevant to a particular inference. The inquiry remains historically cautious: it identifies an evidential architecture and its constraints while leaving mature successor practices open to institutional and social evolution.

The central concept is *trajectory-based credibility*. A trajectory is a selective, event-structured history in which actions, revisions, relations, commitments, and consequences acquire evidential meaning through temporal and relational organization. This structure can preserve distinctions concerning development, agency, judgment, continuity, or responsibility that a terminal artifact compresses. Trajectory evidence therefore occupies an intermediate position between highly portable symbolic inference and information-rich direct co-experience.

The framework is organized by several constraints. Relational bandwidth limits how much history recipients can directly encounter. Historical resistance concerns the extent to which temporally distributed evidence constrains retrospective reconstruction. Agency legibility concerns the recoverability of role structure across human, institutional, and technical participants. Credibility depth concerns how much evidential structure a decision process actually mobilizes. Institutional translation makes trajectories portable while introducing compression, record burden, and unequal legibility.

These constraints also make trajectory-based credibility historically provisional. Once trajectory records, attestations, or credibility interfaces become consequential, actors can adapt to them strategically and institutions can standardize them into new symbolic surfaces. The paper therefore treats trajectory evidence as one evolving component of social inference under symbol inflation. Its closing empirical program specifies how the proposed constructs can be tested across educational, professional, market, and other institutional settings.

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The author encourages good-faith discussion, criticism, independent inquiry, and responsible use of the material in this work. The framework is intended to clarify changing relations among credibility, trajectory, and historical evidence. Responsible application should preserve proportionality, privacy, contestability, and room for unrecorded development, especially where trajectory infrastructure could otherwise become pervasive surveillance, compulsory self-documentation, reputational scoring, or strategic manufacture of apparent relational histories. This ethical request leaves the licence's permissions and legally authorized uses unchanged.

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Notices

Status. This pre-release draft develops a companion inquiry to *Symbolic Diagnosticity under Symbol Inflation*. It presents trajectory-based credibility as a provisional architecture for studying how reliance can draw on temporally extended evidence when isolated symbolic surfaces provide weaker access to

selected histories. The framework treats trajectories as mediated, target-relative, and costly evidential structures, with credibility depth calibrated to the inference, stakes, and burdens of a given setting.

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Statement on the use of language models. The exploratory discussions and preparation of this paper involved OpenAI's ChatGPT. ChatGPT supported exploratory dialogue, source discovery followed by website verification, conceptual reconstruction, argumentative criticism, and LaTeX drafting. The author selected the research problem, directed and approved theoretical commitments, and bears sole responsibility for the manuscript, including its definitions, claims, interpretations, and errors. Authorship credit remains with the human author.

1 Introduction

This section establishes the paper's central problem: a symbolic surface may remain usable while providing weaker access to the history from which recipients infer competence, attention, authorship, or commitment. The objective is to explain how this shift can redirect credibility toward temporally extended evidence while preserving the coordination role of symbolic mediation. The argument begins from the coordination value of portable symbols, introduces relational bandwidth as the constraint on richer access, and positions *trajectory-based credibility* between isolated surfaces and direct co-experience. The section also fixes the paper's historical scope. Trajectory practices are treated as an emergent research direction whose institutional forms remain unsettled.

Large-scale social life depends on action under indirect access to history. Employers make decisions from partial traces of an applicant's learning history. Readers evaluate scholarship from outputs and contextual evidence while continuous access to every failed argument, discarded model, and revision remains unavailable. Customers rely on brands and certifications through similarly compressed access to production histories. Institutions recognize signatures, degrees, professional titles, reports, and other portable forms because direct access to the processes behind them would be too expensive for ordinary coordination. Signaling theory provides one classic account of how observable features can carry information when underlying qualities are not directly visible (Spence 1973). Luhmann's analysis of trust approaches the same structural difficulty from a broader social perspective: trust becomes consequential because actors must reduce complexity in situations where the relevant possibilities exceed what can be fully inspected or calculated (Luhmann 1979). The social value of symbolic mediation therefore begins from a resource constraint: portable forms make selected histories usable when direct observation is too costly.

A companion analysis describes *symbol inflation* as a condition in which the production, circulation, or strategic construction of socially consequential symbolic forms expands faster than the interpretive and institutional capacities used to distinguish the histories, properties, or commitments those forms are taken to indicate. The present paper begins one step later. If similar symbolic surfaces can increasingly arise from heterogeneous histories, recipients face a changed inverse problem. A polished report may reflect extensive domain competence, careful human–AI collaboration, delegated generation followed by review, or largely automated production. A personalized message may reflect close attention, a reusable template, or an automated agent acting under standing instructions. A professional profile can condense years of practice or a rapidly optimized representation of competence. These possibilities preserve the surface's practical utility while making selected historical inferences less determinate.

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Generative artificial intelligence intensifies this problem in several domains while forming only one part of its broader scope. AI-mediated communication already includes cases in which an intelligent agent modifies, augments, or generates messages on behalf of a communicator (Hancock et al. 2020). Similar changes in symbolic diagnosticity can also arise through branding, credential proliferation, professionalized public relations, templating, automated personalization, outsourcing, platform optimization, and other organizational techniques. The relevant question is therefore broader than how to detect AI use. It concerns how credibility practices respond when a present symbolic surface carries less stable information about the history that produced it.

One response would be to demand direct verification of the hidden history. That response encounters an immediate structural limit. Direct experience is rich in information precisely because it consumes time, attention, exposure, and reciprocal participation. A research collaborator can learn how another person responds to uncertainty through months of joint work. A supervisor can observe whether a student revises an argument after criticism. Long-term partners can learn patterns of reliability through repeated interaction. These relations can reveal qualities that a polished surface compresses or omits. Yet the same features that make co-experience informative also make it difficult to scale. Large societies cannot require prolonged relational exposure before ordinary acts of hiring, purchasing, reading, consulting, authorizing, or communicating.

The resulting constraint can be described as *relational bandwidth*. Human actors possess limited capacity for sustained attention to other actors and for participation in shared histories. Relational bandwidth is consumed when people observe conduct over time, interpret changing contexts, remember prior interactions, negotiate disagreement, and remain exposed to later consequences. The scarcity is partly temporal and cognitive, but it is also institutional. Organizations have limited supervisory capacity; professional communities have limited attention; public institutions cannot build deep interpersonal relations with every person affected by their decisions. The importance of symbolic compression follows from this scarcity. Symbols make histories portable because full relational access is unavailable.

The relevant design space spans symbolic inference, temporally extended evidence, and direct co-experience. A recipient may remain unable to reconstruct a complete history while gaining access to more than an isolated present surface. Earlier drafts, dated decisions, changes in interpretation, prior interactions, independent attestations, revision patterns, accepted responsibilities, and visible consequences can situate a present artifact within a temporally extended structure. The recipient still encounters symbolic and institutional traces, now distributed across more than a single compressed endpoint. They form a sequence in which later claims can be interpreted against earlier states.

This paper uses *trajectory-based credibility* to name that intermediate possibility. The concept is initially heuristic. A trajectory is a temporally ordered and socially situated pattern through which selected aspects of prior action, revision, relation, commitment, judgment, and consequence remain available for later interpretation. Trajectory-based credibility arises when a recipient's confidence in a present claim, capacity, commitment, or actor is partly supported by such temporal structure in addition to the present symbolic surface. The relevant trajectory can be sparse, preserving selected events without continuous behavioral recording or claims of certainty about the underlying person or process. Its function is evidential: it changes what kinds of histories remain plausible when the present surface is interpreted.

Four terms are kept distinct throughout the paper. *Trajectory-based evidence* refers to the temporally organized traces available for inference. *Evidential depth* describes how far a given evidence basis reaches beyond the terminal surface into prior states, relations, or consequences. *Trajectory-based credibility* refers to target-relative reliance that is supported in part by such history. *Credibility depth* later describes the configuration of evidential access actually mobilized in a decision. The distinctions prevent a rich archive, a deep evidential structure, and a justified credibility judgment from being collapsed into the same concept.

The distinction is compatible with established accounts of trust as a response to uncertainty rather than its elimination. Möllering emphasizes the role of reason, routine, reflexivity, and a further suspen-

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sion of uncertainty in trust (Möllering 2006). Trajectory-based credibility retains that residual openness while changing the evidential basis through which uncertainty is managed. A long record can still be misleading; a person can change; a trusted institution can fail; a technically verified chain can support an interpretation that later proves mistaken. The narrower proposal is that different evidential architectures can change the basis on which uncertainty is suspended. Where isolated surfaces become less diagnostic, temporally extended relations among traces may acquire greater weight.

Several examples clarify the distinction. Consider a researcher whose present paper is exceptionally polished. If the only evidence available is the final artifact, a reader may find it difficult to infer how much of the conceptual work was performed by the named author, how the research question evolved, or whether the author can respond when the argument is challenged. A trajectory can add information through prior notes, successive versions, earlier related work, seminar exchanges, changes made after criticism, and subsequent extensions of the idea. None of these elements proves competence individually. Together they can make some histories more plausible and others less plausible.

A similar structure appears in professional evaluation. A curriculum vitae is a highly compressed representation. A portfolio contains more evidence, but even a portfolio can be assembled strategically from finished outputs. A temporally extended work history can reveal additional features: whether responsibilities increased, how a person handled failure, whether earlier decisions produced later consequences, whether collaborators repeatedly returned, or whether a claimed specialization emerged through recognizable development. Such evidence is still mediated. It can be selectively presented, institutionally privileged, or strategically staged. The value of trajectory therefore depends on its structure, anchoring, and interpretation rather than on mere volume.

The same distinction matters in interpersonal communication. A single warm and carefully personalized message may provide weaker evidence of contemporaneous attention when such language can be generated at negligible cost. A history of reciprocal exchanges can carry different information because later responses are conditioned by prior events, misunderstandings, commitments, and corrections. Even here, automation can participate extensively. An AI system can preserve context, recall prior messages, and generate continuity. The relevant inference then shifts toward agency: who encountered the information, who updated, who selected the response, who endorsed the commitment, and who remains accountable for consequences. Trajectory-based credibility is therefore inseparable from what later sections call *agency legibility*.

The framework assigns evidential relevance to participation, judgment, and responsibility across time, including in human–AI collaboration. A researcher can use generative systems throughout an inquiry while remaining historically involved in problem selection, evaluation, revision, interpretation, and responsibility. A physician can rely on technical systems while remaining accountable for clinical judgment. An organization can delegate routine communication while preserving clear structures of authorization and response. Conversely, a nominally human-produced artifact can hide ghostwriting, organizational scripting, strategic presentation, or shallow understanding. The relevant question concerns the legibility of participation and judgment across time, with production purity carrying no privileged status.

Trajectory should also be distinguished from technical provenance. Provenance can establish origin, transformation history, chain of custody, or the participation of particular tools and actors. Such information can be highly valuable, especially when the immediate problem concerns authenticity or asset integrity. A trajectory-based account asks additional questions that technical provenance does not automatically answer. Did the nominal author reformulate the problem after encountering contrary evidence? Did an institution maintain a commitment when doing so became costly? Did a decision maker understand and endorse the action recorded under their authority? Did a relationship alter the later conduct of its participants? These questions concern development, judgment, exposure, and responsibility as well as origin.

A further distinction concerns reputation. Reputation aggregates social judgments about an actor and

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can become another portable symbol. Ratings, rankings, citation counts, follower counts, institutional prestige, and other reputational devices can reduce search costs, yet they can also become targets of optimization. Trajectory-based credibility concerns historical structure beyond the accumulation of positive evaluations. A trajectory can contain failure, disagreement, revision, and discontinuity while remaining highly informative. Indeed, some of its diagnostic value may arise precisely from visible change. The relevant question is how an actor or institution moved through changing states, rather than whether a compressed score remained high.

This point introduces the concept of *historical resistance*. An isolated symbolic surface can often be produced after the evaluator's criteria are known. A temporally distributed trajectory can contain traces generated before those criteria, incentives, or later outcomes were fully available. Earlier states can therefore constrain retrospective presentation. A dated prediction carries a different evidential structure from an explanation written after the event. A sequence of research notes produced before a result is known differs from a retrospective narrative of discovery. Repeated commitments made before their costs are realized differ from a later declaration of consistency. Historical resistance is never absolute; records can be fabricated, selectively preserved, or strategically planted. Its importance is comparative: some temporal structures are more difficult to reconstruct retrospectively than a present surface.

This observation creates an immediate ethical danger. If trajectories matter, institutions may conclude that more recording is always better. Continuous monitoring can then be justified as credibility infrastructure. Students may be required to preserve every intermediate action; workers may be evaluated through fine-grained productivity traces; researchers may feel pressure to publicize unfinished thought; interpersonal life may become increasingly auditable. Such a regime would confuse evidential depth with record quantity. It could also alter the behavior being observed, reward actors who can curate legible histories, and create substantial privacy and administrative costs.

The paper therefore treats *record burden* as a constitutive limit rather than a secondary implementation problem. A socially acceptable trajectory practice must remain selective. Different claims require different forms of historical evidence, and many interactions should continue to proceed with very little of it. A low-stakes transaction may require only ordinary symbolic and institutional assurance. A high-consequence professional role may justify a richer history of supervised practice. A long-term collaborative relationship may generate credibility through repeated interaction without any formal archive. The appropriate depth depends on the inference at stake, the cost of error, the availability of alternative safeguards, and the burdens imposed by preservation.

Selective depth also matters because trajectory legibility is unequally distributed. Some actors inhabit environments that automatically generate recognized histories: prestigious universities, established laboratories, regulated professions, large firms, or organizations with durable archives. Other actors may work through informal collaboration, precarious employment, care work, migration, independent scholarship, community practice, or fragmented institutional settings. Their generative histories can be rich while remaining poorly legible to conventional evaluators. A shift from credentials toward trajectory evidence can therefore reproduce inequality if the social capacity to produce recognized trajectories is treated as equivalent to the underlying capacity or contribution.

This problem connects trajectory-based credibility to political economy. If recognized temporal depth becomes scarce and valuable, organizations can build markets around certifying, hosting, ranking, or translating it. Platforms may offer verified work histories; institutions may sell access to supervised trajectories; professional networks may convert relational visibility into advantage; firms may engineer apparently longitudinal engagement. The same process that weakens one symbolic shortcut can create demand for another. A trajectory can itself become symbolic capital once its social value is recognized. Any account of trajectory-based credibility therefore needs a theory of strategic adaptation rather than an assumption that temporal evidence remains outside symbolic competition.

The conceptual architecture of the paper is summarized in Figure 1. The figure identifies three broad analytical positions with different combinations of scalability, historical information, and relational cost;

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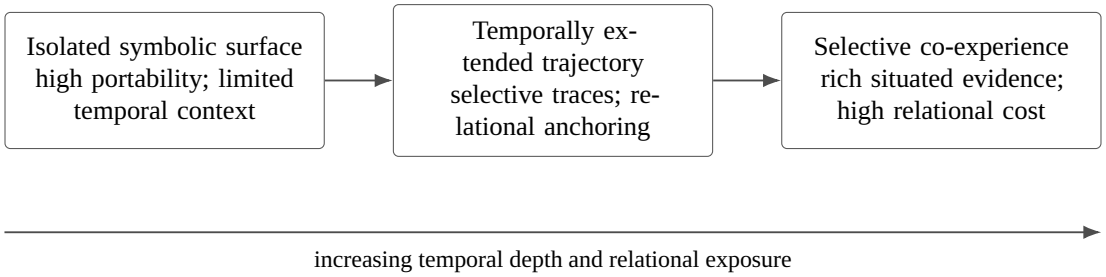

The positions are complementary rather than mutually exclusive. Social practices can increase evidential depth selectively as stakes, uncertainty, or relational commitment change.

Figure 1: Credibility depth across symbolic surface, trajectory, and selective co-experience. The figure represents an analytical range rather than a prescribed sequence or universal hierarchy.

institutions can combine them in context-specific ways. Symbolic surfaces remain the most portable. Trajectories introduce temporal structure while preserving substantial mediation. Direct co-experience offers richer situated information but consumes more relational bandwidth. Institutions and practices can combine these positions rather than selecting only one.

The historical status of this framework requires emphasis. Contemporary actors are currently experimenting with disclosure, verification, portfolios, interaction histories, supervised assessment, reputation mechanisms, and other ways of restoring context around symbolic production. It would be premature to treat these experiments as components of a single successor regime. Perceptual habits and institutional conventions adapt unevenly. A signal that is highly credible in one field can be irrelevant in another; a practice that reduces uncertainty for one group can intensify exclusion for another. The social meaning of a trajectory will itself be historically learned.

Accordingly, this paper does not offer a checklist for individuals seeking to appear trustworthy. Its object is the changing architecture through which credibility can become socially available. The analysis asks how temporal depth can matter without becoming surveillance, how agency can become legible without demanding human-only production, how co-experience can inform high-stakes relations without becoming universally required, and how institutions can translate histories without converting them immediately into another shallow score. These problems require attention to social theory, institutional design, political economy, education, professional practice, and empirical research.

The remaining sections develop that architecture progressively. Section 2 clarifies credibility under reduced symbolic diagnosticity. Section 3 develops relational bandwidth as a structural constraint. Sections 4–6 specify trajectory-based evidence, temporal extension, and historical resistance. Sections 7–8 examine agency legibility and the boundary of technical provenance. Sections 9–10 develop selective co-experience and credibility depth. Sections 11–14 turn to institutional translation across education, professional life, and markets. Sections 15–17 examine record burden, trajectory inequality, and strategic adaptation. Section 18 considers contingency in inquiry as a related epistemic problem. Section 19 formulates an empirical research program, and Section 20 returns to the historical openness of credibility practices under symbol inflation.

The intended contribution is therefore neither a restoration of an imagined pre-inflationary trust order nor a proposal to replace symbols with complete histories. Large-scale societies will continue to depend on compression, convention, and institutional shortcuts. The more limited claim is that the relative value of temporal and relational evidence can increase when isolated surfaces become compatible with a wider range of generative histories. Under those conditions, credibility may become less concentrated in what a present symbol looks like and more distributed across how an actor, artifact, or institution arrived there.

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2 Credibility under Reduced Diagnosticity

This section specifies the evidential transition that motivates the manuscript. A symbolic surface can preserve semantic or practical usefulness while losing discriminating power for selected properties of its generative history. Credibility here means target-relative warranted reliance tied to a specified inference or decision. The analysis develops *evidential migration* as a shift in the sources that support that reliance and identifies the conditions under which temporal or relational evidence becomes useful. This formulation keeps trajectory evidence conditional on the inferential target and domain.

2.1 Credibility under Uncertainty

Credibility becomes analytically useful when a recipient must decide how much reliance to place on a claim, actor, artifact, institution, or representation under incomplete access to its generative history. The relevant uncertainty can concern several different objects. A reader may ask whether a statement is accurate, whether a named author understands it, whether a professional can perform the relevant task without hidden support, whether an institution will honor a commitment, or whether a personalized communication reflects direct attention. These judgments can coexist while receiving different answers.

The present paper therefore uses *credibility* in a narrower sense than the full social phenomenon of trust. Trust commonly involves vulnerability, expectation, routinized reliance, and a willingness to proceed despite residual uncertainty. Möllering's account is useful here because it treats trust as a process in which reasons and routines contribute to a judgment that still requires a further suspension of uncertainty (Möllering 2006). Credibility, as used below, concerns part of the evidential environment within which such reliance becomes possible. A recipient can regard a source as highly credible for one claim while withholding broader interpersonal trust, and an established relationship can sustain trust even when a particular symbolic cue has become weak evidence for the property being inferred.

Definition 2.1 (Target-relative credibility)**.** *Target-relative credibility* is the degree to which a recipient treats an actor, claim, artifact, or institution as providing sufficient grounds for reliance with respect to a specified target inference in a specified context. The target can concern propositional accuracy, competence, authorization, attention, commitment, authorship, responsibility, provenance, or another socially relevant property.

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The target-relative formulation is important because symbol inflation affects inferences unevenly. A technically correct explanation can remain useful as an explanation while becoming weaker evidence that the named speaker possessed the underlying expertise before the interaction. A legally authenticated signature can remain effective authorization while revealing little about the signer's level of attention to the document. A degree can retain formal institutional status while its relation to a particular practical capacity becomes contested. The same symbolic surface can therefore sustain some forms of reliance while placing pressure on others.

This distinction also prevents credibility from becoming a global property of an artifact. A report is not simply credible or non-credible in the abstract. It can be credible as a record of an organization's official position, weak evidence of the individual drafter's competence, moderately informative about the institution's procedural commitments, and highly informative about a dated policy decision. The recipient's task is partly to identify which inference the surface can reasonably support.

2.2 Diagnosticity Reduction

The previous paper defined symbolic diagnosticity through the relation between an observable surface and the histories or properties recipients infer from it. The present analysis uses that relation as a starting condition. Reduced diagnosticity occurs when a familiar surface remains compatible with a wider or more heterogeneous set of plausible histories for the target property at issue. The change can arise from

generative AI, organizational delegation, templating, professionalized branding, credential proliferation, outsourcing, or other changes in production and circulation.

Signaling theory provides a useful limiting intuition. Observable signals can carry information when their production or acquisition conditions differ across underlying types (Spence 1973). A change in production conditions can therefore alter the evidential meaning of an unchanged surface. This observation does not require a claim that earlier signals perfectly revealed underlying qualities. It requires only a comparative shift in the mapping between observable cue and target inference.

Consider professional prose. Under one production regime, fluency, technical vocabulary, and coherent structure may have required substantial prior training or direct drafting effort. Under another regime, a person with less prior knowledge can produce a similar surface through strong assistance, while an expert can use the same assistance to work faster. The visible quality of the text remains real. Its relation to unaided competence becomes less determinate. The same reasoning applies to individualized communication. AI-mediated communication can modify, augment, or generate messages on behalf of a human communicator (Hancock et al. 2020). A message can therefore remain semantically responsive while carrying less direct information about how much attention, interpretation, or drafting effort the apparent sender personally contributed.

Definition 2.2 (Diagnostic basis)**.** A *diagnostic basis* is the set of cues, records, institutional guarantees, relations, and contextual information through which a recipient supports a specified credibility judgment. A diagnostic basis can contain an isolated surface, yet it can also include surrounding evidence that is external to that surface.

The definition shifts attention from the fate of a particular symbol to the architecture of evidence around it. When one cue weakens, recipients can retain the same practical objective while changing the composition of the diagnostic basis. A hiring committee may place less weight on polished take-home writing and more weight on supervised discussion. A research community may continue to read finished papers while assigning greater importance to seminar response, related work, reproducible materials, or longitudinal research development. A customer may rely less on visual brand polish and more on warranty, verified performance history, third-party assurance, or prior experience. These changes can occur gradually and unevenly without an explicit declaration that a former symbol has failed.

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2.3 Evidential Migration

Reduced diagnosticity therefore creates a redistribution problem. The evidential weight once concentrated in a surface can migrate toward other forms of support. The direction of migration depends on the property being inferred. Authorization may move toward authenticated institutional infrastructure. Product quality may move toward verified performance and repeat experience. Professional competence may move toward supervised practice, longitudinal work, or interaction under novel conditions. Interpersonal attention may move toward reciprocal history and exposure to subsequent response.

Definition 2.3 (Evidential migration)**.** *Evidential migration* is a change in the relative contribution of different diagnostic bases to a target credibility judgment following a change in the production, circulation, or interpretation of symbolic cues.

Evidential migration does not imply that the former cue disappears. A curriculum vitae can remain a useful index while carrying less evidential weight than it once did for selected competencies. A brand can remain recognizable while its claims require stronger external anchoring. A polished research article can remain the primary vehicle of scholarly communication while readers become more interested in the surrounding trajectory of argument formation, revision, data, and response. The practical structure is additive and reweighted rather than a simple replacement of one medium by another.

Table 1: Illustrative migration of credibility bases under reduced surface diagnosticity.

Context	**Target inference**	**Surface cue under pressure**	**Possible supplementary basis**
Scholarly work	Conceptual competence	Polished final manuscript	Revision history, prior related work, response under critique, reproducible materials
Professional evaluation	Practical capability	CV, portfolio, take-home output	Supervised performance, longitudinal responsibility, repeated collaboration
Personal communication	Direct attention	Warmth, personalization, stylistic care	Reciprocal history, subsequent updating, accountable commitment
Institutional communication	Authorization	Formal language, seal, branded template	Authenticated office, accountable signatory, enforceable procedure
Market exchange	Product or service reliability	Branding, visual polish, testimonial surface	Verified performance history, warranty, repeat use, independent assurance

Table 1 illustrates this target-relative redistribution. The examples are conceptual. They identify plausible changes in diagnostic architecture and should not be read as claims that every domain is already undergoing the same transition.

The table also shows why the transition cannot be captured by a single measure of ”trust in symbols.” Each row contains a different target inference and a different possible destination for evidential weight. In some cases, the institution can compensate for reduced surface diagnosticity through stronger procedural guarantees. In others, the target concerns a property such as learning, attention, or practical judgment that is inherently temporal. Those cases create stronger demand for evidence distributed across time.

Proposition 2.4 (Redistribution of credibility)**.** *When the diagnosticity of a symbolic surface decreases for a specified target inference, practical reliance can remain stable if other components of the diagnostic basis acquire sufficient evidential weight for that target. The resulting transition concerns the distribution of credibility rather than its aggregate disappearance.*

The proposition is deliberately conditional. Supplementary evidence can be unavailable, costly, exclusionary, or itself strategically manufactured. A recipient may also choose to tolerate greater uncertainty because the stakes are low. The proposition identifies a structural possibility: reduced diagnosticity creates pressure for evidential reallocation before it creates any necessary collapse of social coordination.

2.4 Surface Utility under Historical Ambiguity

A recurring source of confusion is the tendency to treat ambiguity about production history as evidence that the symbolic content itself has lost value. The two judgments can diverge substantially. A generated translation can be accurate even when it provides little evidence about the user’s language competence. A model-assisted legal summary can be useful even when it reveals little about the drafter’s independent doctrinal knowledge. A personalized customer-service response can solve a problem even when no employee composed it personally. A visual design can function effectively while leaving authorship or creative participation difficult to infer from the image alone.

This distinction matters for Paper 3 because trajectory-based credibility is not proposed as a universal requirement for consuming symbolic content. Many tasks are adequately served by direct inspection of the output. If the target is whether a calculation is correct, the relevant evidence may consist primarily of verification of the calculation. If the target is whether an instruction is clear, the reader can often judge

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clarity from the instruction itself. Temporal depth becomes relevant when the recipient needs to infer properties that are only weakly present in the surface and that matter to the subsequent decision.

The distinction can be summarized through the difference between *surface utility* and *historical inference*. Surface utility concerns what the artifact enables a recipient to do in the present context. Historical inference concerns what the artifact supports about the process, capacity, relation, or commitment behind it. Symbol inflation can increase surface utility by lowering production costs while simultaneously reducing historical diagnosticity for selected properties. Productivity gain and evidential ambiguity can therefore coexist within the same practice.

This coexistence helps explain why social adaptation can lag behind technical change. If outputs remain useful, organizations have incentives to adopt the new production pathway quickly. The evidential consequences may become visible more slowly because they arise only when recipients continue to infer latent properties from cues whose production conditions have changed. A professional system can therefore obtain efficiency gains before it develops new conventions for interpreting authorship, competence, or attention.

2.5 Institutional Anchoring

Institutional context can preserve credibility even when a surface becomes cheap to reproduce. A valid authorization derives force from procedures, accountabilities, enforcement, and recognized roles that extend beyond the appearance of the document. A professional certification can retain meaning when issuance depends on supervised practice or externally assessed competence. An organizational statement can remain consequential when a responsible office is identifiable and later conduct can be evaluated against the commitment. In such cases, credibility is partly anchored outside the surface.

This anchoring has two important implications. First, symbolic inflation does not affect every symbolic form in the same way. Symbols closely tied to enforceable institutions can retain substantial diagnostic or performative force even when visually similar forms are easy to generate. Second, institutional anchoring relocates reliance. The recipient increasingly depends on the quality of the validating institution, the integrity of its procedures, and the availability of accountability when the representation proves misleading.

Institutional anchoring is therefore another form of compression rather than an escape from mediation. A recipient usually does not inspect the complete procedure behind a credential or authorization. The institution supplies a second-order guarantee that the relevant history has been processed according to recognized rules. This arrangement can be highly efficient, yet it also concentrates interpretive power in organizations that define which histories count and which traces become legible.

The trajectory framework becomes especially relevant where institutional anchoring is incomplete or where the target property depends on development across time. An institution can certify that a person passed an examination, but that fact may provide limited evidence about how judgment changes under repeated uncertainty. A platform can verify that an account produced a sequence of posts, but account continuity alone may say little about who interpreted, selected, or endorsed each action. A university can verify that coursework was submitted, while the educational question may concern whether durable capability developed through the sequence. The gap between institutional verification and target inference creates space for richer temporal evidence.

2.6 Distributed Bases of Credibility

The analysis so far suggests that credibility is often distributed across several evidential layers. A surface can carry immediate semantic information. An institution can supply authorization or verification. A trajectory can add temporal structure. Repeated interaction can reveal situated conduct under changing conditions. These layers differ in cost, portability, manipulability, and relevance to particular targets.

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A useful conceptual consequence follows. Symbol inflation need not produce a single successor signal. Social systems can respond by combining heterogeneous evidential bases. An employer may use credentials, work history, supervised interaction, and references. A research community may use publications, replication, seminars, correspondence, and longitudinal intellectual development. A consumer may combine brand recognition, third-party certification, prior use, and warranty. The resulting credibility architecture is compositional.

Remark 2.5 (Credibility composition)**.** A credibility judgment can be supported by several partially independent bases. Greater evidential depth does not require that every basis agree or that every basis be equally informative. The practical question concerns whether the combined architecture supplies sufficient grounds for the target inference at an acceptable cost.

This composition also limits the appeal of universal authenticity tests. A single detector, provenance token, reputation score, or disclosure rule can answer only a subset of the questions recipients face. A detector can estimate whether a production method was used while leaving competence or responsibility unresolved. A provenance record can establish file history while leaving understanding unclear. A reputation score can summarize prior judgments while compressing the reasons behind them. Each mechanism can contribute to a diagnostic basis without exhausting it.

The importance of composition becomes clearer once strategic adaptation is considered. Any cue that acquires substantial evaluative weight can become a target of optimization. Actors learn how to produce credible-looking portfolios, collect endorsements, satisfy verification procedures, and cultivate favorable reputation. The same dynamic applies eventually to trajectory evidence. The purpose of the present section is therefore not to identify a cue that escapes strategic behavior. It is to show why credibility can move across layers as the relative diagnosticity of those layers changes.

Temporal evidence becomes especially relevant when the target property is itself developmental or relational. Competence can emerge through learning. Commitment can acquire meaning through persistence under changing incentives. Judgment can become visible through revision after error. Responsibility can be assessed through what actors do after consequences appear. Mutual understanding develops through reciprocal updating. These properties have temporal extension built into their social meaning.

An isolated surface can represent such properties, but representation and observation remain distinct. A person can state that they revised an argument; a sequence of dated versions can show how the revision occurred. An institution can declare long-term commitment; decisions made when maintaining the commitment became costly can provide a different form of evidence. A professional can claim expertise; repeated performance across changing problems can reveal how that expertise behaves outside a single optimized demonstration. Temporal evidence therefore changes the available inferential structure by connecting present claims to prior states and later consequences.

This transition should remain selective. Many forms of ordinary reliance do not justify the cost of reconstructing a trajectory. The demand for temporal depth is likely to be strongest where several conditions coincide: the target inference matters materially to the recipient, the surface has become compatible with substantially different histories, institutional guarantees leave relevant properties unresolved, and error carries enough consequence to justify richer evidence. These conditions define a domain in which trajectory-based credibility can add value without becoming a universal documentary norm.

Working Claim 2.6 (Trajectory relevance)**.** Trajectory-based evidence is especially relevant where the target inference concerns a temporally extended property and where isolated surface cues provide insufficient discrimination among histories that differ materially on that property.

The claim prepares the central transition of the paper. Reduced diagnosticity changes the relative value of available evidence while leaving appropriate evidential depth target-dependent. Where the inferential target concerns development, judgment, commitment, participation, or responsibility, temporally distributed traces can become more informative than further refinement of the present surface alone.

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That response is constrained by the cost of historical access. Rich historical and relational evidence consumes attention, memory, time, supervision, and reciprocal exposure, so indiscriminate increases in required depth can become socially expensive and exclusionary. This constraint motivates *relational bandwidth*: the limited capacity through which actors and institutions can encounter one another's histories in sufficient depth for those histories to matter.

3 Relational Bandwidth

This section identifies the main scalability constraint on richer historical evidence. Direct acquaintance, repeated interaction, and detailed historical reconstruction can improve some inferences, but each consumes time, attention, memory, interpretation, supervision, or reciprocal exposure. *Relational bandwidth* names this finite capacity. The analysis asks how evidential depth can be allocated under that constraint, how institutions can extend limited human observation, and why temporal compression becomes necessary when credibility must travel beyond the original relationship.

The need for symbolic mediation is partly a consequence of scale. Social actors regularly make decisions about people, organizations, products, claims, and institutions whose histories they cannot reconstruct directly. The constraint is informational, temporal, and relational. Directly learning how another actor behaves across changing conditions requires encounters to occur, memories to be retained, differences to be interpreted, and consequences to become visible. Trust scholarship has long treated trust as one way of acting under complexity that exceeds complete calculation or observation (Luhmann 1979). Accounts emphasizing reason, routine, and reflexive interpretation likewise show that practical trust is sustained through heterogeneous bases rather than through exhaustive knowledge (Möllering 2006). The present framework isolates one constraint within this broader problem: the amount of relational history that a recipient can meaningfully encounter is limited.

Definition 3.1 (Relational bandwidth)**.** *Relational bandwidth* is the bounded capacity of an actor or institution to acquire, interpret, retain, and update evidence arising from temporally extended relations with other actors, artifacts, or practices. The relevant capacity includes available attention, time, supervision, memory, interpretive skill, and opportunities for consequential interaction.

The definition concerns usable relational evidence rather than raw data volume. A platform may store millions of interaction records while a decision maker can meaningfully inspect only a small fraction of them. An institution may possess extensive archives while lacking procedures for interpreting how those records bear on a particular judgment. A person may have years of contact with another actor while remembering little that is relevant to the present decision. Relational bandwidth therefore depends on the conversion of traces and encounters into evidence that can actually participate in inference.

3.1 Finite Encounter Capacity

Direct co-experience can reveal features that are difficult to infer from a single symbolic surface. Repeated work with a collaborator can disclose how the person reacts when an initial plan fails, whether reasons are revised when new evidence appears, how commitments are handled under inconvenience, and how responsibility is distributed when consequences emerge. Longitudinal teaching can reveal whether a student's apparent performance develops into transferable capability. Repeated use of a service can disclose reliability across varying conditions. These forms of evidence are rich because they involve multiple states of the relation rather than a single optimized presentation.

Their richness also makes them expensive. A recipient must remain present across time, distinguish relevant changes from noise, preserve enough memory for later comparison, and often expose their own actions to reciprocal adjustment. The cost increases further where interaction requires supervision, travel, professional expertise, confidentiality safeguards, or institutional procedure. The same property that makes co-experience informative therefore limits its scalability.

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This constraint can be represented through a simple allocation model. Let B_i denote the relational bandwidth available to recipient i. Let d_{ij} denote the depth of relational evidence acquired about target j, and let $c_{ij}(d_{ij})$ denote the resource cost of acquiring and maintaining that depth. A feasible allocation satisfies Equation 1.

$$\sum_{j=1}^{n} c_{ij}(d_{ij}) \leq B_i. \tag{1}$$

Equation 1 does not imply that relational life is literally optimized through a numerical budget. It formalizes the narrower point that increasing evidential depth for one set of relations can consume resources that cannot simultaneously be devoted elsewhere. The cost function may also be highly uneven. Ten minutes of direct observation can be sufficient for one question, while another judgment becomes meaningful only after months of interaction. Relational bandwidth is therefore both finite and target-sensitive.

The allocation constraint helps explain why highly scalable societies rely on credentials, brands, professional roles, ratings, signatures, recommendations, and other compressed forms. These devices reduce the amount of direct history a recipient must inspect before coordination can begin. Their vulnerability under symbol inflation does not remove the underlying scalability problem. A response that demanded complete reconstruction of every relevant history would recreate that problem at a higher evidential cost.

Proposition 3.2 (Bandwidth constraint on credibility)**.** *Where a credibility practice requires greater relational depth for a growing number of targets, the required attention and interpretive resources can exceed the capacity of recipients or institutions unless some part of the evidential process is compressed, delegated, or selectively allocated.*

The proposition places an immediate limit on maximalist responses to reduced symbolic diagnosticity. Complete transparency, universal interviews, exhaustive portfolios, continuous supervision, or full process archives can each increase available information while simultaneously making evaluation impracticable. Credibility practices must therefore solve two problems together: they must recover enough evidence for consequential inference while keeping the cost of that evidence compatible with the scale of social coordination.

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3.2 Allocation of Evidential Depth

Finite bandwidth makes evidential depth an allocation problem. The appropriate depth depends on what the recipient is trying to infer and what follows from an error. A low-cost reversible transaction can rationally proceed with shallow verification. Selection of a long-term collaborator can justify much richer relational evidence. A recipient may require only functional output quality in one setting and a history of judgment, responsibility, or commitment in another. Uniform depth across these contexts would waste scarce attention in some cases while remaining insufficient in others.

Several dimensions can affect the value of deeper evidence. Stakes matter because an erroneous inference can impose larger consequences. Reversibility matters because mistakes that can be corrected cheaply require less ex ante certainty. Duration matters because long-lived relationships expose recipients to repeated consequences of an initial judgment. Substitutability matters because a recipient can tolerate more uncertainty when alternative providers or partners are readily available. The opacity of the target property also matters: a property visible in immediate performance requires less historical evidence than one expressed only through development or persistence.

These dimensions need not be combined into a universal decision rule. Their analytical role is to explain why trajectory-based credibility should develop as a graded practice. The same person can be evaluated through different evidential depths for different purposes. A reader can accept a concise factual

answer without reconstructing the author's intellectual development, while a hiring committee considering independent research capacity may reasonably require a much richer history. A customer can purchase an inexpensive object after a surface-level quality check, while a hospital selecting a long-term critical supplier may rely on longitudinal performance records and accountable institutional relationships.

Definition 3.3 (Evidential depth)**.** *Evidential depth* is the extent to which an evidential basis reaches beyond a presently visible symbolic surface into target-relevant prior states, interactions, revisions, relations, or consequences.

Evidential depth characterizes the structure of available evidence. It does not by itself state how strongly a recipient should rely on that evidence, and it is therefore distinct from the later concept of credibility depth, which concerns the evidential architecture actually mobilized for a target decision.

Evidential depth is not equivalent to the quantity of documentation. A large archive can remain shallow if its records repeat the same type of surface cue. A smaller sequence can be deep when it reveals how conduct changes under different conditions or how an actor responds after prior expectations fail. Depth therefore concerns the structure of accessible variation through time rather than documentary volume by itself.

This distinction will later matter for record burden. If institutions equate credibility with the accumulation of traces, actors can be pressured to produce continuous evidence of activity even when those traces contribute little to the target inference. A bandwidth-sensitive framework instead asks which additional historical observations materially change what can be inferred.

3.3 Relational Depth

Repeated interaction can add information because it exposes an actor to variation that a single presentation may avoid. A carefully prepared interview can display fluency under one condition. Collaboration across several stages can show how fluency interacts with uncertainty, disagreement, revision, waiting, resource constraint, and consequence. The relevant evidential gain arises from the relation among states rather than from the repetition of identical tests.

Relational depth therefore depends partly on heterogeneity of encounter. Ten interactions conducted under nearly identical conditions can reveal less than a smaller sequence spanning different demands. A research relationship may become informative when it includes proposal, criticism, failed implementation, revision, and later reinterpretation. A professional relationship may become informative when routine competence is observed together with an unexpected problem. A personal relationship may acquire credibility through the continuity between expressed commitment and conduct after incentives change.

This temporal structure gives relational evidence a property that isolated surfaces frequently lack: later observations can reinterpret earlier ones. An initially impressive performance may become less informative if subsequent behavior reveals that it was highly scaffolded. An early mistake may acquire a different meaning if later states show rapid learning and responsible correction. A statement of commitment can become more credible after conduct remains consistent when maintenance becomes costly. Credibility is therefore capable of retrospective updating across a sequence.

Remark 3.4 (Relational evidence as sequence)**.** Relational evidence derives part of its value from ordered variation. The same set of observable events can support different interpretations when their sequence reveals learning, persistence, escalation, repair, or withdrawal. Chronology is therefore an evidential relation rather than merely a storage format.

The remark helps distinguish relational depth from reputation aggregation. A reputation system can summarize many prior judgments into a score while erasing the order, conditions, and interpretive reasons that produced them. Such compression can be useful at scale, but it may conceal precisely the historical

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structure needed for a target such as learning capacity or responsibility after error. Trajectory-based credibility becomes relevant where the ordering of states contributes materially to the judgment.

3.4 Institutional Multiplication

Institutions partially relax individual bandwidth constraints by distributing observation across roles. A university does not require every employer to watch every student's educational history. Teachers, examiners, administrators, and credentialing procedures transform distributed observations into a portable representation. A professional organization can rely on supervisors, auditors, peer reviewers, and disciplinary procedures. A firm can distribute monitoring across teams and preserve records that allow later decision makers to inherit some of the informational value of earlier encounters.

This multiplication is central to social scale. It allows one recipient to rely on observations made by others. At the same time, it introduces a second-order credibility problem: the recipient must decide whether the institution has selected, interpreted, and compressed those observations in a way relevant to the present target. Institutional multiplication therefore converts direct relational bandwidth into delegated bandwidth rather than eliminating mediation.

The distinction becomes especially important under symbol inflation. Institutions can respond to weakened surface cues by increasing supervised practice, longitudinal assessment, independent verification, or accountable review. These responses may improve the evidential basis of a credential or decision, but they also consume organizational resources. Expanding relational depth across every member of a large institution can become expensive enough to change admission, employment, assessment, or service capacity.

Institutional multiplication also determines whose histories become portable. An organization with stable archives, recognizable roles, and trusted evaluators can convert local encounters into durable evidence. Informal communities, independent workers, migrants, early-career researchers, caregivers, and others whose activities cross institutional boundaries may accumulate equally rich histories while lacking comparable mechanisms of translation. Bandwidth is therefore linked to recognition infrastructure as well as to attention.

Working Claim 3.5 (Delegated bandwidth)**.** Institutional credibility can expand effective relational bandwidth by allowing recipients to inherit selected observations made by others, while the value of that delegation remains dependent on the institution's capacity to preserve the features of history relevant to the target inference.

This claim anticipates the later discussion of institutional translation. The problem is not simply how much history can be recorded. It is how distributed encounters can be transformed into portable evidence without compressing away the very temporal structure that justified collecting them.

3.5 Scarcity Effects

Bandwidth scarcity has distributive consequences. Deep attention cannot be allocated equally to every claimant, collaborator, applicant, institution, or artifact. Recipients therefore use preliminary cues to decide where deeper engagement is worth the cost. Those preliminary cues can include institutional prestige, prior reputation, recommendations, social proximity, linguistic familiarity, visible polish, or already recognized achievement. The mechanism creates a possible feedback loop: actors who are already legible receive more relational attention, and greater relational attention produces richer histories that later support further credibility.

This feedback is especially important for a trajectory framework. A person with access to prestigious laboratories, established firms, recognized mentors, or stable professional communities can accumulate trajectories that contain many independently interpretable traces. Another person can develop comparable capacity through fragmented or informal settings while leaving fewer traces that a distant evaluator

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recognizes. If institutions shift from surface credentials toward trajectory evidence without examining this asymmetry, they can reproduce existing inequalities through a new evidential vocabulary.

Bandwidth scarcity can also privilege continuity itself. Stable participation in one institutional environment often produces coherent archives, repeated witnesses, and interpretable sequences. Discontinuous lives can produce records that are scattered across countries, platforms, languages, occupations, or informal relations. The resulting evidential fragmentation may be mistaken for absence of development. Trajectory-based credibility therefore requires a distinction between a thin trajectory and a poorly translated trajectory.

A second scarcity effect concerns the recipient. Evaluators with limited time may prefer histories that are already narratively compressed. Applicants, organizations, and platforms then have incentives to package trajectories into clean stories of continuous development. Such packaging can improve usability, but it can also remove contingency, conflict, interruption, or ambiguity. The trajectory itself becomes vulnerable to the same symbolic pressures diagnosed in Paper 2.

Research Obligation 3.6 (Bandwidth-sensitive comparison)**.** Empirical evaluation of trajectory-based credibility should distinguish the informational value of historical evidence from the unequal opportunity to produce, preserve, translate, and receive attention for that evidence.

This obligation prevents the framework from treating evidential richness as a neutral personal possession. Richness can reflect capability, but it can also reflect access to institutions capable of witnessing and preserving capability. Later sections will develop trajectory inequality and strategic adaptation more fully. At this stage, the relevant point is that limited bandwidth structures whose histories can become socially consequential.

3.6 Bandwidth-Sensitive Credibility

A viable credibility practice must therefore respect both evidential need and relational cost. Increasing depth can improve inference for some targets, yet indiscriminate depth can overwhelm recipients, burden subjects, and create incentives for continuous self-documentation. Bandwidth sensitivity requires selectivity in what is preserved, when deeper inspection is triggered, and how much direct interaction is justified by the stakes of the decision.

The resulting architecture is likely to be layered. Ordinary symbolic surfaces can continue to support low-cost coordination where their diagnosticity remains adequate. Institutional guarantees can support domains in which authorization or procedure matters more than direct personal history. Trajectory evidence can be introduced when temporally extended properties become relevant. Direct co-experience can be reserved for cases in which the stakes, uncertainty, or relational duration justify its cost. These layers can coexist within the same social system.

Bandwidth sensitivity also changes the meaning of efficiency. A process that minimizes evaluation time can be inefficient if it produces repeated costly errors because the selected evidence was too shallow. Conversely, a process that collects extensive histories for trivial decisions can waste resources without materially improving outcomes. The relevant comparison therefore concerns the relation between evidential cost and the consequences of misclassification.

Proposition 3.7 (Selective depth)**.** *Under finite relational bandwidth, credibility practices can remain scalable when increases in evidential depth are concentrated on target inferences for which additional temporal or relational information is expected to alter a consequential decision.*

The proposition does not specify a universal threshold. It identifies a design orientation for later empirical work. The value of deeper history should be measured against the decision it informs, the availability of alternative signals, the burden placed on the evaluated actor, and the institutional cost of interpretation. This orientation is compatible with substantial variation among domains.

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3.7 Temporal Compression

Relational bandwidth creates the need for an intermediate evidential form. Direct co-experience provides rich information but scales poorly. Isolated symbolic surfaces scale well but can lose diagnosticity for selected historical properties. A trajectory can occupy the space between them by making portions of temporally extended experience inspectable after the original encounters have passed.

This intermediate position can be described as *temporal compression*. A trajectory does not reproduce every moment of a history. It preserves selected relations among states: an early claim and a later revision, a commitment and subsequent conduct, a draft and the criticism that changed it, a decision and the consequence through which its quality became visible. When these relations are preserved, a recipient can access part of the evidential structure of co-experience without having personally occupied the entire history.

Temporal compression differs from ordinary surface compression because its object is a sequence rather than a single state. The recipient still encounters a representation, yet the representation retains enough ordering and contextual variation to support inferences unavailable from the terminal surface alone. Selection, omission, interpretation, and strategic presentation remain part of that representation. The analytical gain lies in widening the observable structure while recognizing that complete history remains inaccessible.

Relational bandwidth therefore gives trajectory-based credibility its practical motivation. Scalable symbolic mediation remains necessary, while selected temporal relations can become portable when the present surface carries insufficient evidence for the inference at stake. This intermediate form is trajectory-based evidence: a structured representation whose informational value comes from preserved relations among events rather than from a collection of artifacts alone.

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4 Trajectory-Based Evidence

This section defines the trajectory as the paper's central evidential object. A trajectory differs from an archive or portfolio because its inferential value depends on preserved relations among events: temporal ordering, contextual variation, relational anchoring, agency information, and selective retention. The analysis formalizes this structure and then examines compression that preserves historical depth while controlling documentary volume. The section also marks the limits created by missing, curated, or strategically produced records.

The need for this distinction follows from the relational-bandwidth constraint developed in Section 3. A recipient rarely has access to an actor's complete history. Even when records are abundant, the recipient usually encounters a selected and compressed subset. The analytical problem is therefore to determine which relations among traces allow that subset to support inferences that a terminal symbolic surface cannot support by itself. A sequence of files, messages, scores, or certificates acquires trajectory value when their order and connection reveal development, persistence, revision, response, consequence, or another target-relevant historical pattern.

Definition 4.1 (Trajectory-based evidence)**.** *Trajectory-based evidence* is a temporally organized set of traces whose relations preserve target-relevant information about the development of an actor, practice, institution, or process across more than one historical state. Its evidential contribution arises from relations among states, including order, revision, response, continuity, interruption, and consequence.

Trajectory-based evidence is one family of evidence that can increase evidential depth. It becomes part of trajectory-based credibility only when a recipient uses that history to support a target-relative judgment. The distinction matters because a trajectory can be richly recorded yet irrelevant to the inference at hand, or highly informative while the recipient lacks access to it.

This definition places the emphasis on relation-bearing history. A trajectory can contain symbolic artifacts, but the artifacts acquire additional evidential meaning through their position within an ordered

structure. An early draft and a later draft can reveal revision when the relation between them is available. A promise and a later action can reveal persistence when the temporal connection is legible. A failed attempt and a later successful attempt can reveal learning when the intermediate development is sufficiently visible. In each case, the trajectory carries information that the terminal artifact alone omits.

4.1 Trajectory Structure

A minimal representation can treat a trajectory as a partially ordered graph of historical states and relations. Let V denote the observable events or traces, E the target-relevant relations among them, $\prec$ the temporal order, and α the available information about participation or agency. The resulting object is defined in Equation 2.

$$\mathcal{T} = \langle V, E, \prec, \alpha \rangle. \tag{2}$$

Equation 2 is deliberately permissive. A trajectory can contain a linear sequence, several parallel branches, repeated interactions, or a mixture of documentary and relational traces. The representation requires only that some temporal and relational structure remain available to the recipient. A research trajectory might connect a question, preliminary note, failed analysis, criticism, revised model, and later application. A professional trajectory might connect a decision, implementation, unexpected difficulty, response, and downstream consequence. A personal trajectory might connect a commitment with later conduct across changing circumstances.

The graph representation also clarifies why a trajectory differs from a simple chronology. A chronology can establish that event a preceded event b while leaving their substantive relation unspecified. Trajectory evidence becomes stronger when the connection itself is legible: b responds to a, revises a, contradicts a, fulfills a commitment made in a, or exposes a consequence generated by a. Temporal order therefore provides one component of evidential structure, while relation type provides another.

The same distinction applies to scale. A trajectory can be short when the relevant process unfolds quickly. Several iterations of a design task can reveal revision and learning within a day. A long trajectory can remain weak when it contains repeated surfaces with little contextual variation. Duration and record count therefore provide imperfect proxies for trajectory depth.

Proposition 4.2 (Relational contribution)**.** *For target inferences that concern development across time, the evidential value of a trajectory can depend more strongly on preserved relations among selected states than on the number of states preserved.*

The proposition gives the trajectory framework an important economy. It creates space for selective preservation. A recipient can sometimes learn more from a small number of well-related traces than from a large archive of activity. This feature will become important when later sections address record burden and surveillance risk.

4.2 Temporal Ordering

Temporal ordering contributes to credibility because many socially important properties are developmental. Learning, persistence, repair, responsiveness, commitment, and responsibility become visible through change or continuity across states. An isolated symbolic surface can display the current state while suppressing the path through which that state became possible. A trajectory restores part of that path.

Consider two polished research manuscripts with similar final quality. One may follow a visible sequence of problem formulation, failed attempts, methodological criticism, revision, and reinterpretation. Another may appear only at the final stage. The first trajectory supplies additional evidence about how the work developed. It can support inferences concerning judgment, capacity to revise, and sustained

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engagement that remain less accessible from the terminal text alone. The comparison does not establish superior intrinsic value for the first manuscript. It establishes a richer basis for selected historical inferences.

Ordering also makes reversals visible. An actor can state one position, encounter evidence, and later change that position. If only the final statement survives, the recipient may observe the conclusion while missing the process of updating. If both states and their relation remain accessible, the same final statement can carry evidence about receptiveness to criticism or capacity for correction. Trajectory-based credibility therefore treats change itself as potentially informative.

Continuity can be informative for different targets. Repeated conduct across contexts can support an inference that a commitment has survived changes in incentive or circumstance. Stable performance across tasks can support a limited inference about reliability. The relevant strength depends on contextual variation: continuity observed under materially different conditions can carry more information than repetition under a single controlled setting.

Temporal ordering also permits reinterpretation of earlier traces. A provisional claim that later becomes a successful prediction acquires a different meaning once the consequence becomes observable. A confident claim that repeatedly fails acquires a different meaning as contrary outcomes accumulate. In this sense, trajectories are dynamically interpretable. New states can alter the meaning assigned to old states without changing the historical record itself.

Remark 4.3 (Retrospective updating)**.** Trajectory evidence permits later events to alter the evidential interpretation of earlier traces. Historical order therefore supports a form of retrospective updating in which credibility judgments remain revisable as consequences, responses, and subsequent conduct become available.

Retrospective updating distinguishes trajectory-based credibility from a static reputation label. A reputation can summarize prior evaluation into a portable judgment. A trajectory preserves enough historical structure for later recipients to reconsider parts of that judgment when new relations become visible.

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4.3 Relational Anchoring

Temporal order alone leaves many histories ambiguous. A trajectory becomes more informative when some traces are anchored to relations beyond the actor's own self-presentation. These anchors can include responses from independent participants, externally visible consequences, institutional procedures, material outcomes, contractual commitments, public timestamps, collaborative records, or other traces whose production depends partly on actors or processes outside the evaluated subject's immediate control.

Relational anchoring matters because self-produced history can become another symbolic surface. A carefully curated portfolio can present a coherent narrative of development while excluding unsuccessful branches, disagreement, uncertainty, or dependence on others. External anchors introduce constraints on that narrative. A collaborator's criticism can establish that revision followed an actual interaction. A deployed system can expose whether an earlier design decision survived contact with use. A later institutional consequence can make a prior commitment easier to evaluate.

Anchoring does not produce automatic truth. Independent participants can share biases, institutional records can contain errors, and material outcomes can have multiple causes. The value of anchoring lies in increasing the number of relations that a purely retrospective narrative must accommodate. This can make some interpretations more difficult to sustain while leaving others open.

The distinction is especially important when trajectories are used to infer agency. A visible sequence of outputs may show continuity without revealing who selected the problem, who made the decisive revision, or who accepted responsibility. Relational anchors can help distribute agency more accurately

Table 2: Idealized record forms relevant to trajectory-based credibility.

Record form	Organizing principle	Inferential contribution
Archive	Preservation of prior traces	Extends historical access while leaving relation and relevance to later interpretation.
Portfolio	Curated presentation of selected work	Makes achievements portable while reflecting strong selection by the presenting actor or institution.
Log	Sequential recording of events or states	Preserves order and frequency while often retaining limited explanation of substantive relations.
Trajectory	Target-relevant relations across historical states	Supports inference from development, revision, response, persistence, interruption, or consequence.

by showing where other participants entered the process. The later section on agency legibility develops this problem directly.

Working Claim 4.4 (Anchored trajectory)**.** A trajectory gains additional discriminatory value when target-relevant parts of its historical structure are connected to traces whose production depends on independent participants, external procedures, or downstream consequences.

The claim concerns discriminatory value rather than a universal ranking of evidence. Some domains contain strong internal records and weak external ones. Others depend heavily on third-party observation. The appropriate form of anchoring remains domain-specific.

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4.4 Record Forms

Several familiar record forms can contain historical information while serving different inferential functions. Table 2 distinguishes four idealized forms. Actual systems frequently combine them.

Table 2 clarifies that trajectory is an analytical relation rather than a file format. An archive can support trajectory reconstruction when its traces can be ordered and related. A portfolio can contain trajectory evidence when it preserves development rather than only selected endpoints. A log can become trajectory evidence when contextual relations make the sequence interpretable. Conversely, a large record system can remain evidentially thin when it preserves events without the relations needed for the inference at hand.

This distinction also prevents a common design error. Systems can respond to uncertainty by maximizing data retention. Extensive retention increases storage while leaving the inferential architecture unresolved. The trajectory framework asks which relations need preservation before asking how much data should be kept. This ordering of priorities is central to the later analysis of record burden.

4.5 Evidential Selectivity

Trajectory construction is necessarily selective. Complete historical capture is infeasible for most social processes and undesirable in many settings. Recipients therefore require a principle for deciding which traces merit preservation and which relations merit attention. The appropriate principle is target-relative relevance.

A trajectory designed to evaluate learning should preserve different relations from one designed to evaluate authorization. Learning may require evidence of initial state, feedback, revision, transfer, and retention. Authorization may require a valid chain of delegation and accountable endorsement. Reliability may require repeated performance under relevant variation. Sincerity may require relations between expressed commitments and later conduct, though such judgments remain ethically and epistemically difficult.

Target-relative selection also reduces the temptation to treat history as a single comprehensive score. A person can display strong revision capacity and weak punctuality, sustained commitment in one domain and rapid exit in another, or deep competence under supervision and uncertain performance under autonomous conditions. A trajectory can support differentiated profiles rather than a single generalized credibility value.

The selection problem therefore includes two questions: which historical relations are relevant to the target, and which retained traces adequately represent those relations. The first is conceptual. The second is empirical and institutional. Confusing the two can produce systems that collect convenient metrics because they are measurable while omitting harder forms of evidence that matter more to the judgment.

Research Obligation 4.5 (Target-relative preservation)**.** Trajectory-based evaluation should justify preserved traces by their expected contribution to a specified inference rather than by the general availability of the traces themselves.

This obligation creates a restraint against indiscriminate documentation. It also keeps the framework compatible with privacy. Evidence can be sufficient for a defined judgment while leaving large parts of a person's history outside the evaluative system.

4.6 Trajectory Compression

The recipient eventually encounters a compressed representation of the trajectory. Full historical reconstruction remains impossible under finite bandwidth. The practical problem therefore shifts from preservation alone to the quality of compression.

A useful compression preserves relations that materially affect the target inference. For learning, a compressed trajectory might retain an initial attempt, a consequential criticism, a revision, and a later transfer task. For professional responsibility, it might retain the decision context, the chosen action, subsequent feedback, and the actor's response. For institutional credibility, it might retain prior commitments, implementation traces, independent review, and observable consequences.

Compression introduces interpretive power. Whoever selects the states and relations can influence the story that becomes visible. Institutions may standardize categories in ways that improve comparison while suppressing unusual forms of development. Individuals may choose episodes that support a preferred self-narrative. Platforms may optimize summaries for engagement or convenience. Trajectory-based credibility therefore relocates part of the credibility problem into the design of historical representation.

A mature trajectory architecture would consequently require legibility of selection. Recipients should be able to understand, at least in broad terms, which kinds of events were eligible for inclusion, which forms of omission are structural, and where interpretation entered the compression process. This requirement does not demand exhaustive disclosure. It asks that the evidential shape of the trajectory remain inspectable enough for recipients to calibrate their inference.

Proposition 4.6 (Compression preservation)**.** *Trajectory compression supports credibility when it preserves the temporal and relational features that bear on the target inference while keeping the interpretive cost within the recipient's available bandwidth.*

The proposition connects Sections 3 and 4. The trajectory provides additional historical structure, while compression keeps that structure socially portable. Excessive compression recreates the ambiguity of an isolated surface. Excessive retention can exceed the recipient's capacity and impose unnecessary burdens on the subject. The viable region lies between these limits and varies across domains.

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4.7 Interpretive Limits

Trajectory evidence remains incomplete. Historical traces can be missing, misclassified, selectively retained, or generated under unequal opportunities for documentation. A coherent trajectory can therefore reflect the structure of the recording environment as much as the structure of the underlying activity. This limitation is especially important when discontinuity, migration, informal labor, private care, independent scholarship, or institutional exit creates gaps in formal records.

Missingness can itself have several meanings. A gap can indicate inactivity, an unrecorded period of substantial activity, deliberate privacy, infrastructure failure, or movement across incompatible recording systems. Treating all gaps as negative evidence would therefore introduce a systematic bias toward actors whose lives are continuously legible to stable institutions.

Strategic curation creates a different limit. Once trajectory evidence acquires social value, actors gain incentives to stage development, preserve flattering branches, and remove inconvenient context. Institutions can also generate standardized trajectories that reward conformity to expected developmental patterns. These pressures will be analyzed more fully in the later analysis of strategic adaptation. Their presence already implies that a trajectory should remain open to contestation and supplementation.

Trajectory-based evidence extends the observable field while preserving the mediated character of historical access. It can improve selected inferences by retaining relations across time. This position preserves the central lesson of Paper 2: credibility depends on the relation between observable form and the history recipients infer from it. Paper 3 changes the observational unit from a single surface to a structured temporal representation.

The decisive additional property is temporal structure. Evidence distributed across time can reveal order, change, branching, convergence, and consequence that a present-state representation cannot carry by itself. Temporal extension therefore becomes part of the evidential architecture rather than a synonym for mere duration.

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5 Temporal Extension

This section develops the temporal structure of trajectory evidence through an event-based partial order. The model permits precedence and historical dependence while preserving parallel branches, incomparable events, and later convergence. Temporal depth is therefore separated from elapsed duration. The section also establishes the computational representation used later to analyze historical resistance while retaining uncertainty about relations that the record does not resolve.

Section 4 represented a trajectory as $\mathcal{T} = \langle V, E, \prec, \alpha \rangle$, where V contains observable events or traces and $\prec$ records temporal order. The notation can now be made more precise. A social trajectory rarely forms a single chain. Research activities can proceed in parallel; several collaborators can act independently; an institutional decision can generate effects in different settings; a later revision can integrate several earlier branches. The relevant temporal object is therefore a partially ordered event structure rather than a single sequence.

5.1 Event Partial Order

Let each vertex $v \in V$ represent an event that has become sufficiently observable for the target inference. An event can be a decision, interaction, revision, commitment, test, observation, institutional act, or consequential change. The strict relation $u \prec v$ states that u precedes v within the trajectory in a target-relevant sense. This relation can encode ordinary temporal precedence, but it can also preserve stronger historical dependence when the record supports it. The order is required to satisfy the conditions in Equation 3.

$$\neg(v \prec v), \qquad (u \prec v \ \wedge \ v \prec w) \Rightarrow u \prec w. \tag{3}$$

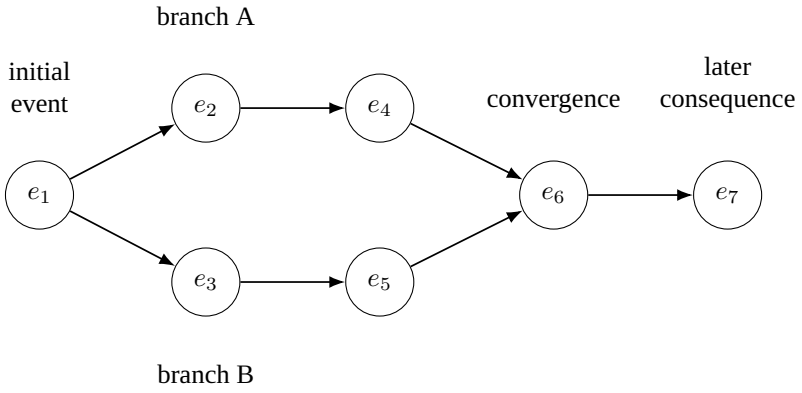

Figure 2: Illustrative event-poset trajectory. The diagram preserves branching, parallel development, convergence, and later consequence without forcing every event into a single linear chain. Arrows indicate established precedence or target-relevant historical dependence.

Equation 3 defines a strict partial order through irreflexivity and transitivity. It does not require every pair of events to be comparable. Two events can therefore remain unordered when the available history provides no target-relevant basis for placing one before the other. This feature is substantively important. Parallel work, independent observations, simultaneous institutional processes, and distributed participation should remain distinct from a fabricated linear narrative.

The incomparability relation is defined in Equation 4.

$$u \parallel v \quad \Longleftrightarrow \quad \neg(u \prec v) \ \wedge \ \neg(v \prec u). \tag{4}$$

In Equation 4, $u \parallel v$ indicates that the trajectory preserves the two events without imposing an order between them. Incomparability can reflect genuine concurrency, insufficient temporal resolution, or analytical independence. These cases can later be distinguished through relation types or metadata, but they should not be collapsed merely to obtain a visually simple history.

Definition 5.1 (Event-poset trajectory)**.** An *event-poset trajectory* is a trajectory whose historical backbone is a strict partially ordered set $(V, \prec)$, supplemented by target-relevant typed relations and agency information. Its temporal content is carried by the order structure among events rather than by a requirement that all events occupy one linear sequence.

This definition changes the meaning of temporal extension. Extension is not simply the accumulation of elapsed time. It is the growth of an ordered historical structure in which later events can depend on, respond to, revise, or constrain interpretations of earlier ones.

Figure 2 illustrates the basic structure. Events e_2 and e_3 occupy different branches, as do e_4 and e_5. The convergence at e_6 records that a later state can integrate or become jointly conditioned by several earlier pathways. The representation therefore retains information that would be lost if the same history were summarized as a single ordered list.

5.2 Order Depth beyond Chronological Duration

Chronological duration and historical depth should remain analytically separate. A trajectory can span ten years while preserving only a few weakly connected states. Another can unfold within several days while containing dense revision, response, branching, and consequence. Elapsed time is therefore one property of a trajectory, while order depth is another.

For a finite event poset, define a chain as a subset of events whose members are pairwise comparable under $\prec$. The maximum chain length provides one simple measure of order depth. It is defined in Equation 5.

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$$D_{\prec}(\mathcal{T}) = \max\{|C| : C \subseteq V \text{ is a chain under } \prec\}. \tag{5}$$

Equation 5 is a structural measure rather than a measure of credibility. A deep chain can record repeated dependence while remaining uninformative about competence, sincerity, or responsibility. Its purpose is to distinguish the number of ordered historical stages from calendar duration and from raw record count.

Breadth carries different information. A wide event structure can preserve parallel exploration, distributed collaboration, or independent testing. In a research process, several methods may be tried without a meaningful order among them. In an institution, several offices may respond to the same initiating event. In a personal relation, several commitments can unfold across different contexts. These structures can matter precisely because their branches later converge or remain inconsistent.

Remark 5.2 (Temporal age)**.** The age of a record should not be treated as a proxy for trajectory depth. A historically extended trajectory derives evidential value from preserved relations among events, including dependence, response, branching, convergence, and consequence. Calendar duration alone supplies little information about these relations.

This distinction helps prevent an easy institutional shortcut. Once history is recognized as valuable, systems may reward older accounts, longer employment, more extensive archives, or uninterrupted documentation. Such proxies can privilege actors with stable institutional continuity while overlooking dense but shorter periods of learning or substantial activity conducted outside formal recording systems. The event-poset representation keeps the analytical focus on relational structure.

5.3 Counterfactual Visibility through Branching

Branching matters because a trajectory often contains alternatives that were available before a later outcome became known. A final successful result can make the history appear more inevitable than it was. Preserving failed attempts, parallel hypotheses, rejected designs, or competing institutional responses can recover part of the uncertainty under which earlier judgments were made.

This does not require preserving every abandoned possibility. The relevant branches are those that contribute to a target inference. For judgment, a small set of alternatives can show that selection occurred among materially different options. For learning, a failed branch can show how feedback altered later conduct. For responsibility, an available warning or rejected alternative can change the interpretation of a later decision.

Branching can therefore increase what may be called *counterfactual visibility*. The trajectory does not recover unrealized worlds. It preserves some evidence about which alternatives were actively represented, attempted, considered, or rejected before the eventual state emerged. This can make later successes and failures more interpretable.

Proposition 5.3 (Branch-preservation contribution)**.** *For target inferences concerning judgment, learning, or responsibility, preserving selected branches can provide information that a single realized path cannot supply, because branch structure reveals part of the alternative set available before later outcomes were known.*

The proposition is especially relevant under symbol inflation. A polished final surface can be generated after the outcome is known and can present a coherent story of how that outcome was reached. A trajectory that preserves selected pre-outcome branches can expose more of the uncertainty that structured the actual process.

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5.4 Consequence through Convergent Histories

Convergence provides a complementary structure. Several earlier events can feed into a later state. A revised theory can integrate separate criticisms. A policy decision can combine evidence from several offices. A product can incorporate parallel engineering and user-feedback streams. A later institutional judgment can depend on several independent records. These convergences are informative because they show that the later event occupies a relational position produced through more than one pathway.

Consequences extend the trajectory beyond the moment of action. A decision and a polished justification may look coherent at the time of issuance. Later implementation, use, failure, repair, uptake, or institutional response can alter the evidential interpretation of the earlier event. Temporal extension therefore includes a forward-facing component: events acquire new historical relations as consequences become observable.

For an event v, its observable historical past can be represented by the set in Equation 6.

$$\text{Past}(v) = \{u \in V : u \prec v\}. \tag{6}$$

Equation 6 identifies the events ordered before v within the available trajectory. As new events are added, earlier events remain fixed while their relational embedding can become richer. A later consequence can therefore enlarge the structure through which an earlier decision is interpreted without changing the earlier event itself.

This property gives trajectories a form of historical openness. Credibility can remain revisable because the evidential structure continues to develop. A present judgment is made from a current substructure, while later events can add relations that support reinterpretation. This is another reason to avoid compressing a trajectory too early into a permanent reputation score.

5.5 Typed Relations beyond Precedence

Partial order supplies the temporal backbone, but social trajectories require relations richer than precedence alone. Two events can be ordered while their substantive connection remains unknown. Paper 3 therefore treats E in Equation 2 as a set of typed relations layered over the event poset.

Relevant relation types can include revision, response, contradiction, fulfillment, delegation, authorization, criticism, dependence, observation, implementation, and consequence. A computational representation can encode such a relation as a labeled edge or as a higher-order relation involving several events. The same event can participate in multiple relation types.

This distinction protects the model from reducing history to time stamps. An earlier draft and a later draft become informative when a revision relation is recoverable. A promise and a later action become informative when a fulfillment or violation relation can be assessed. Two independent observations become informative when their shared target and independence are legible. Temporal extension therefore gains evidential force through the combination of partial order and typed relational structure.

Definition 5.4 (Relational event structure)**.** A *relational event structure* is an event-poset trajectory supplemented by one or more typed relations whose interpretation is specified relative to the target inference. These relations may connect pairs of events or larger event configurations.

The final clause permits higher-order structure. Some historical properties cannot be represented adequately by isolated pairwise edges. A collaboration, for example, can involve several participants and events whose significance lies in the configuration as a whole. A sequence of independent replications can jointly constrain a claim even when no single pairwise relation captures the relevant structure.

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5.6 Computational Representation

The event-poset formulation admits several computational realizations without committing the conceptual framework to one model family. A directed acyclic graph can represent a finite partial order after an appropriate transitive reduction. Typed edges can carry relation classes. Hyperedges or higher-order cells can represent relations whose meaning depends on several events at once. Probabilistic weights can later encode uncertainty about whether a relation is present, how strongly an event supports an inference, or how reliable a trace is.

This flexibility creates a natural bridge to computational models built from events and higher-order relational complexes. A spin-foam-inspired representation is one possible structural analogy. Spin-foam formulations in quantum gravity use combinatorial 2-complexes with vertices, edges, and faces to represent histories and transitions (Perez 2013). In the present social model, vertices can stand for events, connecting structures can encode relations or transitions, and higher-order cells can represent constraints that are not reducible to one linear history. The analogy is methodological. The present paper does not claim that social trajectories instantiate the physical dynamics of spin-foam models. Its value lies in suggesting a computational vocabulary for histories whose structure is distributed, partially ordered, and compositionally constrained.

Remark 5.5 (Model pluralism)**.** The trajectory framework does not require a unique computational formalism. Graph, poset, probabilistic, categorical, or higher-order-complex representations can be appropriate when they preserve the target-relevant event relations and make their modeling assumptions inspectable.

This model pluralism is important because different domains preserve different kinds of historical relation. Software development may provide detailed version and dependency structure. Education may preserve assessments, feedback, and transfer tasks. Institutional governance may provide authorization and review relations. Personal interaction may contain much weaker formal traces. The computational representation should follow the evidential architecture rather than impose the same ontology on every domain.

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5.7 Selective Temporal Extension

Temporal extension should remain selective. A system does not gain credibility merely by recording more events. The relevant objective is to preserve enough ordered and relational structure to support a specified inference while respecting bandwidth, privacy, and burden constraints.

This requirement also means that the event ontology is consequential. Deciding what counts as an event determines which histories become computationally legible. A research notebook can treat each observation as an event, while an institutional record may treat only formally approved decisions as events. A learning system may register assessments while ignoring unrecorded reading, conversation, or reflection. Event selection can therefore reproduce the same recognition inequalities identified earlier in the trajectory framework.

For this reason, the event-poset model is a representation of observable history with a bounded evidential scope. It organizes what has become available for inference while leaving unrecorded relations outside the represented field.

Research Obligation 5.6 (Event-selection legibility)**.** A trajectory architecture should make sufficiently clear which classes of event can enter the representation, which relations are preserved, and which forms of activity are structurally likely to remain outside the observable history.

The obligation also exposes a further property of event-structured evidence: its resistance to retrospective reconstruction after the evaluative target has become known. Partial order, independent anchoring, branching, and downstream consequence can each constrain that reconstruction in different ways. This property is developed as *historical resistance*.

6 Historical Resistance

This section develops a second property of trajectory-based credibility: the extent to which an observable history constrains retrospective reconstruction after an evaluative target has become salient. Section 5 represented trajectories through partially ordered events. The present section uses that structure to distinguish temporal extension from *historical resistance*. A long record can remain easy to curate retrospectively when most of its visible structure is weakly anchored, while a shorter record can be more constraining when earlier events were deposited across independent settings, linked to later consequences, or committed before the current evaluative target was known. Historical resistance therefore concerns the structure of feasible reconstruction rather than chronological age alone.

The concept is deliberately limited. Historical resistance does not establish truth, sincerity, competence, or moral worth. A durable falsehood can acquire a highly resistant history, and a truthful claim can arise from a sparse record. The analytical role of the concept is narrower: it describes how much freedom remains to manufacture, reorder, or reinterpret a trajectory once the desired present appearance is already known.

6.1 Retrospective Reconstruction

Consider an evaluator who observes a present claim, artifact, credential, or performance and then asks which histories remain compatible with it. A producer who already knows the desired present evaluation faces a different problem from an actor who generated earlier traces before that evaluation became salient. The producer can select, curate, or create evidence with the terminal target in view. The resulting history may still be accurate, but its evidential structure contains fewer constraints arising independently of the present objective.

Let y denote a present evaluative target and let Ω denote a class of candidate event structures that could in principle be presented as histories relevant to y. Let C collect the observable constraints imposed by partial order, externally anchored events, cross-event relations, and recorded consequences. The admissible retrospective reconstructions are defined in Equation 7.

$$\mathfrak{F}_C(y) = \left\{ \mathcal{T}' \in \Omega : \mathcal{T}' \models C \text{ and } \mathcal{T}' \rightsquigarrow y \right\}. \tag{7}$$

In Equation 7, the symbol $\mathcal{T}' \rightsquigarrow y$ means that the candidate trajectory remains compatible with the present evaluative target. The equation is schematic. Its purpose is to locate historical resistance in a constrained possibility set rather than in record volume. When additional credible constraints remove possible retrospective reconstructions, the observable history becomes harder to reshape around the present target.

Definition 6.1 (Historical resistance)**.** *Historical resistance* is the degree to which the observable structure of a trajectory constrains retrospective construction, reordering, or selective reinterpretation after a relevant evaluative target has become salient. Historical resistance is target-relative because the same event structure can strongly constrain one inference while leaving another largely open.

A convenient comparison can be made without assigning a universal scalar score. Suppose two evidential architectures, C_1 and C_2, concern the same evaluative target. The resistance ordering in Equation 8 treats the second architecture as at least as historically constraining when every retrospective reconstruction compatible with it is also compatible with the first.

$$C_2 \succeq_H C_1 \quad \Longleftrightarrow \quad \mathfrak{F}_{C_2}(y) \subseteq \mathfrak{F}_{C_1}(y). \tag{8}$$

Equation 8 defines a comparative ordering rather than an empirical measurement scale. Quantitative realizations would require a reference space, a model of feasible manipulation, and assumptions about

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the cost or probability of different reconstructions. Those assumptions are likely to vary substantially across scholarship, employment, institutional governance, commerce, and interpersonal communication.

6.2 Pre-Outcome Deposition

One important source of resistance is the deposition of traces before the specific outcome or evaluative demand they later support has become fully known. An early research note written before a result is obtained, a prediction made before an event occurs, a design decision recorded before downstream performance is visible, or a learning artifact produced before a final assessment can each constrain later narratives about how the present state emerged. Their evidential importance comes from their position relative to the later target rather than from age by itself.

This relation can be expressed through an *evaluation cut*. Let τ_y denote a point at which the relevant target y becomes sufficiently salient to guide strategic retrospective construction. Events that are already fixed relative to the observable history before τ_y can restrict later completion of the trajectory. Events created after τ_y can remain informative, but their interpretation should account for the fact that the terminal criterion was already available to the actor.

The evaluation cut is rarely exact in social life. Research objectives develop gradually, institutional criteria can be partly anticipated, and actors often pursue several goals simultaneously. The concept therefore represents a comparative change in informational conditions rather than a sharp metaphysical boundary. A trace can possess partial pre-outcome force when only some dimensions of the later evaluative target were foreseeable at the time of deposition.

Proposition 6.2 (Pre-outcome constraint)**.** *For a fixed target inference, an event deposited before the relevant evaluative criterion becomes available can constrain retrospective reconstruction more strongly than an otherwise equivalent event created after that criterion is known, provided that the earlier event is sufficiently stable and its temporal placement is itself credible.*

The qualification concerning temporal placement is important. A document that merely displays an old date does not automatically provide historical resistance. Its contribution depends on whether later alteration, backdating, or substitution remains feasible. The concept therefore connects naturally to anchoring relations beyond the artifact itself.

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6.3 Distributed Anchoring

Historical resistance can increase when events are embedded across several relational contexts whose records are difficult for one actor to rewrite unilaterally. Correspondence with another party, an externally reviewed submission, a public presentation, a contractual decision, an institutional approval, a repository deposit, or a transaction recorded by another system can all create anchors that constrain later reconstruction. The central property is not publicity. It is the distribution of control over the historical record.

An anchor is relational when the event is connected to another actor, institution, material consequence, or record system that contributes constraints beyond the focal actor's later self-description. Several anchors can create a network of mutually limiting reconstructions. If one account is revised, the revision must remain compatible with traces held elsewhere and with the partial order connecting them.

The framework should avoid treating nominally distinct sources as automatically independent. Two repositories can rely on the same upstream database; several witnesses can coordinate; organizational records can share a common authority; and automated systems can reproduce the same initial error. Historical resistance therefore depends on the architecture of dependence among anchors, not simply their count.

Definition 6.3 (Distributed historical anchoring)**.** A trajectory exhibits *distributed historical anchoring* when target-relevant events or relations are constrained by multiple loci of record, participation, or consequence whose later modification is not governed by a single focal actor.

Distributed anchoring can support credibility while preserving privacy when the anchors record only what is necessary for the target inference. A system may need evidence that a review occurred before a decision without preserving the entire content of the review. Historical resistance can therefore arise from selective commitments to event existence, order, authorization, or consequence rather than from complete behavioral capture.

6.4 Branching Histories

Branching contributes another form of constraint. A polished retrospective narrative often presents a smooth path from intention to result. Actual inquiry, learning, design, and collaboration frequently contain abandoned alternatives, failed attempts, reversals, parallel experiments, and delayed integration. Where these branches were recorded before the final state became known, they can make the trajectory harder to reconstruct as a frictionless story optimized for the present evaluation.

The event-poset formulation is useful here because alternative branches need not be forced into one sequence. Two events can be incomparable while both precede a later convergence. A later successful outcome may therefore inherit a visible history of competing pathways rather than an apparently inevitable line of development. Such structure can support inferences about exploration, revision, or learning when those properties matter to the evaluation.

Branching should not be romanticized. Artificially producing many alternatives can itself become a strategy of impression management. Nor does every failed path deserve preservation. The evidential contribution lies in target-relevant constraints created by events whose positions and relations were not selected solely after the final outcome became available.

Remark 6.4 (Path dependence)**.** Historical resistance can arise from path-dependent constraints even when the final symbolic surface is easy to reproduce. The relevant information lies in which alternatives were available, which events occurred before later knowledge was accessible, and which earlier commitments shaped subsequent possibilities.

6.5 Consequence-Bearing Events

Events can also become resistant through consequences. A decision that changes resource allocation, a public prediction that later encounters an observable outcome, a design choice embodied in a deployed system, a contractual commitment, or a collaborative action that changes another participant's state can create downstream structure that later narratives must accommodate. These consequences connect trajectory evidence to the world beyond documentary self-description.

Consequence-bearing events need not be dramatic. A small revision can alter a later dependency; a teaching intervention can shape a subsequent performance; a research choice can determine which data become available later. What matters is that the event participates in a relation whose later state is not freely replaceable by rewriting the original account.

This property suggests a distinction between *descriptive traces* and *state-changing traces*. Descriptive traces record what an actor says happened. State-changing traces are embedded in events that modify another record, participant, resource, dependency, or later possibility. Both can be useful, while the second class can provide additional historical constraint when the downstream change is independently observable.

Proposition 6.5 (Consequence constraint)**.** *Where an earlier event generates independently observable downstream states, retrospective reconstructions of that event are constrained by compatibility with those states in addition to compatibility with the present symbolic surface.*

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The proposition does not imply that consequences reveal motives or competence. A harmful decision can have highly visible consequences, and a good decision can produce little observable change. Consequence structure contributes a constraint on historical reconstruction; substantive evaluation remains a separate task.

6.6 Evidential Scope

Historical resistance should therefore be interpreted as a property of an evidential architecture rather than as a synonym for authenticity. Three cases illustrate the distinction. First, a fabricated account can become highly resistant when many actors coordinate around it and institutions preserve it over time. Second, a truthful account can possess low resistance when it leaves few stable traces. Third, a trajectory can strongly constrain authorship while remaining weak evidence about understanding, sincerity, or quality.

This target-relativity protects the framework from a simple equation between history and credibility. The relevant question is which alternative histories have become harder to sustain for the inference at hand. Historical resistance can strengthen a basis for inference while leaving the substantive conclusion open to contestation.

The same caution applies to institutional records. Formal archives can provide powerful temporal and relational anchors while reflecting selective categories, unequal access, administrative error, or institutional interests. A resistant record is still a socially produced record. Its resistance concerns later reconstruction, while its categories and omissions remain available for critical analysis.

Research Obligation 6.6 (Resistance interpretation)**.** Claims based on historical resistance should identify the target inference, the constraints that reduce retrospective freedom, and the forms of error or coordination that remain compatible with those constraints.

This obligation keeps the concept connected to the paper's broader principle of target-relative credibility. It also prevents historical resistance from becoming a universal ranking of persons or trajectories.

6.7 Selective Preservation

A credibility system could respond to the value of historical resistance by recording ever more activity. That response would conflict with the bandwidth, privacy, and burden constraints developed earlier. The more defensible objective is selective preservation of events and relations whose temporal position, anchoring, or consequences materially constrain a specified inference.

Selective preservation shifts attention from record quantity toward constraint quality. In a research setting, a small number of timestamped problem formulations, version transitions, external reviews, and decision points may be more informative than continuous screen capture. In education, staged work, feedback episodes, transfer tasks, and later performance may provide more relevant temporal structure than exhaustive behavioral telemetry. In professional collaboration, consequential decisions and repeated interaction can carry more historical information than a dense archive of routine messages.

This approach also leaves room for purposeful forgetting. Some events can lose their relevance after an evaluation period, while others may need to remain private or contestable. Historical resistance requires a sufficiently structured subset of history to constrain retrospective reconstruction when a consequential inference depends on that distinction.

A resistant history can still leave the distribution of agency unclear. The evidential problem then shifts from whether the trajectory could be reconstructed post hoc to who initiated events, exercised judgment, revised results, endorsed outcomes, or carried responsibility. This separate dimension is *agency legibility*.

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7 Agency Legibility

This section develops a third property of trajectory-based credibility: the extent to which an observable history makes the distribution of agency recoverable for a specified inference. Section 6 showed that a trajectory can constrain retrospective reconstruction while remaining silent about who initiated an event, who formulated a problem, who generated an option, who exercised judgment, who revised a result, who endorsed it, and who accepted responsibility for its consequences. The present section therefore shifts from the resistance of the history to the legibility of the roles distributed within it. Its objective is to specify agency legibility as a target-relative property of an event structure rather than as a binary label attached to a person, artifact, or technical system.

The distinction matters because a unified symbolic surface can arise from a compositional process. A research paper can contain human problem formulation, model-assisted search, automated drafting, human rejection of alternatives, manual verification, institutional review, and final human endorsement. A professional report can be assembled from several analysts, software systems, organizational templates, and a responsible signatory. A personal message can be initiated by one person, phrased by a computational system, edited by the sender, and delivered under a stable identity. The visible surface can remain singular while the underlying agency structure is distributed.

Agency legibility therefore concerns more than nominal authorship. It asks which participants occupied which roles at which events, how those roles changed over time, and which role assignments remain compatible with the observable history. This formulation is especially important when credibility judgments concern actor-specific properties such as competence, attention, judgment, commitment, or responsibility.

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7.1 Role Structure

Let V denote the event set of a trajectory, A the set of human, institutional, or technical participants, and R a domain-specific set of agency roles. The event-level role relation is given in Equation 9.

$$\mathcal{R}_A \subseteq V \times A \times R. \tag{9}$$

In Equation 9, a triple (v, a, r) records that participant a occupies role r in event v. Multiple participants can occupy the same role, and one participant can occupy several roles within the same event. The relation therefore accommodates collaborative and hybrid processes without forcing every event into a single-agent representation.

The role vocabulary should follow the target inference. A trajectory concerned with intellectual contribution may distinguish problem formulation, evidence selection, generation, criticism, revision, interpretation, and endorsement. A trajectory concerned with institutional authorization may emphasize proposal, review, approval, execution, monitoring, and accountable sign-off. A trajectory concerned with interpersonal communication may preserve initiation, attention, composition, sending, response, and later updating. The ontology of agency is therefore itself part of the evidential architecture.

Table 3 gives an illustrative role vocabulary. The table is analytical rather than exhaustive. Its purpose is to show why a single category such as "author" can compress several historically distinct contributions.

Table 3 also shows why agency legibility remains inference-specific. A recipient evaluating conceptual originality may care primarily about formulation, selection, and revision. A recipient evaluating formal authorization may care more about endorsement and approval. A recipient evaluating operational reliability may care about execution and oversight. The same trajectory can therefore be highly legible for one target and weakly legible for another.

Definition 7.1 (Agency legibility)**.** *Agency legibility* is the degree to which the observable structure of a trajectory constrains plausible assignments of target-relevant roles to the participants involved in its

Table 3: Illustrative agency roles within a trajectory.

Role family	Event-level question	Target-relevant contribution
Initiation	Who caused the process or event to begin?	Supports inference about agenda setting, attention, and originating commitment.
Formulation	Who specified the problem, objective, or evaluative frame?	Helps distinguish question formation from later execution.
Generation	Who produced candidate content, actions, or solutions?	Locates productive contribution without equating generation with final judgment.
Selection	Who chose among alternatives or determined continuation?	Supports inference about judgment, preference, and decision authority.
Revision	Who altered an earlier state in response to evidence, criticism, or failure?	Makes corrective participation and learning more legible.
Endorsement	Who accepted the resulting artifact, message, or decision as attributable to them?	Connects a distributed process to commitment and answerability.
Execution	Who implemented the selected action or transmitted the final output?	Distinguishes realization from earlier formulation or approval.
Oversight	Who monitored performance, consequences, or compliance?	Supports inference about continuing control and institutional responsibility.

events. Agency legibility is relational and target-relative; it concerns recoverable role structure rather than a general property of an actor or artifact.

This definition also separates agency from mere presence. A person's name in a record establishes participation only under additional assumptions about the role attached to that presence. Likewise, a technical system appearing in a production chain does not by itself reveal whether it generated alternatives, ranked them, reformulated human input, executed an instruction, or determined a consequential choice.

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7.2 Attribution Space

Agency legibility can be represented through the set of role assignments that remain compatible with the observable trajectory. Let O_A denote the available agency-relevant evidence, including event relations, version history, recorded decisions, acknowledgments, endorsements, interaction traces, and institutional rules. The admissible assignment space is defined in Equation 10.

$$\mathfrak{A}_{O_A}(\mathcal{T}) = \{\rho : V \to \mathcal{P}(A \times R) \mid \rho \models O_A\}\,. \tag{10}$$

In Equation 10, each admissible mapping ρ assigns one or more participant-role pairs to the events of the trajectory while remaining compatible with the available evidence. A wide assignment space indicates that many materially different agency structures fit the same visible history. A narrower space indicates that the observable trajectory constrains role attribution more strongly.

A comparative legibility ordering can therefore be specified through set inclusion. The ordering is defined in Equation 11.

$$O_A^{(2)} \succeq_A O_A^{(1)} \quad \Longleftrightarrow \quad \mathfrak{A}_{O_A^{(2)}}(\mathcal{T}) \subseteq \mathfrak{A}_{O_A^{(1)}}(\mathcal{T}). \tag{11}$$

Equation 11 describes comparative constraint on plausible role assignments. It does not establish that the remaining assignment is true. Incorrect metadata, coordinated misdescription, hidden delegation, or institutional conventions can produce a narrow but misleading assignment space. Agency legibility

therefore contributes to credibility only when the evidence that constrains attribution is itself sufficiently reliable for the target at hand.

Proposition 7.2 (Role-sensitive diagnosticity)**.** *Where a credibility judgment concerns an actor-specific capacity, commitment, or exercise of judgment, evidence gains additional discriminatory value when the target-relevant role of that actor becomes more legible within the events that support the inference.*

The proposition explains why a polished output can remain weak evidence about a specific person's competence even when the output's provenance is known. A file history may establish who possessed the document and which software modified it while leaving the decisive intellectual roles underdetermined. Conversely, a small number of well-placed decision traces can sometimes clarify who formulated the problem, rejected alternatives, and endorsed the result without preserving every intermediate operation.

7.3 Compositional Agency

Many trajectories distribute agency across participants rather than assigning a complete act to one actor. This distribution is familiar in organizations, professional teams, publishing, administration, and technical systems. The contemporary relevance of the problem increases as computational systems can participate in generation, ranking, summarization, recommendation, and communication while preserving a unified surface. Research on AI-mediated communication explicitly treats computational agents as operating on behalf of communicators by modifying, augmenting, or generating messages, thereby making agency and mediation central questions for interpretation (Hancock et al. 2020). Work on human–AI interaction likewise emphasizes that increasingly agentic media technologies can alter how users perceive and allocate agency (Sundar 2020).

Trajectory-based credibility can represent this composition without requiring a single percentage of "human contribution." A scalar percentage compresses several distinct questions into one measure. The evaluator may instead need to know who framed the objective, who supplied evidence, who generated candidate solutions, who inspected errors, who selected among alternatives, who revised the result, and who endorsed the final state. Different allocations can support different inferences even when the amount of machine-generated surface material is similar.

Consider two AI-assisted research trajectories. In the first, a researcher formulates the problem, develops the evaluative criteria, asks a model to produce candidate derivations, rejects several candidates, checks the surviving argument against source material, rewrites the exposition, and endorses the result. In the second, a system receives a broad topic and produces a polished manuscript that is accepted with minimal substantive review. Both trajectories can contain extensive machine-generated text. Their agency structures differ substantially for inferences concerning judgment, understanding, and sustained intellectual participation.

The same distinction applies beyond AI. A senior professional can sign a report written almost entirely by a team while exercising substantial review and institutional responsibility. Another signatory can endorse a report with little knowledge of its contents. A named creator can coordinate a complex production without directly executing most of it. Agency legibility provides a vocabulary for examining these differences while keeping authorship, production, control, and responsibility analytically separable.

Remark 7.3 (Surface unity)**.** A unified symbolic voice can coexist with distributed agency. Trajectory-based analysis therefore treats apparent unity at the surface as compatible with multiple event-level role structures.

This remark is especially important under symbol inflation because polished surfaces increasingly reveal less about the division of labor that produced them. Agency legibility addresses that loss by shifting attention from stylistic or material unity toward recoverable role relations across the trajectory.

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7.4 Control Trace

Agency legibility becomes particularly important when the target inference concerns control or responsibility. Philosophical work on meaningful human control over autonomous systems develops tracking and tracing conditions for relating system behavior to human reasons and to human agents who can understand and answer for relevant parts of the system (Santoni de Sio and Hoven 2018). The present framework has a different scope, but the tracing problem provides a useful neighboring insight: responsibility-relevant analysis often requires a history that reaches beyond the terminal action to earlier decisions, designs, authorizations, and opportunities for intervention.

A trajectory can therefore preserve a *control trace*: a target-relative substructure showing where participants could shape, redirect, approve, suspend, or correct a process. The presence of such a trace does not determine the final normative allocation of responsibility. It makes the historically relevant control structure more available for later interpretation.

This distinction matters because causal contribution, practical control, formal authority, and moral or legal responsibility can diverge. A technical subsystem can cause a downstream state while lacking institutional authority. A manager can possess formal authority while exercising little contemporaneous attention. A reviewer can materially change an output while carrying limited responsibility for later use. A designer can influence a system long before an operational event occurs. Agency legibility supplies the historical map from which these questions can be examined; the normative judgment requires additional legal, ethical, and institutional criteria.

Research Obligation 7.4 (Responsibility separation)**.** Trajectory-based evaluation should distinguish evidence about role occupancy, causal contribution, practical control, formal authority, and normative responsibility whenever the target inference depends on one or more of these properties.

The obligation prevents the trajectory framework from converting a record of participation into an automatic assignment of blame or credit. It also protects technical contributors whose role can be substantial in production while the relevant decision authority lies elsewhere.

7.5 Selective Agency Traces

Agency legibility creates an obvious pressure toward more detailed recording. A system could preserve every prompt, keystroke, model response, revision, conversation, and intermediate decision in an attempt to reconstruct agency perfectly. Such a design would conflict with the paper's relational-bandwidth constraint and would intensify privacy, surveillance, and administrative burden. The relevant objective is selective preservation of role-discriminating traces.

Role-discriminating traces are records whose presence materially reduces ambiguity for a specified target inference. In research, a small set of problem statements, decision notes, rejected alternatives, verification episodes, and final endorsements can make intellectual roles more legible than exhaustive capture of interface activity. In an institution, approval records, review comments, delegation boundaries, and consequential interventions can clarify authority more effectively than continuous monitoring. In communication, the relevant trace may concern whether a person personally reviewed and endorsed a message rather than the complete record of how every sentence was generated.

This principle also permits legitimate opacity. Some roles can remain private when their disclosure contributes little to the target inference. Sensitive collaboration, protected sources, confidential review, or accessibility tools can require selective concealment. Agency legibility therefore concerns sufficient role resolution for a defined social purpose rather than universal transparency.

Proposition 7.5 (Selective role preservation)**.** *For a fixed target inference, an agency trace is evidentially useful when its preservation reduces materially relevant ambiguity in the admissible role assignments while imposing acceptable informational, privacy, and administrative costs.*

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This proposition anticipates the later analysis of record burden. It also clarifies why agency legibility cannot be reduced to disclosure volume. A long technical log can reveal extensive system activity while leaving human judgment opaque. A concise record of decisive role transitions can provide greater legibility with substantially less retained data.

Agency legibility connects directly to provenance while remaining analytically distinct from it. Provenance can establish origin, transformation, handling, or custody; agency questions can additionally concern problem framing, judgment, interpretation, commitment, and authority. Technical traceability can therefore narrow the agency-assignment space without settling every role-sensitive inference. Section 8 specifies this boundary and the conditions under which provenance requires additional relational or institutional interpretation.

8 Provenance Boundary

This section locates provenance within the trajectory framework. Its structural role is to distinguish technical reconstruction of origin and transformation from the broader credibility inferences developed in Sections 4–7. Provenance can preserve valuable relations among artifacts, activities, agents, transformations, and custody states. The relevant boundary appears when a recipient asks for properties whose interpretation depends on judgment, understanding, commitment, responsibility, or relational participation. The discussion therefore treats provenance as an evidential projection of a richer trajectory and specifies the conditions under which that projection is sufficient for a particular target inference.

Provenance already has mature technical vocabularies. The W3C PROV family represents provenance through entities, activities, agents, and typed relations such as generation, derivation, attribution, use, association, and delegation (World Wide Web Consortium 2013). NIST similarly defines provenance through the chronology of origin, development, ownership, location, and changes, with personnel and processes included in some formulations (National Institute of Standards and Technology 2024). C2PA Content Credentials provide a media-oriented architecture for recording asset provenance through manifests, assertions, claims, signatures, ingredients, and transformation histories; version 2.2 defines provenance as the history of an asset and its interaction with actors and other assets represented by provenance data (Coalition for Content Provenance and Authenticity 2025). These systems demonstrate that provenance can carry substantially more information than a simple timestamp or source label.

The trajectory framework therefore places the boundary beyond a narrow distinction between "technical metadata" and "social history." Provenance models can include agents, activities, delegation, and detailed event relations. The deeper distinction concerns the inferential target. A provenance record can richly describe what happened in a production chain while leaving several socially relevant properties underdetermined.

8.1 Provenance Projection

Let $\mathcal{T}$ denote a trajectory in the sense developed in Section 4. A provenance architecture selects a subset of the trajectory's observable structure and encodes it according to a provenance vocabulary. This selection is represented by a projection in Equation 12.

$$\pi_P : \mathcal{T} \longmapsto P. \tag{12}$$

In Equation 12, P denotes the provenance representation available to a recipient. Depending on the system, P can preserve origins, transformations, temporal relations, software agents, human or organizational agents, signatures, custody transitions, derivations, and selected claims about the production process. The projection can therefore be information-rich while still remaining partial relative to the full trajectory.

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This formulation avoids treating provenance as a fixed amount of metadata. Different systems instantiate different projections. A minimal file history, a laboratory data-lineage system, a supply-chain ledger, a W3C PROV graph, and a C2PA manifest store can all represent provenance while retaining different classes of relations. The analytical task is therefore to identify which trajectory distinctions survive a particular projection and which become unavailable.

Definition 8.1 (Provenance boundary)**.** For a specified target inference, the *provenance boundary* is the point at which additional accuracy in origin, transformation, custody, or technical history ceases to resolve the remaining ambiguity relevant to that target without supplementary trajectory, agency, relational, or institutional information.

The definition makes the boundary target-relative. Provenance can be highly informative for determining whether a file was derived from another file, whether a declared transformation occurred, or whether a signed manifest has been altered. The same record can provide weaker evidence concerning whether a nominal author understood an argument, whether a communicator personally attended to a recipient, or whether an institutional signatory exercised meaningful review.

8.2 Technical Traceability

Technical traceability contributes to trajectory-based credibility through several mechanisms. First, it can establish continuity among versions or assets. Second, it can preserve transformation order. Third, cryptographic bindings can make some classes of tampering detectable. Fourth, standardized vocabularies can permit provenance information to travel across systems. Fifth, externally anchored provenance can strengthen historical resistance by making retrospective alteration require changes across multiple linked records.

C2PA provides a concrete example of these contributions. Its specification distinguishes asset history from authenticity and defines authenticity through facts that can be cryptographically verified as untampered, including provenance data and content bindings (Coalition for Content Provenance and Authenticity 2025). The architecture can record actions such as creation or transformation and can preserve relations to ingredients used in a composed asset. These capabilities are directly relevant to the historical-resistance problem because they can make selected portions of a production path harder to rewrite silently after distribution.

The W3C PROV model illustrates a broader representational point. Its starting vocabulary includes entities, activities, agents, derivation, attribution, use, association, and acting on behalf of another agent (World Wide Web Consortium 2013). A provenance graph can therefore represent substantially more than file succession. It can encode relations among people, organizations, activities, and artifacts. This makes provenance a natural substrate for portions of the event-poset architecture developed in Section 5.

Proposition 8.2 (Traceability contribution)**.** *When a provenance system preserves target-relevant origin or transformation relations with independent integrity protection, it can increase the historical resistance of the corresponding trajectory substructure by reducing the range of retrospectively admissible reconstructions.*

The proposition concerns evidential constraint rather than truth certification. Tamper-evident records can preserve misleading assertions, and correctly attributed artifacts can contain incorrect claims. A complete transformation history can also document a low-quality process. Provenance strengthens selected historical relations while leaving their social interpretation as a separate analytical step.

8.3 Target Sufficiency

A precise boundary can be stated by comparing trajectories that become indistinguishable under a provenance projection. For an observed provenance representation p, let the compatible trajectory class be defined by Equation 13.

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$$[\mathcal{T}]_P(p) = \{\mathcal{T}' \mid \pi_P(\mathcal{T}') = p\}. \tag{13}$$

Equation 13 collects the trajectories that produce the same available provenance representation. Let $\theta(\mathcal{T})$ denote the target property relevant to a recipient. Provenance is sufficient for that target only when the compatible trajectories agree on the value required for the inference. This condition is expressed in Equation 14.

$$\forall \mathcal{T}_a, \mathcal{T}_b \in [\mathcal{T}]_P(p), \qquad \theta(\mathcal{T}_a) = \theta(\mathcal{T}_b). \tag{14}$$

Equation 14 is a criterion of target-relative discriminability rather than an empirical claim that any current provenance system satisfies it. If two trajectories share the same provenance record while differing materially in the target property, the provenance projection leaves a residual ambiguity for that inference.

This criterion clarifies several familiar cases. A record can establish that a document passed through a named software system while leaving open how intensively a person reviewed the result. A signed institutional workflow can establish formal authorization while leaving open the depth of substantive understanding. A media provenance chain can establish that a photograph was cropped or color-adjusted while leaving open the intentions surrounding its selection and publication. The same provenance information can therefore be sufficient for one question and insufficient for another.

Remark 8.3 (Inferential locality)**.** Provenance sufficiency should be assessed locally with respect to the target property and decision context. A provenance architecture can cross the boundary for one inference while remaining well within it for another.

This locality prevents the framework from assigning a global credibility score to provenance systems. The relevant task is to identify the exact inference for which a record is being used.

8.4 Authenticity Scope

The distinction between provenance and authenticity requires similar care. In technical systems, authenticity often concerns the integrity of a claimed relation between an asset and a signed or otherwise verifiable history. C2PA, for example, defines authenticity through cryptographically verifiable facts and distinguishes that technical property from the broader semantic interpretation a recipient may draw from the content (Coalition for Content Provenance and Authenticity 2025). This is a valuable scope discipline for trajectory-based credibility.

A technically authentic provenance record can support the claim that specified data, assertions, or bindings remained intact. It does not by itself determine whether the represented action was sincere, whether the creator possessed relevant competence, whether a stated purpose was accurate, or whether the surrounding institution deserves confidence. These additional properties depend on relations whose meaning arises from wider historical and social context.

The same distinction applies to identity. A cryptographically verified signer can make attribution more stable while the significance of that signature continues to depend on authority, role, institutional procedure, and the extent of review. Identity certainty and agency legibility therefore interact without collapsing into one another.

Proposition 8.4 (Authenticity scope)**.** *Technical authenticity can strengthen credibility when the target inference depends on integrity, attribution, or transformation history. Broader inferences require additional premises connecting those verified relations to the property being evaluated.*

The proposition gives provenance an important but bounded role. The value of a verified history depends partly on the quality of the interpretive bridge from recorded relation to target property.

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8.5 Agency Resolution

Section 7 distinguished initiation, formulation, generation, selection, revision, endorsement, execution, and oversight. Provenance systems can encode some of these roles directly or indirectly, but the availability of an actor relation does not automatically reveal the granularity of participation required for a social inference.

This issue is visible even in mature technical standards. W3C PROV supports agent association and delegation, while C2PA's current action model focuses strongly on asset operations and software agents; its version history records a deliberate reduction in the earlier generic use of "actor" in the technical specification (World Wide Web Consortium 2013; Coalition for Content Provenance and Authenticity 2025). The comparison illustrates that provenance standards make design choices about which actors, activities, and claims belong inside the interoperable record.

For trajectory-based credibility, agency resolution therefore asks whether the provenance representation distinguishes the role transitions that matter for the target inference. A record of software use can be adequate for reconstructing transformation history while remaining coarse for evaluating intellectual authorship. A record of formal approval can establish authority while leaving the degree of contemporaneous attention unresolved. A record of repeated human intervention can show participation while leaving the quality of judgment open.

Research Obligation 8.5 (Role-sensitive provenance)**.** Where a credibility judgment depends on human or institutional agency, provenance should be interpreted together with a role vocabulary sufficiently granular for the target inference and with explicit separation among participation, control, authority, credit, and responsibility.

The obligation does not require every provenance standard to encode the complete social world. It identifies the point at which a trajectory system needs a complementary agency layer.

8.6 Interpretive Dependence

Provenance becomes socially useful through interpretation. A recipient must decide which recorded relations matter, which institutions or signers deserve reliance, which transformations are benign, and which absences are consequential. These judgments depend on domain conventions and can change historically.

A transformation such as translation, compression, stylistic editing, model assistance, or image enhancement can have very different significance across domains. The same technical action can be routine in one setting and disclosure-relevant in another. A missing intermediate artifact can be harmless in a privacy-sensitive workflow and consequential in a scientific reproducibility context. Provenance therefore enters credibility through a domain-specific interpretive layer rather than through a universal mapping from trace to trust.

NIST's broad provenance definition reinforces this point by treating provenance as chronology and source metadata that can include personnel and processes (National Institute of Standards and Technology 2024). Such breadth increases representational capacity while leaving the evaluative meaning of the represented relations to the surrounding governance context.

Definition 8.6 (Interpretive bridge)**.** An *interpretive bridge* is the domain-specific set of conventions, institutional rules, background knowledge, and target assumptions through which provenance relations acquire evidential significance for a credibility judgment.

Interpretive bridges can themselves become objects of historical adaptation. Under symbol inflation, recipients may learn that a previously reassuring provenance cue carries less diagnostic value, or that a newly standardized trace provides useful evidence. Provenance systems therefore participate in changing credibility practices rather than standing outside them.

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8.7 Trajectory Integration

The trajectory framework treats provenance as a composable layer. Provenance can anchor selected event relations, preserve partial order, strengthen integrity, identify derivations, and constrain some agency assignments. Other trajectory components can then supply information about judgment, interaction, consequence, institutional context, or repeated co-experience.

This layered architecture has an important practical implication. A trajectory record does not become stronger merely by accumulating every available provenance field. Its evidential value depends on whether the preserved relations reduce uncertainty for the target property at acceptable cost. Selective provenance can therefore be preferable to exhaustive provenance when additional fields create privacy, security, cognitive, or administrative burden without materially improving the relevant inference.

The relation also runs in the opposite direction. Trajectory information can make provenance more interpretable. A cryptographic event becomes more meaningful when situated within a sequence of review, revision, challenge, and consequence. A named agent becomes more informative when the surrounding role structure identifies the form of participation. A derivation relation becomes more consequential when the earlier source was itself embedded in an independently anchored history.

Working Claim 8.7 (Layered evidential architecture)**.** Trajectory-based credibility can combine provenance, agency traces, institutional anchoring, and relational history as partially overlapping evidential layers whose relevance varies with the target inference and available relational bandwidth.

This claim preserves the modularity of the framework. Different domains can develop different combinations without requiring a single universal record format.

8.8 Relational Residual

Even a rich provenance-plus-trajectory architecture leaves a residual class of evidence that emerges through interaction itself. Repeated collaboration can reveal responsiveness to challenge, practical judgment under uncertainty, memory of shared commitments, willingness to revise, and behavior when consequences become salient. Some of these properties can later leave traces, yet their evidential force often arises from situated participation before they are compressed into a record.

This residual does not diminish the importance of provenance. It identifies the next layer in the paper's graded architecture. Provenance strengthens portability and historical constraint. Trajectories extend evidence across time. Agency legibility clarifies role structure. Direct or repeated interaction contributes experiential information whose acquisition consumes substantially more relational bandwidth.

The remaining evidential layer is selective co-experience: richer relational evidence acquired through interaction when the expected value of deeper exposure justifies its cost.

9 Selective Co-Experience

This section develops the most relationally intensive position in the paper's credibility architecture. Its structural role is to identify what direct or repeated participation can reveal that remains only partially available through symbolic surfaces, provenance, or reconstructed trajectories. The discussion first distinguishes co-experience from simple co-presence. It then examines reciprocal updating, exposure to consequence, and the evidential contribution of situated participation. The later parts explain why co-experience must remain selective under finite relational bandwidth, how institutions can structure bounded forms of shared experience, and why familiarity, power, and unequal access limit its use as a general credibility criterion. The section concludes by showing how co-experience itself becomes compressed into later trajectory records, preparing the graded account of credibility depth developed in the next section.

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The previous sections progressively widened the observable basis of credibility. A symbolic surface provides a portable present state. A trajectory restores selected historical relations. Historical resistance constrains retrospective reconstruction. Agency legibility clarifies how participation is distributed, and provenance strengthens selected relations of origin, derivation, and integrity. These layers can substantially improve inference while remaining mediated. A recipient can inspect a rich trajectory without having participated in the events through which that trajectory was formed.

Co-experience changes this position. A participant encounters part of the process while it is still unfolding. Information arrives together with timing, response, hesitation, revision, constraint, and consequence. The recipient can sometimes test an interpretation by acting, asking, challenging, delegating, or waiting for later conduct. The evidential object therefore includes a changing relation rather than only a record of that relation.

This richer access is socially familiar. Collaboration, apprenticeship, supervised practice, repeated exchange, trial work, joint problem solving, and long-term interaction all permit forms of credibility judgment that differ from judgment based only on finished outputs. Trust theory has long emphasized that social reliance operates under conditions in which complete calculation or observation remains unavailable (Luhmann 1979; Möllering 2006). The present framework isolates one implication for symbol inflation: when a portable surface becomes compatible with a wider range of generative histories, situated interaction can sometimes provide discriminating evidence that the surface no longer carries by itself.

9.1 Situated Participation

Co-experience requires more than two actors occupying the same place or communicative channel. Attendance at the same meeting can leave participants with little information about one another. Repeated messages can remain highly scripted. A supervised task can be organized so rigidly that the evaluator sees compliance while learning little about judgment. The relevant property is therefore *situated participation*: participants become jointly exposed to an evolving process in which at least some target-relevant states cannot be fully fixed in advance.

Definition 9.1 (Co-experience)**.** A *co-experience* is a bounded, target-relevant subhistory in which two or more participants are exposed to an unfolding process and obtain some capacity to observe, respond to, or become consequentially affected by one another's conduct within that process.

The definition is deliberately broad enough to include interaction mediated by technology. Co-experience does not require physical proximity. Two researchers working asynchronously on a difficult problem can acquire situated evidence about one another when drafts, objections, failed attempts, and revisions alter the next stages of the shared process. A remote engineering team can observe how members respond to a production failure. A student and supervisor can accumulate co-experience through successive work even when most exchanges are digital. What matters is the coupling of conduct across an evolving event structure.

The event-poset model from Section 5 provides a natural representation. A co-experience occupies a selected neighborhood of the trajectory in which several participants are connected to some of the same events and where later events can depend on their responses to earlier ones. Shared exposure therefore adds a perspectival layer to the event structure. The participants do not merely learn that an event occurred later; they encounter parts of the process before all downstream consequences are known.

This point distinguishes co-experience from retrospective observation. A later reader can see that an actor revised a position after criticism. A participant in the exchange may also observe how the criticism was received, which clarifications were requested, how quickly the actor changed course, which parts were defended, and how the later revision affected joint work. Some of this can be recorded, but its initial evidential force arises from situated participation.

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Remark 9.2 (Co-presence)**.** Co-presence supplies an opportunity for co-experience but does not guarantee it. The credibility contribution depends on whether the shared setting exposes participants to target-relevant variation, response, or consequence.

9.2 Reciprocal Updating

One of the strongest contributions of co-experience is access to reciprocal updating. A static trajectory can record a sequence of actions. Situated interaction can additionally reveal how one participant's action changes the state of another participant and how that changed state feeds back into later conduct. The resulting evidence is especially relevant for properties such as responsiveness, practical understanding, capacity to revise, coordination under uncertainty, and maintenance of commitments across changing information.

Reciprocity should be interpreted broadly. A response can be verbal, practical, institutional, or temporal. A collaborator may revise an analysis after a criticism. A manager may change resource allocation after receiving evidence from a team. An advisor may narrow a claim after a student's counterexample. A professional may decline a requested action because later information changes the risk. These episodes expose the relation between incoming information and subsequent conduct.

Repeated interaction also permits calibration. A recipient can learn which kinds of statements are provisional, how uncertainty is communicated, whether commitments are remembered, and how much verification is appropriate for later claims. This form of knowledge is difficult to reduce to a single symbolic cue because its object is a pattern of updating across contexts.

The evidential gain does not depend on agreement. Disagreement can be highly informative when it reveals how participants formulate objections, distinguish stakes, acknowledge uncertainty, repair misunderstanding, or maintain a working relation after conflict. A smooth interaction can sometimes provide less information than a difficult episode because little variation is introduced. The relevant structure is therefore response under informative change rather than interpersonal harmony.

Proposition 9.3 (Reciprocal evidence)**.** *For target inferences concerning responsiveness, revision, or relational coordination, co-experience can add evidence when participants observe how conduct changes after target-relevant interventions or changes in shared conditions.*

The proposition is conditional. Repeated exposure under nearly identical conditions can produce familiarity without substantial new discrimination. Likewise, a highly hierarchical setting can suppress visible disagreement and make apparent coordination difficult to interpret. The value of reciprocal updating depends on the structure of the encounter.

9.3 Consequence Exposure

Co-experience can also place participants in relation to consequences. A decision appears differently before and after its effects become visible. When participants remain connected to the process across this interval, they can observe whether earlier claims are revised, defended, repaired, or abandoned as consequences accumulate.

This structure matters for credibility because many target properties concern conduct under consequence rather than performance before consequence. A promising proposal can be produced cheaply. Sustained responsibility for its implementation, response to failure, and willingness to absorb corrective feedback unfold later. A polished apology can be generated immediately; later conduct can reveal whether the relation changed. A confident forecast can be stated once; continued participation exposes how the forecaster treats subsequent error.

The historical-resistance framework from Section 6 clarifies why this matters. Consequence-bearing events add constraints that were not fully selectable when the initial symbolic surface was produced. A

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participant who remains exposed to later states encounters a history whose meaning can change as downstream events become available. Co-experience can therefore generate evidence before that evidence is compressed into a later record.

Shared consequence should not be romanticized. Two actors can experience the same nominal outcome while bearing very different risks. An employee and an executive can participate in the same failed project while facing unequal costs. A client and professional can share a decision while possessing very different exit options. A meaningful analysis therefore asks how consequence is distributed rather than treating nominal participation as equal exposure.

Definition 9.4 (Consequence exposure)**.** *Consequence exposure* is the degree to which a participant remains connected to target-relevant downstream states generated or materially affected by earlier conduct, with sufficient observability for those states to inform a later credibility judgment.

This definition keeps consequence exposure separate from punishment or moral blame. A participant can remain exposed to learning-relevant outcomes without being personally liable for them. The concept concerns continuity between prior conduct and later observable states.

9.4 Experiential Contribution

The trajectory framework does not assume that co-experience yields privileged access to truth. Participants misperceive one another, remember selectively, interpret actions through prior expectations, and can be manipulated by strategic performance. The relevant claim is narrower: co-experience can expose classes of evidence that are difficult to recover from portable records alone.

Three contributions are especially important. First, situated interaction can provide fine temporal resolution around response. A record may show that a revision occurred, while the participant observed the sequence of challenge, hesitation, testing, and change through which it emerged. Second, participants can generate new evidence by intervening. A question, request, counterexample, or unexpected task can reveal how another actor responds to variation that was not selected by that actor. Third, co-experience can provide contextual information that would be disproportionately costly to record exhaustively, including tone, timing, local constraints, tacit coordination, and practical adaptation.

These contributions create an experiential residual after documentation. Even a rich trajectory can preserve the events and relations judged most relevant while omitting many microstates through which participants formed their interpretations. The residual is one reason personal references, supervised practice, repeated collaboration, and trial interaction remain socially important even where extensive records exist.

At the same time, experiential evidence is difficult to transfer. A person who worked closely with an actor can possess rich situated knowledge that a later recipient cannot directly inspect. Once transferred through a recommendation, rating, testimonial, or institutional certification, much of the experience is compressed again. Co-experience therefore does not escape symbolic mediation; it creates a richer local basis from which later symbolic compression can occur.

Working Claim 9.5 (Local richness)**.** Co-experience can increase the local richness of credibility evidence while leaving a portability problem for actors who did not participate in the shared history.

This portability problem links selective co-experience to institutional translation. Later sections will examine how institutions attempt to convert situated observation into scalable forms without eliminating the distinctions that made the original experience informative.

9.5 Selective Allocation

Finite relational bandwidth prevents co-experience from becoming a universal precondition for reliance. Large societies depend on interactions among actors who will never develop substantial shared history.

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The practical role of co-experience is therefore selective: deeper interaction can be concentrated where the expected informational gain is material relative to the cost of misclassification and the burden of obtaining that evidence.

Section 3 established the general principle of selective depth. Co-experience gives that principle a more concrete form. A low-stakes exchange can proceed through ordinary symbolic cues or institutional guarantees. A decision involving long duration, difficult reversibility, large asymmetry, or substantial dependence can justify more direct interaction before commitment. The relevant depth can also increase after uncertainty appears. A trajectory inconsistency, unexplained provenance gap, contested agency claim, or unusually high consequence can trigger a more relationally intensive stage of evaluation.

Selectivity can therefore be adaptive rather than fixed. An institution need not classify every relationship in advance as shallow or deep. It can begin with portable evidence and increase interaction when the decision process encounters uncertainty that cannot be resolved efficiently through existing records. This architecture preserves scalability while reserving relational bandwidth for cases in which it is expected to matter.

The same principle applies within a relationship. Co-experience does not require continuous observation. A small number of strategically informative episodes can sometimes reveal more than constant low-information contact. A supervised performance under changing conditions, a joint response to failure, or a substantive disagreement can expose target-relevant variation that months of routine interaction may not provide.

Research Obligation 9.6 (Selective exposure)**.** Practices that use co-experience for credibility should identify the target inference, the expected informational contribution of deeper interaction, and the burdens imposed on the participants before increasing relational exposure.

This obligation protects the framework from drifting toward a demand for universal intimacy. The value of co-experience lies partly in its scarcity and specificity. Requiring extensive personal access for routine decisions can create exclusion without a corresponding evidential gain.

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9.6 Institutional Mediation

Institutions already create bounded forms of co-experience when surface evidence is considered insufficient. Supervised practice exposes performance under observation. Probationary arrangements allow conduct to be evaluated before a longer commitment is made. Oral examination permits an evaluator to introduce unanticipated questions and observe updating. Pilot projects expose a proposed collaboration to actual coordination. Staged responsibility allows later tasks to depend on conduct observed in earlier ones.

These practices differ substantially in purpose and fairness, but they share a structural feature: credibility is generated partly through an interaction whose content cannot be fully determined by a preproduced symbolic surface. The institution creates a temporary event structure in which response becomes observable.

Institutional mediation can multiply relational bandwidth by distributing observation. A single decision maker need not personally experience every relevant episode. Supervisors, peers, clients, review committees, and operational systems can each encounter different parts of a trajectory. The later challenge is how their situated observations are combined without becoming a crude score or reproducing institutional hierarchy.

This multiplication also introduces governance questions. Participants may perform differently when they know every interaction affects future credibility. Evaluators can confuse familiarity with quality. Informal access to high-status observers can produce more portable endorsements than equally informative work conducted outside recognized institutions. Co-experience therefore remains embedded in systems of opportunity and recognition.

9.7 Relational Boundary Conditions

The strongest reason to keep co-experience selective is that it carries its own inferential failures. Familiarity can increase confidence without increasing accuracy. Repeated interaction can generate loyalty, dependency, or reluctance to revise prior judgments. Shared institutional culture can make participants interpret the same conduct similarly while overlooking alternatives. Close relations can also create conflicts of interest that weaken the portability of an endorsement to outsiders.

Power asymmetry changes what can become visible. A subordinate may appear consistently agreeable because disagreement is costly. A precarious worker can sustain responsiveness through uncompensated availability. A student may permit continuous observation because refusal threatens evaluation. In such settings, rich records of interaction can reflect unequal exposure rather than freely chosen relational depth.

Selective co-experience can also privilege actors who have access to recognized networks. A candidate already embedded in prestigious institutions can accumulate consequential interactions with people whose testimony travels widely. An outsider can possess substantial competence while lacking comparable opportunities for recognized co-experience. The later section on trajectory inequality will treat this problem directly.

For these reasons, co-experience should not be interpreted as an intrinsically superior form of evidence. It is one evidential layer whose strengths and failures differ from those of symbolic surfaces and trajectories. Its value is highest where situated response or consequence is relevant to the target inference and where the interaction can be structured without excessive burden or domination.

Remark 9.7 (Relational fallibility)**.** Greater relational depth changes the evidence available to a recipient; it does not remove interpretation, bias, strategic behavior, or institutional power from the credibility process.

9.8 Compression after Experience

Co-experience is locally rich and globally difficult to scale. Social systems therefore tend to compress shared experience after it occurs. A supervisor writes a recommendation. A professional interaction becomes a reference. A period of supervised practice becomes a credential. A repeated collaboration becomes a reputation. An institutional committee converts multiple observations into a decision.

This return to compression is unavoidable. The problem identified in Paper 2 reappears at a higher level: a portable summary can eventually circulate beyond the history that gave it meaning. A reference letter can become formulaic. A credential can outlive the assessment practice that once made it diagnostic. A reputation can persist after the underlying relation changes. The social value of co-experience therefore depends partly on how later compression preserves or erases the structure of the original encounters.

Trajectory-based credibility offers an intermediate possibility. Selected events from co-experience can remain connected to a later summary: a period of supervised work, a sequence of revisions, a documented response to failure, or a bounded record of staged responsibility. The resulting object remains compressed while preserving more historical structure than a scalar reputation or categorical credential.

The paper's architecture can now be stated more precisely. Symbolic surfaces, trajectories, and co-experience differ in portability, temporal structure, relational exposure, and interpretive cost. They occupy positions within a graded evidential architecture whose configuration for a particular inference is captured by *credibility depth*.

10 Credibility Depth

This section integrates the earlier evidential layers through the concept of *credibility depth*. The term is reserved for the configuration of evidential access actually mobilized in a target-relative credibility

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process. It is therefore distinct from *evidential depth*: evidential depth characterizes how far a particular evidence basis reaches beyond a terminal surface, whereas credibility depth concerns how a recipient or institution assembles and uses one or more evidence bases for a decision. The analysis develops sufficiency, escalation, portability, and proportionality under this distinction.

The available layers include symbolic surfaces, contextual anchors, trajectory evidence, provenance, agency traces, and selective co-experience. Each contributes differently to different target inferences and carries a distinct combination of portability, acquisition cost, privacy burden, and relational dependence. Credibility depth provides a vocabulary for configuring these layers according to evidential need.

A routine transaction can be adequately supported by a shallow but institutionally reliable cue, while a long-duration collaboration can justify richer historical or relational access. The relevant issue is therefore fit: which evidential layers are required for the target inference and decision context, and where additional layers would add burden with little diagnostic gain.

Definition 10.1 (Credibility depth)**.** For a target inference q in context C, *credibility depth* is the configuration and extent of target-relevant evidential access actually mobilized by a recipient or institution, including any use of temporal history, external anchoring, legible agency, situated response, or consequence beyond an isolated present surface. Depth belongs to the credibility arrangement linking a target inference, an available evidential architecture, and a recipient capable of interpreting that evidence.

The same trajectory can support high depth for one inference and low depth for another, while archive length alone carries no automatic implication of depth. This keeps credibility depth attached to the evidential relation and target context rather than to a generalized property of the evaluated person, artifact, or institution.

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10.1 Target-Relative Access

Credibility depth begins from the target-relative structure established in Section 2. A recipient evaluating whether a document was issued by an authorized institution may need only a valid institutional anchor. A recipient evaluating unaided technical competence may require a different form of evidence. A recipient evaluating responsiveness under uncertainty may require observed interaction or a history in which changing conditions produced visible adaptation. The amount of evidence can remain constant while its depth relative to a particular target changes.

This target dependence prevents a common category error. Richer historical information can be irrelevant to the inference actually at stake. A complete revision history does not necessarily improve evidence about institutional authorization. A cryptographically authenticated provenance chain does not by itself establish understanding. Years of acquaintance do not necessarily establish competence in a newly encountered technical domain. Direct interaction can reveal responsiveness while leaving long-term reliability unresolved. Depth therefore depends on whether the evidence reaches the latent property or relation being inferred.

A useful way to describe this structure is through a *depth profile*. Let $Q = \{q_1, \ldots, q_m\}$ denote the target inferences relevant to a decision. For an evidential arrangement E in context C, the depth profile is defined in Equation 15.

$$\mathbf{d}(E, C) = \big(d_{q_1}(E, C), \ldots, d_{q_m}(E, C)\big). \tag{15}$$

In Equation 15, each component records the target-relative depth mobilized by the evidential arrangement for one inference. The notation does not assume a universal metric or common numerical scale across domains. It expresses a structural point: an arrangement can be deep with respect to provenance and shallow with respect to judgment, or deep with respect to repeated responsiveness and shallow with respect to independent competence. A scalar reputation score would suppress this heterogeneity.

Remark 10.2 (Profile heterogeneity)**.** Credibility depth is generally multidimensional. Aggregating target-specific depth into a single score can erase the distinction between evidential strengths that arise from different histories and support different inferences.

This multidimensionality also clarifies why trajectory-based credibility should resist totalizing judgments. A trajectory can reveal substantial persistence, revision, and consequence while containing weak evidence about a target that was rarely exposed. A person who has repeatedly completed one class of tasks under observation may still be difficult to evaluate in a different domain. The relevant response is not to deny the value of the existing trajectory. It is to limit the inference to the region for which the trajectory carries evidence.

10.2 Depth beyond Volume

Documentary abundance can easily be mistaken for either evidential depth or credibility depth. The distinction becomes especially important under symbol inflation because producing, storing, and formatting records can itself become inexpensive. A portfolio containing hundreds of artifacts can remain shallow if the artifacts repeat similar surfaces without revealing meaningful differences in history, agency, response, or consequence. Conversely, a small number of well-positioned events can provide substantial depth if they constrain important interpretations.

The event-poset model from Section 5 makes the distinction precise. Depth can increase when the evidential structure contains target-relevant branching, independently anchored relations, consequential transitions, or observations deposited before an outcome became known. Merely adding more vertices of the same evidential type need not create comparable gain. Ten nearly identical outputs can contribute less to a competence inference than one supervised performance under unfamiliar conditions followed by a documented revision.

The same distinction applies to duration. Chronological age can contribute historical resistance, but age alone is not depth. A long interval containing little target-relevant variation may provide weak evidence. A shorter trajectory can become more informative when it exposes an actor to changing constraints, contested decisions, feedback, failure, repair, and observable consequences. Section 5 therefore separated chronological duration from order depth. Credibility depth extends that distinction by asking how much of the target-relevant structure becomes available to the recipient.

Prestige presents a related problem. A prestigious institutional association can provide strong external anchoring while remaining a compressed signal. Its diagnostic value depends on the process through which the institution observed, evaluated, or authorized the relevant property. Treating prestige itself as deep evidence can reproduce the exact compression problem the trajectory framework is intended to examine. Institutional standing can be valuable, but its evidential contribution should be located within the depth profile rather than allowed to substitute for the entire profile.

Proposition 10.3 (Depth-volume separation)**.** *Increasing the quantity, duration, or prestige of available records does not necessarily increase credibility depth. Depth increases only to the extent that added evidence expands target-relevant access to history, agency, relational anchoring, situated response, or consequence.*

This proposition also limits the incentives created by the framework. If volume were treated as depth, actors would rationally accumulate records for their own sake. The result could be a new form of symbolic inflation in which documentation proliferates faster than recipients can interpret its relevance. A depth-sensitive architecture instead asks what additional discrimination a record creates for a specified target inference.

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10.3 Sufficiency Thresholds

The availability of deeper evidence does not imply that every decision should consume it. Relational bandwidth remains finite, and deeper evidence can impose direct costs on both evaluators and evaluated actors. These costs include time, cognitive effort, coordination, privacy exposure, institutional resources, opportunity costs, and sometimes vulnerability. The practical question is therefore one of evidential sufficiency under bounded resources.

Let k index an ordered family of evidential arrangements ranging from relatively shallow symbolic access toward richer historical or relational access. Let $L_q(k \mid D, C)$ denote the expected decision loss associated with remaining at depth k for target inference q in decision setting D and context C. Let $B(k \to k+1 \mid C)$ denote the burden of acquiring and processing the next layer. A depth increase is locally justified when the condition in Equation 16 is satisfied.

$$L_q(k \mid D, C) - L_q(k+1 \mid D, C) > B(k \to k+1 \mid C). \tag{16}$$

Equation 16 is a decision-analytic representation rather than an empirical law. Its function is to express the trade-off that motivates selective depth. The left-hand side represents the expected reduction in consequential error obtained from richer evidence. The right-hand side represents the burden of obtaining that evidence. Both quantities can be uncertain, contested, or difficult to measure. The structure nevertheless prevents the framework from treating maximal observation as the default.

A sufficiency threshold is therefore contextual. Low-stakes, reversible decisions can rationally tolerate greater residual ambiguity. Decisions with large downstream dependence, difficult reversibility, or substantial asymmetry can justify deeper evidence. A temporary low-cost service purchase and the appointment of a fiduciary can involve the same person while demanding very different evidential depth. The distinction lies in the decision architecture, not in an absolute judgment of the person's worth.

Definition 10.4 (Depth sufficiency)**.** An evidential arrangement is *depth-sufficient* for target inference q in decision setting D when additional evidential depth is not expected to reduce consequential uncertainty enough to justify its added burdens under the relevant institutional and ethical constraints.

Depth sufficiency is deliberately provisional. New information can change the expected value of deeper inquiry. A contradiction in a trajectory, a provenance discontinuity, an unexplained agency gap, or a change in stakes can move a decision from a shallow evidential regime toward a deeper one. Sufficiency therefore concerns the current relation between evidence and decision, not a permanent status conferred on an actor.

10.4 Adaptive Escalation

Selective depth becomes most useful when it can be increased in response to emerging uncertainty. A fixed architecture that requires the same evidence from every participant wastes relational bandwidth and can create unnecessary exclusion. An adaptive architecture begins with evidence proportionate to the ordinary decision context and escalates when specific triggers indicate that additional depth may materially change the inference.

Such triggers can arise from the evidence itself. A trajectory can contain unexplained discontinuities. Provenance can identify a transformation whose agency remains unclear. Two independent records can conflict. A stated competence can lack exposure to the conditions in which it matters. A high-stakes commitment can depend on a relationship for which only a surface-level history is available. In each case, the trigger is target-specific rather than a generalized suspicion of the actor.

Adaptive escalation can also arise from the development of the relationship. A short collaboration may begin with ordinary credentials and work samples. As responsibility expands, later stages can introduce supervised tasks, access to prior decisions, references to earlier collaborators, or bounded co-

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experience. The evidential architecture deepens with the relation rather than demanding its maximal form at entry.

This structure has an important distributive advantage. Entry into a social or professional field need not require a fully developed recognized trajectory before participation begins. An actor with sparse portable history can enter through a bounded interaction that generates new evidence. The resulting trajectory can then support later decisions. Adaptive escalation therefore provides one mechanism through which trajectory-sensitive systems can avoid freezing inherited advantage, although the later analysis of trajectory inequality will show that this possibility depends heavily on access to such opportunities.

Proposition 10.5 (Adaptive depth)**.** *Where deeper evidence is costly, a staged architecture can preserve scalability by allowing credibility depth to increase when target-specific uncertainty, consequence, or relational dependence increases.*

The proposition does not prescribe a universal sequence. Some domains begin with strong institutional assurance and rarely require direct interaction. Others depend heavily on situated performance from the outset. The relevant design variable is the capacity to vary evidential depth without confusing one layer with another.

10.5 Depth Mismatch

A central failure mode arises when the depth of available evidence is poorly matched to the inference being made. A *depth mismatch* occurs when a recipient draws a high-consequence or high-specificity inference from an evidential layer that provides little target-relevant access, or when an institution demands substantially deeper exposure than the decision requires.

The first form resembles the diagnostic mismatch developed in Paper 2. A polished surface can be treated as sufficient evidence of authorship, effort, or competence even when production pathways have become heterogeneous. Within the present framework, the problem can be described as an inference that exceeds the available depth. The surface may remain informative about content while being too shallow for the historical property attributed to it.

The second form is equally important. Institutions can demand extensive process access, behavioral records, personal history, or repeated exposure for decisions that could be made adequately with much less information. This form of depth mismatch creates privacy loss, administrative burden, and exclusion without a corresponding evidential benefit. It can also normalize surveillance by presenting maximal visibility as a condition of trustworthiness.

Depth mismatch is therefore bidirectional. Credibility practice can be too shallow for the inference or unnecessarily deep for the decision. A trajectory-based framework should be evaluated against both errors.

Definition 10.6 (Depth mismatch)**.** A *depth mismatch* occurs when the evidential depth used in a credibility process is materially misaligned with the target inference and decision context, either by supporting an inference that exceeds the available target-relevant evidence or by imposing evidential exposure whose expected contribution is disproportionate to its burden.

This definition connects epistemic and ethical evaluation. A credibility system can be epistemically weak because it relies on shallow evidence. It can also be ethically poor because it extracts unnecessary depth. The same design problem therefore concerns both discrimination among plausible histories and limits on what institutions are entitled to demand.

10.6 Portability Gradient

Figure 1 introduced a broad analytical range from isolated symbolic surfaces through trajectory evidence toward selective co-experience. The range can now be interpreted as a *portability gradient*. Symbolic

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surfaces are comparatively easy to transport across contexts. Co-experience is comparatively difficult to transfer because much of its evidential value is situated in the participants' direct exposure to unfolding events. Trajectory evidence occupies an intermediate position by preserving selected temporal and relational structure in a form that can travel beyond the original interaction.

Greater depth therefore tends to create a translation problem. The recipient who personally observed a difficult collaboration can draw on tacit contextual information unavailable to a later evaluator. If that experience is compressed into a short recommendation, portability increases while historical structure is lost. If the entire interaction record is transferred, historical richness increases while interpretive burden and privacy exposure become substantial. Institutional design must navigate between these extremes.

Portability also changes the locus of trust. A recipient who cannot inspect the complete underlying history may rely on the procedure that selected, preserved, or summarized the evidence. At greater scale, credibility therefore depends partly on second-order institutions: archives, assessment systems, professional communities, review processes, provenance standards, and accountable intermediaries. The attempt to escape symbolic compression can thus create a new layer of institutional compression.

This recursive structure is central to the paper. Trajectory-based credibility does not remove mediation. It can alter what is mediated and how much historical structure remains available after mediation. The problem is to preserve enough target-relevant structure for the intended inference while keeping the evidence portable enough to function under finite relational bandwidth.

10.7 Calibration across Contexts

Credibility depth should therefore be calibrated rather than maximized. Calibration requires attention to the target property, decision consequence, reversibility, available alternatives, relational duration, asymmetry, and burden of evidence. Different domains can settle on different architectures even when they confront similar symbol-inflation pressures.

In scholarship, a published output can remain the primary surface while revision history, data provenance, prior inquiry, and oral discussion provide deeper layers when relevant. In education, ordinary work can coexist with supervised performance or longitudinal evidence where assessment targets durable formation. In professional settings, credentials can remain useful entry signals while staged responsibility generates additional trajectory evidence. In markets, institutional guarantees can support routine exchange while high-dependence services justify richer histories of performance and accountability.

These examples are illustrative rather than prescriptive. Their common structure is selective access to increasing evidential depth. The framework therefore shifts the design question away from choosing one universally preferred credibility mechanism. The more useful question concerns how a domain permits movement among evidential layers while preserving proportionality, contestability, and access.

Research Obligation 10.7 (Proportional depth)**.** A credibility practice that increases evidential depth should be able to state which target inference motivates the increase, why existing evidence is insufficient for the decision context, and how the additional evidential burden remains proportionate to the expected informational contribution.

This obligation will become especially important once institutions attempt to operationalize the trajectory framework. A conceptual trajectory can preserve rich history without requiring a standardized administrative format. Institutions, by contrast, must decide what to record, what to ignore, how to summarize, who may interpret the evidence, and how an evaluated actor can contest an interpretation. Those choices determine whether trajectory-based credibility remains a flexible evidential architecture or hardens into another symbolic scoring regime.

Credibility depth becomes socially consequential only when richer evidence can travel beyond the actors who originally encountered it. Raw trajectories are too extensive and context-dependent to function as direct inputs to routine institutional decisions. The next problem is therefore second-order compression: how selected historical structure can become portable without erasing the distinctions that justified

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deeper evidence in the first place. Section 11 develops that translation problem through selection, attestation, compression, contestation, retention, and revision.

11 Institutional Translation

This section examines how institutions make trajectory evidence usable while preserving interpretability beyond an opaque score or exhaustive dossier. *Institutional translation* is treated as a second-order compression problem: an organization selects and stabilizes target-relevant evidence while preserving enough structure for later inspection, correction, and revision. The analysis focuses on the conditions that make this compression proportionate, contestable, and temporally governable, including the risk that standardized trajectory summaries become new status symbols.

The need for translation follows directly from relational bandwidth. A hiring committee, university, professional association, insurer, publisher, funding body, or platform works from a selective representation of each participant's history. Even when a rich trajectory exists, the institution encounters practical limits of time, expertise, privacy, storage, and interpretive attention. Institutional credibility practices therefore select and transform evidence before it enters a decision. The resulting representation can be a portfolio, supervised assessment, attestation, structured record, review report, reference, licence, qualification, or other portable object.

This transformation is unavoidable at scale, yet it creates a recursive problem. Paper 2 described symbolic forms as compression interfaces whose diagnostic relation to underlying histories can become unstable under symbol inflation. A trajectory-sensitive institution can respond by admitting richer histories into evaluation. Once those histories are summarized for portability, however, the institution produces another symbolic surface. The central design problem is therefore the preservation of target-relevant historical structure through compression while keeping the resulting representation open to correction and contextual interpretation.

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11.1 Translation Architecture

Institutional translation is target-conditioned: an institution selects from a trajectory and produces a portable evidential representation for a declared inference. The representation can preserve selected temporal, relational, agency, or provenance structure within a bounded reconstruction of the history. The same trajectory can therefore support different representations when an institution is evaluating technical competence, authorization, reliability under pressure, longitudinal learning, or responsibility for a particular outcome.

Definition 11.1 (Institutional translation)**.** *Institutional translation* is the target-conditioned process through which an institution converts selected trajectory evidence into a portable representation for a decision procedure.

The definition emphasizes that translation includes interpretation. An institution does more than transfer records from one container to another. It decides which traces count, which relations matter, which absences are tolerable, how contradictory evidence is handled, and what inference the resulting representation is permitted to support. Translation therefore distributes epistemic authority. The institution can make a trajectory more legible, while its categories can also narrow what becomes recognizable.

A useful architecture separates at least four layers. The first is the underlying trajectory, which remains heterogeneous and only partially recorded. The second is the selected evidential subset made available to the institution. The third is the institutional representation produced through review, attestation, normalization, or summarization. The fourth is the decision in which that representation is used. Keeping these layers distinct prevents a credential, score, or portfolio from being mistaken for the trajectory itself.

Table 4: Institutional operations in trajectory translation.

Operation	Trajectory input	Portable representation	Primary risk
Selection	Target-relevant events and relations	Bounded evidential subset	Omission of important context
Normalization	Heterogeneous records and descriptions	Comparable format or category	Erasure of meaningful difference
Attestation	Observed event, role, or process	Accountable third-party statement	Authority substitution
Compression	Extended sequence or relational structure	Summary, profile, credential, or report	Loss of historical structure
Retention	Evidence with continuing decision relevance	Versioned institutional record	Excessive persistence and surveillance
Contestation	Representation and its supporting basis	Correction, annotation, or revised interpretation	Procedural burden or symbolic compliance

11.2 Target-Sensitive Selection

Institutional translation begins with selection. Selection is necessary because a trajectory can contain information that is irrelevant, private, redundant, difficult to interpret, or disproportionate to the decision. A trajectory-based framework therefore requires an account of omission as well as preservation. The evidential question is which subset of the available history materially changes the target inference.

Selection should be target-sensitive. Evidence of repeated successful publication can be relevant to one scholarly decision while providing limited evidence about mentoring capacity. A longitudinal sequence of revisions can illuminate learning while offering little information about authorization. A history of reliable delivery can support an inference about operational dependability while remaining weak evidence of independent problem formulation. Institutional translation becomes more precise when the target property is stated before the evidence is selected.

This ordering matters because retrospective target definition can invite strategic reinterpretation. If an institution first observes an extensive record and only afterward decides what the record supposedly demonstrates, almost any sufficiently rich trajectory can be narrated in multiple ways. A target-sensitive procedure constrains that freedom by specifying the intended inference and decision context before the evidential subset is compressed.

Research Obligation 11.2 (Target declaration)**.** An institution using trajectory evidence should state the target inference and decision context that motivate the selected evidence, including the dimensions of the trajectory that the representation is designed to preserve.

Target declaration also limits evidential expansion. A decision about eligibility for a bounded task need not become an invitation to reconstruct an actor's entire professional, social, or personal history. The target functions as a boundary on institutional curiosity. In this sense, target-sensitive selection supports both diagnostic quality and informational restraint.

Table 4 separates several operations that can otherwise be hidden inside a single evaluation. The distinction is analytically useful because each operation has a different failure mode. Selection can omit relevant context. Normalization can erase meaningful heterogeneity. Attestation can shift trust toward the attesting authority. Compression can conceal the path from evidence to inference. Retention can create surveillance burdens. Contestation can become ceremonial if correction mechanisms lack practical effect.

11.3 Selective Standardization

Institutions often require comparability. Applicants, students, employees, researchers, suppliers, or professionals arrive with heterogeneous histories that cannot be evaluated through entirely bespoke proce-

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dures. Some standardization is therefore compatible with trajectory-sensitive credibility. The important issue is where standardization is placed.

A trajectory architecture can standardize the *interface* through which evidence enters a decision while leaving the underlying histories heterogeneous. An institution can specify a common target, evidential time window, role taxonomy, attestation format, or review procedure without requiring every actor to possess the same sequence of experiences. This preserves comparability at the level of questions and procedures while allowing multiple pathways to satisfy the evidential requirement.

This approach differs from converting the entire trajectory into a single standardized life course. A rigid requirement for one institutional pedigree, one type of employment sequence, or one canonical portfolio can make trajectory sensitivity function as status reproduction. Interface-level standardization can instead permit actors to present structurally different evidence relevant to the same target.

Proposition 11.3 (Interface standardization)**.** *Where institutional comparison is necessary, standardizing target definitions, evidential interfaces, and review procedures can preserve greater trajectory heterogeneity than standardizing the histories from which evidence must originate.*

The proposition is deliberately limited. A common interface can still encode bias through its target definitions, accepted categories, language, timing, or proof requirements. The value of interface standardization lies in making the locus of standardization more visible and therefore more open to examination.

11.4 Attestation

Attestation provides one mechanism for translating local experience into portable evidence. A person who directly observed an event, collaboration, supervised task, or institutional process can produce a statement that later recipients use without sharing the original experience. References, examination records, supervised-practice reports, peer review, audit statements, and professional sign-offs all contain forms of attestation.

Within the present framework, an attestation should be interpreted as a relation among at least three elements: an observed or institutionally accessible part of a trajectory, an attesting actor or body, and a target claim. Its credibility depends partly on the attestor's access to the relevant history, the specificity of the claim, the accountability attached to the statement, and the recipient's grounds for trusting the attesting process.

Attestation therefore relocates relational bandwidth. A recipient can rely on observations performed by another actor, but the recipient must then evaluate the attestation structure. A generic endorsement such as "excellent collaborator" carries less inspectable historical structure than a bounded statement specifying the interaction context, observed role, duration, and target property. Greater specificity can improve interpretability while still avoiding the transfer of the entire underlying record.

The institution should also distinguish observation from inference. An attestor may have observed that an actor revised a design after contradictory evidence emerged. The claim that this demonstrates intellectual humility is an interpretation of that event. Preserving the distinction between event description and target inference makes later disagreement more tractable.

Definition 11.4 (Bounded attestation)**.** A *bounded attestation* is a portable statement that identifies the target claim, the attestor's relation to the relevant trajectory segment, and the scope of evidence on which the statement is based.

Bounded attestation can reduce the pressure to disclose complete histories. It allows a local observer to translate selected experience into a statement whose scope can be inspected. Its limitation is recursive: recipients still depend on institutions or social relations that make the attestor recognizable and accountable.

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11.5 Compression Loss

Every institutional representation loses information. The practical question concerns the location and consequence of that loss. Compression becomes problematic when the omitted structure is material to the inference that the portable representation invites.

A conventional credential can retain authorization while omitting the variation of learning histories among credential holders. A portfolio can preserve examples of work while hiding rejected alternatives and revision processes. A recommendation can preserve another person's judgment while omitting the events on which the judgment was based. A numerical score can support ranking while losing the structure of disagreement, development, or contextual dependence that produced the number.

Trajectory-sensitive translation therefore benefits from *traceable compression*. The term refers to an institutional representation that preserves a practicable path back to the selected evidential basis and interpretive procedure when the decision context justifies review. Traceability need not imply universal access to underlying records. Access can be role-limited, consent-sensitive, or activated only under contestation. The important property is that the representation is not epistemically self-sealing.

Definition 11.5 (Traceable compression)**.** *Traceable compression* is an institutional compression process in which a portable evidential representation remains connected, through an inspectable procedure, to the selected trajectory evidence and interpretive operations that support the target inference.

Traceable compression introduces a productive asymmetry between ordinary use and exceptional review. Most recipients can rely on the portable representation at low cost. When stakes rise, inconsistency appears, or the evaluated actor contests the interpretation, authorized review can access a deeper layer. The architecture therefore combines portability with conditional depth.

This arrangement resembles the adaptive escalation developed in Section 10. Institutional translation does not need to expose maximal evidence at the first stage. It can preserve pathways through which deeper evidence becomes available when the decision warrants it.

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11.6 Contestability

Institutional translation can affect opportunity, recognition, access, and reputation. An evaluated actor therefore has an interest in how a heterogeneous trajectory is summarized. Because translation requires selection and interpretation, disagreement is structurally possible even when the underlying records are accurate.

Contestability concerns the ability to identify the representation being used, understand the target inference attributed to it, challenge material errors or omissions, and introduce relevant counterevidence. These capacities become especially important when an institutional representation travels beyond the context in which it was produced. A summary generated for one decision can acquire a broader social meaning that the original evidence did not support.

A contestable system should therefore preserve scope. If a representation was produced to assess supervised technical performance, later users should be able to distinguish that narrow function from claims about general professional worth. Scope metadata can be as important as provenance metadata because it records the inferential mandate under which the representation was created.

Research Obligation 11.6 (Contestable translation)**.** A consequential institutional representation should provide a practicable means to identify its target, correct material factual errors, challenge material interpretive omissions, and record revisions that affect later use.

Contestability also protects institutions. A system that permits structured correction can learn from recurrent translation errors. Patterns of successful challenge can reveal categories that systematically omit relevant forms of work, overvalue particular institutional pathways, or confuse absence of documentation with absence of competence.

11.7 Temporal Governance

Trajectory evidence changes over time. New events can alter the interpretation of earlier events, responsibilities can shift, skills can decay or develop, and institutions can change their evaluative standards. Institutional translation therefore requires temporal governance rather than permanent accumulation.

One implication is versioning. A portable representation should be understood as a time-indexed interpretation of available evidence rather than a timeless statement about the actor. Later evidence can justify revision without implying that the earlier representation was fraudulent. Versioning preserves the historical fact that an institution reached a particular judgment under a particular evidential state while allowing the current representation to change.

Another implication is expiry. Some evidence remains relevant for long periods; other evidence loses target relevance quickly. A supervised performance from many years earlier may still establish that an event occurred while providing weak evidence about current competence. Institutions can therefore separate historical persistence from current inferential weight.

Deletion is equally important. A trajectory-sensitive system gains little ethical legitimacy if every temporary evaluative trace becomes permanently available for future decisions. Retention should be tied to a stated institutional purpose, and the persistence of evidence should remain proportionate to its continuing target relevance, legal obligations, and the interests of affected parties.

Temporal governance thus prevents trajectory from becoming an accumulating shadow record. The institutional objective is selective historical legibility, not indefinite preservation of every evaluative event.

11.8 Reification Risk

Institutional translation can produce a new symbolic object with substantial social force. Once a trajectory summary, profile, credential, or attestation becomes portable, recipients may begin treating it as a property of the person rather than as a bounded institutional interpretation. This is the reification risk of trajectory-based credibility.

The risk is especially strong when representations become easily sortable, searchable, rankable, or exchangeable across institutions. A device originally intended to preserve historical context can become a new compressed status marker. Actors then acquire incentives to optimize for the representation itself, institutions begin using it outside its original mandate, and the underlying trajectory recedes from view. Symbol inflation can therefore reappear at the level of trajectory credentials.

The paper's architecture provides several constraints against this drift. Target declaration limits the inference. Interface standardization locates comparability in procedure rather than biography. Bounded attestation specifies the observer's relation to the evidence. Traceable compression preserves a path to deeper review. Contestability permits correction. Temporal governance prevents a representation from becoming timeless. None of these devices eliminates reification, but together they make the translation process more visible.

Remark 11.7 (Recursive compression)**.** Trajectory-based credibility remains vulnerable to the same social logic that motivates it. Once trajectory evidence is institutionalized, its portable representations can themselves become symbolic surfaces whose production, circulation, and interpretation require renewed diagnostic scrutiny.

This recursive possibility is a central reason for treating trajectory-based credibility as an evolving evidential architecture rather than a final institutional solution. Any mature practice will need mechanisms for reopening its own compressed representations when their diagnostic relation to underlying histories begins to weaken.

Education makes the translation problem concrete because institutions already compress extended learning processes into grades, transcripts, recommendations, and degrees. Under symbol inflation, polished outputs can arise through increasingly heterogeneous combinations of student effort, peer support,

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templates, automated systems, and generative tools. When assessment is intended to support an inference about durable formation, selected evidence of development, revision, supervised performance, problem formulation, or transfer can preserve a path back to the learning process without requiring continuous monitoring. Section 12 examines this domain as a test of whether institutional translation can remain development-sensitive and proportionate.

12 Trajectory Evidence in Educational Settings

This section applies the framework to education, where institutions must infer durable formation from bounded performances. Its objective is to separate evidence of present output from evidence of development across time, especially when AI mediation widens the range of pathways producing similar work. The analysis treats feedback, revision, transfer, supervised performance, and agency legibility as possible sources of formation-sensitive evidence while preserving proportionality and space for exploratory learning.

Educational institutions routinely translate extended learning histories into portable judgments. Grades, examinations, transcripts, portfolios, recommendations, and degrees give later recipients a compact representation of the learning process that preceded the credential. This compression is socially useful, but it also creates an inverse problem. A polished artifact can support an inference about what a student can do, yet the strength of that inference depends on the relation between the artifact, the learning process, the assessment conditions, and the target capability.

Research on formative assessment has long treated learning as responsive to feedback, standards, self-assessment, and opportunities for revision across a developing process (Black and Wiliam 1998; Sadler 1989; Nicol and Macfarlane-Dick 2006). The trajectory framework complements these traditions by describing how temporally distributed evidence becomes relevant when a single output provides weak discrimination among different histories of formation.

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12.1 Learning Trajectories

A learning process can contain episodes of explanation, practice, error, feedback, revision, transfer, collaboration, tool use, and supervised performance. Some events precede and constrain others, while other events occur in parallel. The partial-order model introduced in Section 5 is therefore well suited to education. A revision can depend on earlier feedback; a later explanation can draw on several parallel exercises; a transfer task can reveal how previously separate strands of learning have been integrated.

Definition 12.1 (Learning trajectory)**.** A *learning trajectory* is a target-relative subtrajectory of educational events, relations, and traces whose temporal and relational structure bears on an inference about formation, development, transfer, or retained capability.

The definition is intentionally narrower than a complete educational record. Assessment selects a target-relevant subtrajectory rather than treating attendance logs, keystrokes, messages, and every interim artifact as equally evidential. Evidence useful for judging conceptual understanding can differ from evidence useful for judging laboratory judgment, collaborative responsibility, oral communication, or independent problem formulation.

This target-relative structure also limits the role of chronology. Informative depth depends on the organization of development, including relations among initial performance, feedback, revision, and transfer, rather than elapsed duration alone. As developed in Section 5, order depth and relational structure can vary independently of chronological length.

12.2 Formation Evidence from Performance

Educational assessment frequently moves from an observable performance toward a claim about a less directly observable capability. The inferential gap is familiar: a correct answer can arise from durable understanding, short-term rehearsal, extensive scaffolding, peer assistance, tool use, or some mixture of these pathways. The output remains educationally meaningful, but its diagnostic relation to the target capability varies with the production history.

The distinction can be expressed as one between *performance evidence* and *formation evidence*. Performance evidence concerns what was successfully produced or enacted under specified conditions. Formation evidence concerns the temporally extended development that supports an inference about what has been learned, retained, integrated, or made available for later use. The two forms of evidence can support one another without being equivalent.

This distinction is compatible with formative-assessment traditions. Black and Wiliam's review emphasized the learning effects associated with strengthened formative feedback, while Sadler's account linked formative assessment to students' ability to compare current performance with standards and act to close the gap (Black and Wiliam 1998; Sadler 1989). In trajectory terms, feedback matters partly because it creates an interpretable relation between states of performance. A revision after feedback contains information that neither the initial artifact nor the final artifact carries alone.

Definition 12.2 (Formation-sensitive evidence)**.** *Formation-sensitive evidence* is evidence whose interpretation depends on temporally ordered change in a learner's performances, judgments, explanations, or actions rather than on the quality of a single terminal output alone.

Formation-sensitive evidence accommodates regression, confusion, reframing, delayed understanding, and domain-specific variation. A trajectory can be informative precisely because it preserves discontinuities that a final polished artifact would compress away.

12.3 Development through Revision

Feedback becomes trajectory evidence when later action can be interpreted in relation to earlier information. A student's revised proof, rewritten argument, redesigned experiment, or corrected model can reveal whether feedback was noticed, understood, selectively accepted, or transformed into a new approach. The evidential object is the relation among versions, feedback events, and subsequent choices.

Nicol and Macfarlane-Dick connect formative assessment with self-regulated learning and emphasize the active role of students in generating and using feedback (Nicol and Macfarlane-Dick 2006). A trajectory-sensitive interpretation extends this point by preserving selected traces of the feedback loop. The relevant evidence can include a small number of consequential revisions, an explanation of why a change was made, or a later task that reveals whether the revised understanding transfers beyond the original exercise.

Revision histories can nevertheless become performative. Once students know that visible revision itself is rewarded, they can produce elaborate but weakly informative change logs. The educational value of revision evidence therefore depends on target relevance and on the relation between revision and later performance. A record of many edits is less informative than a small number of changes that reveal conceptual reorganization or improved judgment.

Remark 12.3 (Revision legibility)**.** Revision becomes evidentially useful when the relation between an earlier state, an intervening informational event, and a later state is sufficiently legible for the target educational inference. Revision volume alone does not establish learning depth.

This point also prevents trajectory-sensitive assessment from becoming an aesthetic preference for visibly messy work. Some students solve problems with relatively little recorded revision; others externalize more of their thinking. The framework therefore evaluates the inferential role of available traces rather than treating one visible work style as the norm.

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12.4 Transfer Evidence from Supervised Performance

A central educational challenge concerns whether a capability demonstrated in one setting remains available under changed conditions. Transfer tasks, oral explanation, supervised practice, and application to unfamiliar cases can provide evidence that differs from repeated performance on a familiar artifact type. Their value lies partly in changing the conditions under which a learned structure must be reconstructed or applied.

Selective co-experience, developed in Section 9, is especially relevant here. A teacher, supervisor, examiner, or peer can observe how a learner responds to clarification requests, unexpected constraints, partial failure, or a change in problem framing. These interactions need not dominate the assessment system. A bounded episode of supervised performance can supply deeper evidence when a high-stakes inference cannot be supported by a portable artifact alone.

Recent work on generative AI and higher-education assessment also points toward learning processes, self-regulation, critical thinking, and assessment redesign rather than treating final-product control as the only available response. A 2024 scoping review of empirical studies identified self-regulated learning, responsible learning, integrity, assessment literacy, and policy redesign among the recurrent issues in the emerging literature (Xia et al. 2024). A teacher survey reported perceived need for greater attention to learning processes, higher-order thinking, ethical values, and face-to-face relational learning in response to increasingly capable generative systems (Bower et al. 2024). These findings do not establish a single preferred assessment model, but they support the relevance of process-sensitive and relational evidence as an active area of educational adaptation.

The trajectory framework adds a calibration principle to this discussion. Supervised depth should be allocated where the target inference warrants it. A low-stakes practice task may require little verification. A consequential judgment about independent professional readiness may justify deeper observation, transfer tasks, or oral examination. This is the educational form of the proportional-depth obligation developed in Section 10.

12.5 AI-Mediated Learning

Generative AI makes the educational inverse problem more visible because similar outputs can arise from different distributions of student judgment, model generation, editing, verification, and synthesis. Yet the relevant educational distinction is broader than a human–AI binary. Students have long learned through textbooks, calculators, peers, tutors, templates, software, and institutional scaffolds. The assessment problem concerns which capabilities and forms of agency the institution intends to infer under a particular configuration of assistance.

Agency legibility from Section 7 therefore provides a more precise educational vocabulary than a simple declaration that AI was or was not used. For some tasks, the important evidence may concern problem formulation and verification even when generation is heavily assisted. For others, unaided recall, manual technique, or spontaneous explanation may itself be the target. The relevant disclosure can accordingly be role-sensitive: which parts of the process required student initiation, selection, revision, evaluation, or endorsement?

UNESCO's guidance on generative AI in education emphasizes human-centred use, pedagogical design, data privacy, and the need to reconsider educational practices as generative systems become more capable (Miao and Holmes 2023). The trajectory framework is compatible with this emphasis when it treats AI use as part of the generative history rather than as a categorical defect. The objective is to preserve enough information about student agency and development to support the intended educational inference while avoiding unnecessary exposure of the student's entire interaction history.

This creates an important distinction between *tool transparency* and *learning legibility*. A complete prompt log can reveal tool interaction while remaining weak evidence about conceptual understanding. Conversely, a short oral defense, a targeted revision explanation, or a transfer task can provide strong

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Table 5: Illustrative trajectory-sensitive educational evidence.

Target inference	Selected trajectory evidence	Portable educational representation	Primary risk
Conceptual development	Initial explanation, feedback, consequential revision	Developmental narrative or bounded portfolio entry	Rewarding visible revision rather than learning
Transfer	Performance across changed problems or contexts	Transfer assessment or examiner attestation	Overgeneralizing from a narrow task
Independent judgment	Problem framing, choice among alternatives, verification	Oral defense or structured commentary	Advantage from familiarity with evaluators
Collaborative capability	Role-specific contributions across joint work	Bounded team-process attestation	Conflating group success with individual contribution
AI-mediated capability	Student initiation, selection, checking, revision, endorsement	Role-sensitive process statement	Excessive logging of private interactions
Durable professional preparation	Repeated supervised performance with consequences	Longitudinal competency judgment	Institutional gatekeeping and documentation burden

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learning evidence while revealing relatively little private interaction data. Educational design can therefore seek selective agency legibility rather than maximal technical logging.

12.6 Translation of Educational Trajectories

Educational institutions eventually need portable outputs. Even a rich learning trajectory must be translated into grades, narratives, certificates, decisions, or credentials that can be used by people who did not participate in the learning process. Section 11 described this as a second-order compression problem. Education makes the problem particularly visible because the same learner may be represented simultaneously through course grades, transcript categories, teacher comments, portfolio artifacts, and supervised performances.

Table 5 aligns each target inference with selected evidence, a portable representation, and a characteristic risk. Keeping these layers distinct reduces category errors such as treating a polished portfolio as direct evidence of independent judgment or a team outcome as a complete measure of individual competence.

Trajectory-sensitive translation also benefits from conditional depth. A transcript can remain a lightweight first-stage representation. When a decision requires deeper evidence, selected underlying material can become available through portfolios, supervised assessments, references, or structured review. This layered architecture avoids making every later recipient inspect the complete educational history while preserving the possibility of deeper examination where stakes justify it.

12.7 Documentation Proportionality

Education makes record burden unusually sensitive because students occupy an asymmetric institutional position and records collected for learning can later affect ranking, recommendation, access, or discipline. Continuous capture of drafts, conversations, biometric states, locations, or software interactions would

often exceed what a target educational inference requires. A more proportionate design preserves a small number of pedagogically meaningful events, such as a baseline task, a consequential revision, a supervised transfer exercise, or a final explanation, while leaving much ordinary learning outside durable evaluation.

Constant observation can also alter learning behavior. Students may optimize the appearance of a trajectory, avoid exploratory failure, or suppress unusual approaches when every intermediate state carries reputational consequences. Trajectory-sensitive assessment therefore needs protected developmental space in which provisional ideas and mistakes can remain part of learning without automatically becoming permanent institutional evidence.

Research Obligation 12.4 (Protected developmental space)**.** A trajectory-sensitive educational system should distinguish evidence selected for consequential evaluation from exploratory learning activity that remains outside durable institutional judgment, except where a clearly stated safety, legal, or pedagogical obligation requires otherwise.

Portable credentials remain necessary because later institutions usually work from compressed educational representations. Trajectory-sensitive assessment is therefore best understood as a layered supplement: grades, degrees, and certificates can remain low-bandwidth interfaces, while selected underlying evidence becomes available when a consequential target inference requires greater depth. Professional evaluation extends this architecture into settings where formation is interpreted through organizational roles, responsibility, and consequence-bearing performance.

13 Trajectory Evidence in Professional Settings

This section extends the framework to professional evaluation, where credibility concerns practical capability, judgment, responsibility, coordination, and performance under organizational constraints. Work samples, structured evaluation, supervised practice, references, and project histories become useful when their scope and role structure remain legible. The analysis therefore focuses on selective professional trajectories and the conditions under which they can travel across organizations while retaining bounded scope and avoiding conversion into comprehensive employment dossiers or prestige proxies.

Professional evaluation compresses distributed histories into portable judgments. A curriculum vitae, title, recommendation, portfolio, professional licence, interview performance, or reputation can summarize years of work while revealing only a small portion of the events that produced the representation. This compression is necessary because employers, clients, collaborators, and professional bodies rarely possess direct access to a person's complete work history. The inferential problem resembles the educational case developed in Section 12, while the target properties change. Professional settings place greater weight on responsibility-bearing action, coordination under constraints, practical judgment, transfer across contexts, and the consequences of decisions made for other people or institutions.

Research in personnel selection provides an established empirical reminder that different selection procedures supply different kinds of predictive evidence. Classic meta-analytic work compared work samples, interviews, cognitive measures, and other procedures as predictors of later job performance (Schmidt and Hunter 1998). More recent reanalysis has revised several earlier validity estimates downward while preserving the broader conclusion that selection methods differ substantially in criterion-related validity and should be interpreted with attention to their measurement assumptions (Sackett et al. 2022). The trajectory framework asks how selected professional evidence can be interpreted as part of a temporally and relationally structured history, extending the information available from an isolated score or performance.

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13.1 Role-Conditioned Trajectories

Professional competence is expressed through roles. The same person can formulate problems in one project, execute predefined tasks in another, supervise colleagues in a third, and provide final authorization in a fourth. A professional trajectory therefore becomes more informative when events are interpreted together with the roles under which action occurred.

Definition 13.1 (Professional trajectory)**.** A *professional trajectory* is a target-relative subtrajectory of work events, role assignments, decisions, interactions, revisions, and consequences whose temporal and relational structure bears on an inference about professional capability, judgment, reliability, responsibility, or development.

This definition builds directly on the agency model in Section 7. A project outcome can be impressive while remaining weak evidence about a particular participant when the distribution of initiation, execution, review, and responsibility is opaque. Conversely, a comparatively modest project can be highly informative about judgment when the participant's role is legible and the relevant decisions can be connected to subsequent consequences.

Role conditioning also limits indiscriminate inference from prestige. Employment at a well-known organization is a portable symbol, yet the evidential meaning of that affiliation depends on what the person actually encountered and did within the organization. The trajectory framework therefore directs attention toward the relation between role, event, and target inference. Institutional affiliation can remain informative while carrying less evidential weight than role-specific traces when the evaluation concerns practical capability.

13.2 Work-Sample Evidence

Work samples reduce part of the inverse problem by asking a candidate or practitioner to perform tasks related to the target domain. Their evidential value arises from greater proximity between the observed performance and the capability being inferred. Historical personnel-selection research has treated work-sample tests as one of several procedures with substantial criterion-related validity (Schmidt and Hunter 1998; Sackett et al. 2022). Within the present framework, a work sample is best understood as a bounded event inserted into a larger trajectory.

A single work sample remains sensitive to task selection, preparation, assistance, familiarity, and local performance conditions. Trajectory depth emerges when the sample is connected to other evidence. A baseline attempt, a clarification exchange, a revision after critique, or a second task under changed conditions can reveal dimensions of professional judgment that a terminal artifact alone compresses away. The objective is not to maximize the number of exercises. It is to select a small set of events whose relations increase discrimination among plausible capability histories.

The distinction between product quality and professional capability is especially important in AI-mediated work. A candidate may produce a strong report through extensive model assistance while exercising substantial judgment in problem formulation, evidence selection, verification, and revision. Another candidate may produce a similarly polished report through largely delegated generation with minimal evaluation. The final surfaces can converge while the professional trajectories differ. Role-sensitive observation can therefore preserve information about where professional judgment entered the process without demanding unaided production as a universal standard.

Remark 13.2 (Work-sample depth)**.** The evidential depth of a work sample depends on the target capability, task conditions, and surrounding trajectory. Additional tasks increase evidential value when they expose relevant variation, transfer, revision, or role structure; repetition alone can add little information.

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13.3 Structured Evaluation

Interviews are another compressed professional encounter. An evaluator observes a short interaction and uses it to infer future behavior, competence, communication, motivation, or fit. Research on selection interviews has long distinguished structured from less structured procedures, with structure generally improving reliability and validity through greater consistency in questions and evaluation processes (Campion et al. 1997). This insight is compatible with trajectory-based credibility because structure can improve the comparability of bounded evidential events without requiring a universal biography format.

A structured professional encounter can be designed around target-relevant episodes. An evaluator might ask a candidate to reconstruct a consequential decision, explain how uncertainty was handled, respond to a changed constraint, or revise an earlier proposal. The resulting evidence concerns relations among problem representation, choice, feedback, and response. These episodes become trajectory-sensitive when they are anchored to verifiable prior work or when later stages of the evaluation revisit earlier reasoning.

Structure also reduces opportunities for evaluators to substitute broad impressions for specified evidence. This matters because interpersonal evaluation can incorporate cultural similarity, familiarity, and stylistic preference alongside judgments of capability. Rivera's study of hiring in elite professional-service firms showed how cultural matching could become salient in evaluation beyond productivity-related considerations (Rivera 2012). A trajectory-sensitive procedure can therefore separate target-relevant professional evidence from generalized judgments of resemblance or ease of interaction.

The separation remains incomplete because evaluators interpret evidence through institutional norms and their own histories. Structured evaluation should therefore be understood as an evidential architecture that constrains discretion rather than eliminating interpretation. The relevant question is whether the structure makes the basis of judgment sufficiently legible for review, comparison, and contestation.

13.4 Consequence-Bearing Practice

Professional credibility becomes especially consequential when decisions affect clients, patients, colleagues, infrastructure, budgets, public outputs, or organizational commitments. In such settings, the relation between an action and its later consequences can provide evidence unavailable from self-description or simulated tasks. The historical-resistance framework from Section 6 becomes important because consequence-bearing events are often deposited before later evaluation and are partly constrained by independent outcomes.

A professional trajectory can therefore include selected chains linking a decision event to implementation, feedback, correction, and later consequence. This structure can support inference about judgment under uncertainty, responsiveness to emerging evidence, willingness to revise, and the capacity to manage responsibility across time. The evidential target is the patterned relation among events rather than a simple success count.

Outcome interpretation requires caution. Professional results depend on teams, resources, institutional conditions, market environments, chance, and inherited constraints. A favorable outcome therefore does not establish that every preceding decision was competent, and an unfavorable outcome does not establish poor judgment. Trajectory evidence becomes useful when it preserves enough context to distinguish decision quality from outcome luck and to identify how the actor responded once consequences became visible.

This distinction makes professional trajectories compatible with fallibility. A trajectory containing mistakes can provide strong credibility evidence when it shows accurate recognition, responsible correction, and learning across subsequent events. The framework therefore avoids turning professional history into a record of uninterrupted success. Consequence-bearing depth can include how a person acts after error, disagreement, or unexpected change.

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13.5 Longitudinal Observation

Repeated collaboration can reveal forms of professional capability that short selection events capture only weakly. Colleagues can observe reliability across deadlines, revision under criticism, coordination across roles, judgment under changing constraints, and the stability of commitments over time. These observations resemble selective co-experience from Section 9, but professional settings add formal roles and organizational consequences.

Longitudinal observation gains evidential value from variation. Repeated exposure to nearly identical routine tasks may reveal consistency while providing limited information about adaptation. A more informative professional trajectory can contain different project phases, counterparties, levels of uncertainty, and responsibility structures. The partial-order model from Section 5 allows parallel assignments and branching projects to remain distinct while later events reveal convergence, transfer, or changing role depth.

Professional trajectories can also reveal development. Early supervised practice may be followed by more autonomous judgment, broader responsibility, or mentoring roles. The evidential meaning lies in how the role structure changes and how later performance relates to earlier feedback and experience. This temporal view prevents a professional identity from being reduced to a frozen credential acquired at one point in time.

Longitudinal observation nevertheless creates relational dependence. People with access to stable teams, prestigious projects, or influential supervisors can accumulate more legible professional histories than equally capable people working through fragmented, temporary, independent, or less visible arrangements. This asymmetry becomes central in the later analysis of trajectory inequality; within the present section, it establishes a reason to avoid equating richness of documentation with richness of capability.

13.6 Bounded Attestation

References and recommendations translate local observation into portable professional evidence. Their value depends partly on whether the attesting person actually observed the target-relevant events and whether the scope of the attestation is clear. A general statement that someone is “excellent” compresses many possible bases of judgment. A bounded attestation states what relationship existed, what kinds of events were observed, and which inference the witness is prepared to support.

This structure parallels the bounded-attestation principle developed in Section 11. A project supervisor may be well positioned to attest to coordination, revision, and delivery under specified conditions while possessing little basis for evaluating capabilities outside that project. A client may observe responsiveness and practical judgment while lacking access to internal technical work. A colleague may observe collaboration closely while having limited information about formal responsibility. Scope limitation increases legibility because it reduces the temptation to convert local experience into an unrestricted professional verdict.

Digital professional platforms can make attestations easier to accumulate, yet volume can quickly become another symbolic surface. Numerous generic endorsements may possess less target-specific value than a small number of well-scoped attestations anchored to identifiable shared work. The trajectory framework therefore treats attestation quality as relationally grounded and target-sensitive rather than additive.

Research Obligation 13.3 (Attestation scope)**.** Professional attestations used for consequential evaluation should make the observer’s relation to the relevant work sufficiently legible to distinguish witnessed evidence from reputation, inference, and hearsay.

This obligation does not require public disclosure of confidential projects or private relationships. Institutions can preserve scope through role descriptions, bounded categories, confidential references, or auditable procedures while keeping sensitive content protected.

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Table 6: Illustrative trajectory-sensitive evidence in professional evaluation.

Target inference	Selected trajectory evidence	Portable professional representation	Primary risk
Practical capability	Target-relevant work sample, revision, transfer task	Structured work-sample record	Task coaching or narrow task fit
Judgment under uncertainty	Decision episode, alternatives considered, later update	Bounded case reconstruction	Retrospective rationalization
Role-specific contribution	Project events linked to role assignments and outputs	Role-conditioned project record	Prestige substitution for actual contribution
Reliability	Repeated commitments, delivery, response to disruption	Scoped longitudinal attestation	Rewarding access to stable organizations
Collaborative capability	Repeated cross-role interaction and conflict resolution	Bounded collaborator reference	Familiarity and cultural-matching bias
Responsible AI-mediated work	Problem formulation, verification, revision, endorsement	Role-sensitive process statement	Excessive monitoring of technical interactions

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13.7 Portability Across Organizations

Professional life often crosses organizations. A person can move between firms, universities, public institutions, independent work, temporary projects, and collaborative networks. Trajectory evidence therefore faces a portability problem: rich local histories must become interpretable elsewhere without forcing every future evaluator to reconstruct the original organization.

Institutional translation can address this problem through layered representations. A lightweight professional surface can contain role, period, responsibility level, and selected outputs. Deeper evidence can remain available conditionally through work samples, scoped attestations, verified project traces, supervised demonstrations, or later co-experience. The architecture resembles credibility depth in Section 10: recipients begin with portable evidence and escalate only when the stakes and remaining uncertainty justify additional depth.

Portability should preserve distinctions among role, contribution, and outcome. A project title alone can conceal distributed work, while a detailed dossier can become too costly to interpret. A role-conditioned professional representation therefore selects the events and relations relevant to a declared inference under the actor's role conditions. This selection is an evidential judgment rather than an automatic score, and institutions can reasonably select different evidence when their responsibilities differ.

Table 6 decomposes professional credibility into target-specific evidential problems. Separating the inference, selected trajectory evidence, and portable representation limits the tendency to treat a single résumé line, interview impression, or reputation signal as evidence for every professional property at once.

13.8 Professional Access

Professional trajectories are easier to make legible in some settings than in others. Consequential projects, stable supervisors, recognized organizations, prestigious clients, and durable documentation are unevenly distributed, so richer evaluation can convert prior opportunity into later credibility. Research on cultural matching in hiring also shows that evaluators can incorporate interpersonal and status filters beyond target

productivity (Rivera 2012). Trajectory evidence therefore requires a distinction between the quality of the evidential relation and the prestige of the setting in which it was produced.

A practical capability can sometimes be demonstrated through prior employment, independent projects, supervised trials, open-source contributions, professional examinations, or later performance after provisional entry. These routes need not be interchangeable in every occupation, especially where law or safety requires specific supervision or licensing. They do show why professional evaluation should preserve plural evidential routes whenever materially different histories can support the same target inference.

Research Obligation 13.4 (Plural evidential access)**.** Where professional credibility can be supported through materially different histories, institutions should preserve more than one legitimate evidential route when doing so remains compatible with the responsibilities and risks of the role.

Professional settings therefore reveal both the promise and the danger of trajectory-based credibility. Richer temporal and relational evidence can improve the interpretation of capability, agency, and responsibility. The same evidence can become a new status infrastructure if organizations reward legibility itself or make recognized histories available mainly to already advantaged actors. Market exchange extends the problem further by placing trajectory evidence alongside brands, reputation, scarcity, consumer inference, and strategically produced demand under symbol inflation.

14 Trajectory Evidence in Market Settings

This section examines trajectory evidence in market exchange, where buyers and sellers usually act through partial access to production histories and uncertain expectations about future conduct. Market symbols remain valuable for coordination, yet selected claims about quality, origin, reliability, scarcity, or continuing service may require deeper evidence when surface cues become easier to construct. The analysis therefore treats reputation, provenance, consequence-bearing exchange, and market translation as historically situated evidential infrastructures whose value remains vulnerable to strategic adaptation and unequal access.

Market exchange has long depended on compressed evidence. Buyers rarely observe the complete production history of a good, the internal capability of a seller, the durability of a service provider, or the future behavior of a platform before transacting. Akerlof's analysis of quality uncertainty showed how informational asymmetry can alter market outcomes and how institutions such as guarantees and brand names can partly counteract uncertainty (Akerlof 1970). Market symbols therefore perform genuine coordinative work. A brand, warranty, review score, certification, seller badge, provenance statement, or luxury mark can reduce the amount of history a recipient must reconstruct before acting.

Symbol inflation changes the conditions under which these compressed forms are interpreted. Firms can produce larger volumes of polished advertising, personalized communication, branded narratives, testimonials, product imagery, creator content, and customer-facing explanations at lower marginal cost. Platforms can rank and summarize enormous quantities of market information. Individual sellers can construct professional-looking symbolic surfaces with comparatively modest infrastructure. These developments can improve access and communication while also widening the set of generative histories compatible with a similar market-facing surface. The resulting problem is target-relative: a polished storefront can remain useful for discovering products while becoming weaker evidence about production quality, seller continuity, human attention, or the history behind a scarcity claim.

14.1 Market Credibility under Symbol Inflation

Market credibility concerns the evidential basis on which an actor accepts a market-facing claim or expectation strongly enough to transact, continue a relationship, or allocate attention. The target can

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vary substantially. A buyer may care about product quality, delivery reliability, origin, repairability, safety, status meaning, seller responsiveness, environmental practice, or the likelihood that a warranty will be honored. A single symbolic cue rarely supports all of these inferences equally well.

Definition 14.1 (Market credibility)**.** *Market credibility* is target-relative confidence that a market-facing claim, expectation, or commitment is sufficiently supported for a transaction or related decision under the available evidential conditions.

The definition preserves the distinction developed throughout the paper between credibility and truth. A claim can be true while weakly supported for a particular recipient, and a highly credible market representation can later prove inaccurate. The analytical object is the relation among target inference, available evidence, institutional environment, and action threshold.

Brand research provides one established example of market credibility operating through compressed symbols. Erdem and Swait found that brand credibility, understood through trustworthiness and expertise, influenced brand consideration and choice across multiple product categories, with effects shaped by uncertainty and perceived risk (Erdem and Swait 2004). The trajectory framework interprets such findings without reducing brands to deception or mere image. A brand can carry accumulated expectations generated by prior transactions, institutional investments, product histories, service encounters, and public responses. The critical question under symbol inflation is how much of that history remains connected to the present surface and which target inferences still receive useful support from the brand cue.

14.2 Brand-History Compression

A brand is among the clearest examples of social compression in market life. Its portable form can condense a distributed history of products, transactions, advertising, service responses, design decisions, failures, recalls, endorsements, and consumer experience. The compression can be useful even when most recipients never reconstruct the underlying history. Brand recognition lowers search costs precisely because a small symbolic surface can carry expectations accumulated elsewhere.

Trajectory-based analysis adds resolution by distinguishing the brand symbol from the events that sustain or revise its evidential meaning. A long-lived brand can contain multiple partially independent trajectories across product lines, jurisdictions, ownership structures, production partners, and historical periods. Continuity of name therefore does not entail continuity of every underlying practice. Conversely, organizational change does not automatically erase accumulated credibility. The relevant unit is the target-specific relation between present claims and the portions of history that materially bear on them.

This distinction is important for scarcity and status goods. Market symbols can communicate social position in addition to product properties. Han, Nunes, and Drèze showed that the prominence of luxury branding can participate in status signaling differently across consumer groups (Han et al. 2010). Such cases illustrate that symbolic diagnosticity in markets is multidimensional. A conspicuous mark may be highly diagnostic of category recognition or intended status communication while carrying much weaker information about craft history, durability, origin, or the distribution of labor behind the object.

Remark 14.2 (Brand continuity)**.** Brand continuity can support trajectory-based credibility when present claims remain meaningfully connected to the histories that generated prior expectations. The age, prestige, or visual stability of the brand alone does not establish that connection for every target inference.

14.3 Reputation Infrastructure

Digital markets increasingly transform dispersed consumer experience into portable reputation signals. Ratings, reviews, seller histories, platform badges, transaction counts, complaint records, and recommendation systems allow recipients to draw on experiences they did not personally share. Dellarocas

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described online feedback mechanisms as large-scale word-of-mouth infrastructures capable of supporting trust and cooperation while also raising substantial design and evaluation problems (Dellarocas 2003). Within the present framework, reputation infrastructure functions as a distributed trajectory-compression system.

The trajectory content of a reputation system depends on what events enter the system and how their relations remain visible. A single average rating compresses transaction histories very aggressively. A time series of verified purchases, seller responses, delivery outcomes, complaint resolutions, and repeat interactions preserves more structure. Greater structure does not automatically yield better judgment, because recipients still face limited bandwidth and platform interfaces can privilege selected dimensions. The analytical task is to preserve enough target-relevant temporal and relational information for a warranted inference without requiring recipients to inspect every transaction.

Reputation systems are also strategic environments. Luca and Zervas documented economic incentives associated with suspicious or fraudulent reviews in the Yelp setting, showing that review systems can become objects of competitive manipulation (Luca and Zervas 2016). This finding matters for trajectory-based credibility because any portable representation that influences demand can itself become a target of optimization. Verified transactions, reviewer histories, temporal patterns, and independent anchors can raise the cost of some forms of manipulation, yet each additional verification layer creates new institutional dependencies and possible forms of strategic adaptation.

Proposition 14.3 (Reputation compression)**.** *The credibility contribution of a reputation summary depends partly on the relation between the compressed representation and the distributed transaction history from which it is produced. Increased review volume alone does not establish stronger diagnosticity when the event population, incentives, or aggregation process remain weakly legible.*

14.4 Provenance-Supported Market Evidence

Provenance can become especially important where market value depends on origin, production history, authorized transformation, custody, or scarcity. Art, collectibles, luxury goods, food, industrial components, sustainability claims, and digitally produced media can all contain market inferences for which origin history is relevant. Section 8 established that technical provenance can strengthen traceability while leaving broader social properties unresolved. The same boundary applies in markets.

A provenance record can support an inference that an item passed through specified actors or transformations. It may help distinguish authorized from unauthorized copies, establish chain of custody, or preserve selected production events. These contributions can materially change market confidence. They remain analytically separate from judgments concerning aesthetic value, labor conditions, environmental quality, craftsmanship, sincerity, or the fairness of a price. Such properties require additional evidence and interpretive standards.

Scarcity claims illustrate the distinction. A market can attach value to an object's limited availability, difficult production history, institutional recognition, or social exclusivity. Provenance can support some factual components of scarcity, such as edition history or custody. It cannot by itself determine the cultural or economic significance assigned to scarcity. Trajectory evidence therefore clarifies what kind of history is being invoked by a scarcity claim and which parts of that history are independently anchored.

14.5 Consequence-Bearing Exchange

Market credibility also develops after the initial transaction. Delivery, product performance, return handling, repair, complaint response, warranty fulfillment, subscription changes, dispute resolution, and repeated purchase create consequence-bearing events that can revise earlier expectations. These events are particularly informative because they connect pre-transaction claims to later states that were not fully controllable at the moment of presentation.

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Table 7: Illustrative trajectory-sensitive evidence in market settings.

Target inference	**Selected trajectory evidence**	**Portable market representation**	**Primary risk**
Product reliability	Repeated performance, repair, return, failure history	Warranty record or longitudinal quality summary	Survivorship and selective reporting
Seller reliability	Delivery, dispute, refund, response, repeat transaction events	Scoped seller-history summary	Platform dependence and gaming
Origin or custody	Production, transfer, authentication, transformation events	Provenance statement or authenticated record	Overextension from origin to broader quality claims
Brand credibility	Product history, service response, public correction, continuity of commitment	Brand-level history summary	Prestige substitution and narrative curation
Consumer reputation	Verified transactions, temporally distributed reviews, reviewer histories	Rating or review profile with contextual metadata	Review fraud, selection effects, and strategic amplification
Scarcity-related credibility	Edition, production constraint, custody, release history	Bounded scarcity or edition record	Artificial scarcity and status inflation

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A seller trajectory can therefore include more than product descriptions and promotional representations. It can contain patterns of response when promised conditions fail, willingness to repair or refund, consistency across repeated transactions, and behavior when reputational incentives become adverse. For long-duration services, the history of updating, support, pricing changes, and termination practices can be more informative than the initial marketing surface for some target inferences.

Repeated exchange also creates selective co-experience between market actors. A long-term customer may acquire rich local evidence about a supplier that remains inaccessible to a first-time buyer. Reviews, references, transaction records, and service histories can transfer part of this experience. The transfer is necessarily lossy. The portability problem from Section 9 therefore reappears in markets. Locally rich histories must be compressed for recipients who did not participate in them.

Table 7 separates market inferences that are often compressed into a general impression of trustworthiness or prestige. Product reliability, seller conduct, origin, brand credibility, reputation, and scarcity therefore receive distinct evidential treatments; strength for one target can coexist with weakness for another.

14.6 Market Translation

Consumers and organizations rarely have the relational bandwidth to inspect raw market trajectories. Platforms, certifiers, warranties, seller histories, and professional intermediaries therefore compress larger histories into decision interfaces. Their value depends on scope: recipients need to know what has been verified, which target inference the representation supports, and where promotional or interpretive claims begin. Low-stakes purchases can rely on shallow evidence and routine guarantees; high-cost, safety-relevant, authenticity-sensitive, or difficult-to-reverse transactions can justify deeper access.

Research Obligation 14.4 (Proportional market legibility)**.** Market trajectory infrastructures should make target-relevant evidence available at a depth proportionate to the stakes and uncertainty of the transaction while limiting demands for unrelated historical disclosure.

Market translation also concentrates power. Once reviews, provenance histories, verification marks, or longitudinal seller records influence demand, actors can optimize those traces and intermediaries can acquire authority over which histories remain visible. Incumbents often possess stronger documentary infrastructure than small firms, informal producers, independent creators, or cross-jurisdictional sellers. These problems are developed systematically in Sections 15–17; here they delimit the market application: trajectory evidence can improve selected inferences without making historical legibility costless, manipulation-resistant, or equally accessible.

The market domain therefore shows why richer history remains dependent on portable translation. Brands, reviews, warranties, provenance records, and seller histories can each support bounded inferences while retaining distinct scopes. Their use also makes visible the costs of producing, preserving, verifying, and carrying historical traces, which the record-burden analysis addresses directly.

15 Record Burden

This section develops *record burden* as the principal cost generated by trajectory-sensitive credibility. Historical evidence must be captured, maintained, disclosed, interpreted, verified, contested, and eventually retired; each operation consumes resources and can alter behavior. The objective is to identify when the informational gain from a record justifies these burdens. The section therefore develops a proportionality criterion that constrains institutional demands for documentation.

Trajectory-based credibility can therefore create a recursive pressure. Once historical traces acquire evidential value, actors gain incentives to preserve more of their activities in forms that can later be inspected. Institutions may likewise request increasingly detailed documentation because richer records appear to reduce uncertainty. Yet the resulting evidential gain can be accompanied by new costs. Public-administration research on administrative burden has shown that compliance systems can impose learning, compliance, and psychological costs on the people who must navigate them (Herd and Moynihan 2018). The present concept is broader than administrative burden; the neighboring literature nevertheless makes visible a general point: evidential and procedural requirements distribute costs as well as information.

Definition 15.1 (Record burden)**.** For an actor or organization a, a target inference q, and an institutional context I, *record burden* is the target-relative bundle of costs generated by producing, preserving, maintaining, disclosing, interpreting, verifying, contesting, and retiring records that are expected to support credibility judgments.

The definition emphasizes a bundle because record burden is rarely reducible to storage cost. A technically inexpensive archive can still require substantial labor to make its entries intelligible, correct errors, protect sensitive material, respond to verification requests, and establish which parts remain relevant. Conversely, a compact record can carry high disclosure cost if it exposes intimate or strategically sensitive information. The burden therefore belongs to the surrounding evidential practice rather than to the file size of the archive.

15.1 Burden Profile

A burden profile separates capture, maintenance, disclosure, verification, contestation, and retirement costs. Two evidential systems can impose similar total time costs while placing those costs in very different locations. One may automate capture while making correction difficult; another may retain little data while requiring repeated live verification; a third may transfer most costs to an institution that performs attestation. The distribution among components matters because each creates different failure modes and inequalities.

Table 8 shows why the record problem is structurally different from a simple request for transparency. Every operation that makes a trajectory more portable can also reshape the trajectory or redistribute

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Table 8: Illustrative components of record burden in trajectory-based credibility.

Record operation	Primary burden	Credibility contribution	Potential distortion
Capture	attention, time, instrumentation	preserves events before later evaluation	activity may be reorganized around recordability
Preservation	storage, curation, migration	maintains temporal continuity	obsolete or sensitive traces can persist beyond usefulness
Disclosure	privacy, strategic exposure	makes selected history available to recipients	actors with greater privacy resources can disclose more selectively
Verification	institutional labor, technical checking	tests integrity, origin, or scope	verification requirements can privilege standardized traces
Contestation	expertise, time, procedural access	permits correction and contextualization	errors can harden when challenge mechanisms are costly
Retirement	review, deletion, archival judgment	limits indefinite evidential carryover	premature deletion can remove legitimate historical context

control over its interpretation. Information infrastructures are never neutral containers of social history: classification and standardization choices make some distinctions easier to preserve and others harder to express (Bowker and Star 1999). A trajectory system therefore selects a recordable world at the same time that it records one.

15.2 Capture Friction

Capture friction concerns the cost imposed at the moment an event is converted into a durable trace. The burden can be minimal when evidence is generated as a by-product of ordinary activity, such as a versioned repository that already records revisions. It can be substantial when actors must interrupt work to explain, categorize, timestamp, annotate, or certify what they are doing. The evidential value of a record can therefore depend on a process that competes with the activity being evaluated.

This competition matters especially for generative and exploratory work. Early inquiry often contains provisional language, abandoned paths, weakly articulated intuitions, and local experiments whose future importance is unknown. Requiring each event to become immediately legible for later evaluators can shift attention from exploration toward anticipatory explanation. The resulting archive may become cleaner while the underlying process becomes less spontaneous. Record design therefore changes the field in which evidence is generated.

The audit literature provides a neighboring institutional example. Power's account of the expansion of auditing emphasizes that verification practices can encourage organizations to construct forms of activity that are auditable, thereby changing what is performed and documented (Power 1997). The trajectory framework faces a comparable risk at smaller scales. A requirement intended to reveal a process can gradually produce a process optimized for being revealable.

Remark 15.2 (Capture neutrality)**.** Low-friction capture does not imply neutral capture. Automation can reduce the visible labor of documentation while expanding the volume, granularity, or persistence of what becomes available for later evaluation.

The relevant design question is therefore selective capture. Events that materially constrain a target inference can justify preservation even when many neighboring events remain unrecorded. This

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target-relative approach retains the analytical value of trajectory evidence while resisting the idea that completeness is the natural standard of credibility.

15.3 Reactive Documentation

Records can alter conduct because actors anticipate how those records will later be read. Espeland and Sauder describe *reactivity* as the process through which people and organizations change behavior in response to being evaluated or measured (Espeland and Sauder 2007). Trajectory-sensitive credibility can create a similar mechanism even when it does not employ a numerical ranking. Once revision histories, response times, collaboration traces, or documentation patterns become salient credibility cues, actors can begin optimizing the cues themselves.

This does not make the resulting evidence worthless. Strategic adaptation is already present in credentials, portfolios, recommendations, reviews, and branded reputations. The more precise implication is that evidential interpretation must account for the social life of the recording rule. A trace generated before it carried evaluative value can differ epistemically from a trace produced after actors learn that it is being inspected. The distinction parallels historical resistance from Section 6: pre-evaluative traces can constrain retrospective fabrication, while stabilized evaluation regimes can create new forward-looking incentives.

Reactive documentation also increases the cost of remaining illegible. Actors who choose to preserve privacy, maintain informal work practices, or avoid persistent digital traces can appear to possess thinner trajectories even when their underlying competence or reliability is comparable. The burden is therefore partly anticipatory. An actor may document today because of uncertainty about what an institution could demand tomorrow.

Definition 15.3 (Anticipatory record burden)**.** *Anticipatory record burden* is the present cost generated by uncertainty about future evidential demands, including precautionary preservation, self-monitoring, and the maintenance of records whose later relevance is unknown.

This burden can expand sharply when institutions do not declare target inferences in advance. Target declaration from Section 11 therefore serves a second function: it limits the range of historical material actors have reason to preserve defensively.

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15.4 Preservation Horizon

A trajectory acquires historical resistance partly through persistence, yet indefinite persistence creates its own distortions. Digital systems can make retention cheap enough that forgetting ceases to occur by default. Mayer-Schönberger's analysis of digital memory emphasizes the social consequences of a shift from costly remembering toward comparatively effortless retention (Mayer-Schönberger 2009). Trajectory-based credibility intensifies this tension because older traces can remain evidentially attractive precisely when they have become contextually distant.

A *preservation horizon* specifies the temporal interval during which a record remains presumptively relevant to a defined target inference. The horizon can differ across record types and domains. A recent supervised task may be highly informative about current operational competence, while a much older artifact can remain important for authorship history or institutional continuity. The concept therefore concerns evidential relevance rather than a universal expiration date.

Preservation horizons also support role transition. Individuals move between educational, professional, civic, and personal contexts. Carrying every earlier trace into each new evaluative setting can make identity excessively path-dependent. Selective retirement allows a trajectory to retain history without freezing the actor into its most legible past state. This is especially important when the framework later addresses trajectory inequality: groups with more institutional exposure can accumulate both more recognized achievements and more durable negative records.

Proposition 15.4 (Temporal boundedness)**.** *Where a record's expected contribution to a target inference declines with contextual distance while its privacy, interpretation, or maintenance burden persists, trajectory-based credibility gains from explicit review of continued retention rather than automatic indefinite carryover.*

Temporal boundedness does not require destruction of every retired record. Some materials can move from active evaluative use into archival status, with different access conditions and interpretive expectations. The distinction between active evidence and historical archive reduces pressure to make all preserved history continuously actionable.

15.5 Contestation Capacity

Record burden includes the capacity required to correct, contextualize, or challenge a trace after it has entered an evidential system. An inaccurate timestamp, mistaken identity link, incomplete role attribution, or misleading summary can propagate across later decisions if recipients treat the record as self-authenticating. Historical resistance can then work in the wrong direction: once an error becomes distributed across independent systems, its persistence can mimic the appearance of strong anchoring.

Contestability therefore requires more than a formal right to object. Effective challenge can require access to the disputed record, knowledge of how it was interpreted, procedural time, supporting evidence, and an authority capable of revising downstream representations. These requirements resemble the wider insight from administrative-burden research that procedural access is shaped by learning and compliance costs as well as formal eligibility (Herd and Moynihan 2018). In trajectory systems, the ability to carry evidence must be accompanied by the ability to carry context.

A burden-sensitive system should therefore treat contestation capacity as part of evidential quality. Records that are highly portable but difficult to correct can create stronger path dependence than records that are locally rich but procedurally revisable. The credibility of an infrastructure partly depends on whether its historical claims can themselves acquire histories of correction.

Working Claim 15.5 (Correction trace)**.** When a consequential record is revised, the correction process can itself become a bounded trajectory event that preserves the fact of revision without requiring the superseded interpretation to remain equally actionable.

The claim permits two objectives to coexist. Institutions can preserve auditability of change while reducing the practical force of an outdated or mistaken representation. This is more compatible with trajectory-based credibility than treating a database entry as a timeless statement about the actor.

15.6 Burden Proportionality

The preceding analysis suggests that record requirements should be calibrated to the inferential value they are expected to provide. Let E denote a selected evidential subset of a trajectory, let $D_q(E)$ denote its diagnostic adequacy for target inference q, and let $B_I(E)$ denote the burden imposed by making that subset usable in institutional context I. A burden-sensitive selection problem is stated in Equation 17.

$$E^* \in \operatorname*{argmin}_{E \subseteq \mathcal{T}} B_I(E) \qquad \text{subject to} \qquad D_q(E) \geq \tau_q. \tag{17}$$

Equation 17 does not prescribe a calculable universal metric. It formalizes the ordering principle already developed through credibility depth: evidence should become deeper until it is sufficient for the target inference, while additional exposure requires additional justification. The burden term can itself remain multidimensional when privacy, time, institutional labor, and contestation costs cannot be responsibly collapsed into one number.

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Research Obligation 15.6 (Record proportionality)**.** A trajectory-sensitive credibility practice should preserve and request the least burdensome evidential structure that remains adequate for the declared target inference, with deeper exposure justified by corresponding increases in consequence, uncertainty, dependence, or verification need.

This obligation also limits the conversion of trajectory evidence into continuous behavioral telemetry. More data can sometimes improve discrimination, yet indiscriminate accumulation can increase reactive behavior, inequality, privacy loss, interpretive burden, and strategic gaming. The relevant objective is *evidential sufficiency with bounded historical exposure*.

The distribution of these burdens is uneven. Some actors possess institutions that capture, curate, translate, and attest their histories on their behalf. Others perform the documentary labor themselves, often across incompatible platforms or jurisdictions. Access to privacy-enhancing intermediaries, legal correction, or professional portfolio construction is also uneven. Record burden therefore links directly to trajectory inequality: the credibility value of a history depends partly on whether an actor can produce a trajectory that institutions know how to recognize.

16 Trajectory Inequality

This section examines inequality in the production of legible trajectories. Actors can possess comparable target-relevant capacities while differing sharply in access to opportunities, recognized witnesses, archival infrastructure, translation support, and correction mechanisms. *Trajectory inequality* names this gap between substantive capacity and institutionally usable evidence. The analysis focuses on how cumulative recognition can widen that gap and on the need for plural routes to evidential adequacy.

The previous sections have treated trajectory evidence as a possible response to weakened surface diagnosticity. That response creates a new distributional question. Histories are generated under unequal conditions. Some actors work inside institutions that automatically timestamp, archive, attest, and translate their activities. Others develop comparable capacities through informal, fragmented, cross-organizational, or weakly documented settings. The resulting difference concerns more than the amount of history available. It concerns whether a history enters forms that a later recipient can recognize, verify, and use.

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Definition 16.1 (Trajectory inequality)**.** *Trajectory inequality* is systematic variation in the capacity of actors or groups to generate, preserve, attest, translate, transport, and contest target-relevant historical evidence under the interpretive rules of a receiving institution.

The definition treats trajectory inequality as relational. A history can be rich in one setting and weakly legible in another. A community-based project, family enterprise, independent research program, open-source contribution, or cross-border career can contain substantial evidence of judgment and persistence while fitting poorly into the categories used by a particular evaluator. Conversely, institutional membership can make selected events highly portable because recognized organizations already supply names, dates, roles, references, and standardized records.

16.1 Legibility Gap

Let $E_{I,q}(a)$ denote the evidence about actor a that institution I can access and interpret for target inference q. Section 15 introduced $D_q(E)$ as the diagnostic adequacy of an evidential subset for a declared target. For two actors a and b, the institution-relative legibility gap is defined in Equation 18.

$$\Lambda_{I,q}(a,b) = D_q(E_{I,q}(a)) - D_q(E_{I,q}(b))\,. \tag{18}$$

Equation 18 becomes distributionally significant when a and b are sufficiently similar with respect to the target property while their accessible evidential bases differ for reasons generated by institutional

position, documentary infrastructure, network access, or translation capacity. The equation therefore does not rank persons. It isolates a property of the evidential environment through which persons become knowable to a particular recipient.

This distinction matters because an institution can observe a legibility difference and misinterpret it as a capacity difference. A dense archive can appear to indicate a richer history even when it mainly indicates superior infrastructure. A recognizable recommender can add evidential force because the recipient already knows how to interpret the recommender's institutional position. An unfamiliar but careful attestation can carry less weight because the receiving system lacks an established interpretive bridge.

Working Claim 16.2 (Legibility-capacity separation)**.** Trajectory-sensitive evaluation gains analytical precision when the strength of a recorded history is separated from the target-relevant capacity the history is intended to evidence.

The claim is modest. Evidence remains necessary for evaluation under uncertainty. The point is that evidential richness has its own production conditions, and those conditions can vary independently from the property under evaluation.

16.2 Opportunity Structure

Trajectory formation begins before recording. Actors differ in access to events that later carry credibility value. Prestigious projects, supervised placements, repeated client contact, recognized competitions, funded research, leadership roles, formal publication channels, and high-consequence assignments all generate events whose later evidential value can be substantial. Access to these events is already structured by prior education, employment, geography, networks, language, financial resources, institutional membership, and accumulated recognition.

Research on cumulative advantage provides a neighboring account of how favorable relative positions can become resources for later gains across careers and life-course processes (DiPrete and Eirich 2006). The trajectory framework adds an evidential dimension to this mechanism. Earlier access produces later events; later events produce attestable history; attestable history supports further access. The cycle can therefore operate through the generation of legible evidence as well as through material reward.

An opportunity structure also shapes the kinds of uncertainty an actor is allowed to encounter publicly. Some institutional environments provide low-cost opportunities to fail, revise, and try again while preserving the resulting development as evidence of learning. Other environments expose actors mainly to high-stakes evaluation, making experimentation costly. Trajectory depth can therefore depend on whether an actor had access to settings in which meaningful development could occur and remain documentable.

16.3 Institutional Sponsorship

Institutions can multiply trajectory legibility by supplying durable identifiers, standardized roles, recognized supervisors, archival systems, credentialing procedures, and audiences that already understand the local categories. These functions amount to a form of evidential sponsorship. The institution does not create every underlying capacity, yet it can make selected capacities easier for outsiders to infer.

The mechanism overlaps with social-capital theory, in which resources embedded in social relations can be accessed and mobilized for purposive action (Lin 2001). In trajectory-sensitive credibility, relational resources also affect whether a history receives recognized witnesses, interpretable endorsements, and entry into networks through which later recipients can validate it. A reference from a known institution can therefore carry two layers simultaneously: information about the actor and information supplied by the standing of the attesting network.

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Table 9: Sites of trajectory inequality in credibility formation.

Site	Credibility function	Unequal resource	Possible distortion
Opportunity	Generates consequential events	Access to projects, supervision, responsibility, experimentation	Sparse history interpreted as sparse capacity
Capture	Preserves events over time	Archival tools, stable accounts, administrative support	Documentary density interpreted as developmental depth
Attestation	Connects events to recognized witnesses	Network position, institutional standing, repeated observers	Familiar witnesses receive disproportionate evidential weight
Translation	Makes local history intelligible elsewhere	Standard categories, professional editing, institutional interfaces	Unfamiliar trajectories become difficult to compare
Portability	Carries evidence across settings	Interoperable records, language, jurisdictional continuity	Mobile actors lose context during transfer
Contestation	Corrects or contextualizes records	Time, expertise, procedural access, advocacy resources	Errors persist unevenly across actors

This creates an important asymmetry. Institutional sponsorship can reduce verification cost for recipients, which explains part of its persistent practical value. The same reduction in cost can concentrate recognition around already familiar institutions. Evidence that travels easily is used more often; repeated use further stabilizes the categories through which that evidence is interpreted.

Table 9 separates several sites that can otherwise collapse into a single impression of "strong" or "weak" trajectory evidence. The distinction is useful because interventions at one site can leave another unchanged. Better archival portability can preserve more records while leaving opportunity access unequal. More standardized attestations can lower interpretation cost while narrowing the range of experiences that receive institutional recognition.

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16.4 Cumulative Recognition

Trajectory inequality can become self-reinforcing when recognized history improves access to later credibility-bearing events. DiPrete and Eirich describe cumulative advantage as a family of mechanisms in which relative advantage can generate further gains over time (DiPrete and Eirich 2006). A trajectory-sensitive setting can add a specific pathway: recognized evidence becomes a resource for producing additional recognized evidence.

Consider two early-career actors with comparable target-relevant ability. One receives a role inside a well-known institution and accumulates documented projects, recognized supervisors, external-facing responsibilities, and portable references. The other performs substantial work across short contracts, informal collaborations, or independent settings. After several cycles, the evidential difference can become larger than the initial capacity difference because each later evaluator sees a history partly shaped by earlier evaluators.

This process can also operate inside markets and professions. Section 13 showed how work samples and references become portable professional evidence, while Section 14 described reputation infrastructure in market exchange. Once recognized past transactions or affiliations influence future access, credibility itself becomes one mechanism through which advantage can accumulate.

Proposition 16.3 (Recognition accumulation)**.** *When access to future credibility-bearing events depends partly on previously recognized trajectory evidence, differences in institutional legibility can compound across time even when initial target-relevant differences are modest.*

The proposition does not imply inevitable divergence. Countervailing institutions, open-entry opportunities, portable work samples, independent verification, and plural routes to recognition can weaken cumulative effects. The relevant analytical task is to identify when prior legibility functions as an input into later opportunity.

16.5 Translation Friction

Trajectory evidence is often produced locally and interpreted elsewhere. Translation friction arises when the categories used to describe one history do not map cleanly onto the categories of the receiving environment. Bowker and Star's analysis of classification emphasizes that categories and standards are embedded in infrastructures that shape what becomes visible and actionable (Bowker and Star 1999). Trajectory systems inherit this problem because every portable history requires some classification of roles, events, institutions, and outcomes.

Cross-organizational and cross-border trajectories make the issue especially visible. Job titles can differ in scope across institutions. Educational stages can have different meanings across jurisdictions. Informal responsibility can exceed formal rank. Independent work can contain substantial technical or intellectual depth while lacking a familiar organizational label. Translation therefore requires more than literal language conversion; it requires an interpretive bridge between local structures of recognition.

Translation friction can generate asymmetric compression. Familiar histories are compressed efficiently because recipients already share the categories required to interpret them. Unfamiliar histories require explanation, contextual evidence, and sometimes third-party validation. The actor with the less familiar trajectory therefore pays a higher bandwidth cost simply to reach the same starting point of evaluation.

Remark 16.4 (Asymmetric compression)**.** Institutional familiarity can reduce the amount of explanation required to make a trajectory portable. This efficiency can be socially useful while simultaneously producing unequal translation burdens across differently situated actors.

The remark preserves a central theme of this paper: portability is valuable, yet the infrastructure that creates portability can distribute recognition unevenly.

16.6 Documentary Labor

Section 15 treated recording as a multidimensional cost. Trajectory inequality adds the question of who performs that labor. In some settings, institutions capture events automatically through learning-management systems, publication records, payroll systems, project repositories, supervised assessments, or customer histories. In other settings, the actor must reconstruct the evidence manually.

This difference changes the effective cost of credibility. A person supported by institutional infrastructure can accumulate a dense trajectory as a by-product of ordinary participation. An independent actor may need to preserve correspondence, maintain repositories, secure attestations, explain role boundaries, translate documents, and assemble context specifically for later evaluation. The same evidential depth therefore can require very different amounts of invisible labor.

Administrative-burden research is useful here because formal access can coexist with unequal learning, compliance, and procedural costs (Herd and Moynihan 2018). Trajectory-sensitive systems can reproduce a similar pattern when the formal invitation to "show your history" presumes documentary resources that are unevenly distributed.

Documentary labor also interacts with privacy. Actors with strong institutional sponsorship can sometimes rely on trusted intermediaries that disclose only selected attestations. Actors without such intermediaries may face pressure to expose raw records directly. Inequality can therefore appear as a difference in how much personal history must be surrendered to achieve comparable credibility.

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16.7 Asymmetric Contestability

Unequal trajectory production is only one side of the problem. Actors also differ in their capacity to challenge the histories attributed to them. Section 15 introduced contestation capacity as part of evidential quality. Here the distributional implication becomes central: an error, omitted context, or misleading classification has different practical consequences depending on whether the actor can access the record, understand the procedure, produce counterevidence, and reach an authority capable of correction.

This is particularly important when records become portable. A local misclassification can travel into later decisions, while the contextual knowledge required to correct it remains local. The actor then encounters a reversal of the ordinary portability advantage: the negative representation moves more easily than the explanation needed to revise it.

Institutions can also differ in how they treat gaps. One evaluator may interpret missing evidence conservatively as uncertainty; another may interpret the same absence as negative evidence. The second practice increases trajectory inequality because weak documentary access becomes substantively punitive.

Working Claim 16.5 (Gap neutrality)**.** Where an institution lacks sufficient trajectory evidence for a target inference, evidential absence should remain analytically distinguishable from evidence of low target-relevant capacity.

Gap neutrality does not require institutions to ignore uncertainty. It requires uncertainty to remain represented as uncertainty rather than being silently converted into a substantive judgment.

16.8 Recognition Plurality

Trajectory-sensitive credibility becomes more equitable when several materially different histories can support the same target inference. Section 13 introduced plural evidential access for professional evaluation. The principle can be generalized. A target such as technical competence, reliable delivery, pedagogical growth, or accountable judgment can sometimes be evidenced through multiple event structures rather than one canonical pathway.

This principle also limits categorical lock-in. Tilly's account of durable inequality emphasizes organizational processes through which categorical distinctions can become linked to unequal access to valued resources (Tilly 1999). A trajectory system can intensify such closure if one institutional pathway becomes the default model of a credible history. Recognition plurality creates room for equivalence across heterogeneous trajectories while preserving target-specific standards.

Research Obligation 16.6 (Plural recognition)**.** A trajectory-sensitive institution should permit materially heterogeneous evidential pathways to satisfy a target inference when those pathways provide comparable diagnostic adequacy, historical resistance, and agency legibility for the decision at hand.

Plural recognition differs from lowering evidential standards. It changes the mapping between history and recognized evidence. The standard remains tied to the target inference, while the routes through which adequate evidence can be assembled remain open to more than one institutional biography.

The section's broader implication is that trajectory evidence can redistribute credibility without automatically redistributing the capacity to become credible. Once trajectories acquire recognized value, actors and institutions will begin responding strategically to the new evidential environment. Some will invest in better documentation, staged histories, optimized attestations, and infrastructures designed to manufacture the appearance of temporal depth. Section 17 therefore turns from unequal access to the strategic transformation of trajectory evidence itself.

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17 Strategic Adaptation

This section endogenizes the evidential environment. Once actors know that histories, attestations, revisions, or consequence-bearing events influence later evaluation, they can adapt both conduct and documentation. Such adaptation can improve underlying practice, improve legibility while leaving the target property largely unchanged, or optimize the proxy itself. The analysis distinguishes these possibilities and explains why trajectory-based credibility remains historically provisional: successful trajectory systems can become new symbolic infrastructures subject to strategic optimization and later recalibration.

Strategic adaptation is already familiar in symbolic environments. Credentials affect educational choices, rankings affect organizational priorities, reputation systems affect seller behavior, and audit regimes affect what organizations prepare to make visible. Spence's signaling framework makes clear that actors can rationally invest in observable signals when receivers use those signals to infer otherwise hidden properties (Spence 1973). Espeland and Sauder likewise show that evaluative measures can become reactive when organizations alter behavior in response to the measures used to compare them (Espeland and Sauder 2007). Trajectory-sensitive credibility introduces the same reflexivity at a richer temporal scale. The object of optimization can become the history itself, or more precisely the portion of history expected to remain visible to later evaluators.

Definition 17.1 (Strategic trajectory adaptation)**.** *Strategic trajectory adaptation* is a change in conduct, documentation, interaction, or evidential presentation that occurs partly because an actor anticipates how a future recipient or institution will interpret the resulting trajectory.

The definition is intentionally neutral. Anticipating later evaluation can improve practice. A researcher may preserve clearer version histories, a professional may document responsibility boundaries, a seller may create better repair records, and an institution may design more reliable attestation procedures. These responses can increase both underlying quality and evidential legibility. Strategic adaptation becomes analytically difficult because the same evaluative rule can also reward changes that primarily improve observability, comparability, or apparent depth.

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17.1 Evaluative Reactivity

Trajectory evidence changes the environment in which trajectories are produced. Before a particular trace becomes evaluatively salient, it can arise as a by-product of ordinary activity. After institutions begin requesting that trace, actors may produce it more deliberately. The evidential meaning of the trace can therefore change even when its visible form remains stable.

This is especially important for historical resistance. Section 6 emphasized that records deposited before a later evaluative target is known can constrain retrospective reconstruction. Strategic adaptation introduces a forward-looking counterpart. Once the evaluative rule is known in advance, actors can seed histories prospectively. A six-month sequence of traces can still be temporally genuine while having been generated from the beginning for a known future audience.

Temporal extension therefore cannot serve as an automatic proxy for independence from strategic construction. Time raises the cost of some forms of retrospective fabrication, yet anticipation allows strategic behavior to move earlier in the trajectory. Historical resistance remains valuable, but its interpretation must include the history of the evaluation regime itself.

Remark 17.2 (Evaluation-aware history)**.** A temporally extended record can be historically real while remaining strongly shaped by anticipated evaluation. Temporal depth and evaluative independence are therefore distinct properties.

The remark matters because trajectory systems can otherwise reproduce a familiar mistake from surface-based credibility: treating a visible feature as if its production conditions were fixed. Once a credibility practice stabilizes, its own criteria become part of the generative conditions of later evidence.

17.2 Legibility Investment

A first form of strategic adaptation is *legibility investment*: actors devote resources to making an existing target-relevant history easier to inspect, verify, translate, or contest. This can include maintaining repositories, requesting bounded attestations, preserving consequence-bearing events, clarifying role assignments, or converting local records into portable formats.

Legibility investment can be socially productive. Section 16 showed that unfamiliar or institutionally unsupported histories often incur higher translation friction. Better documentation can reduce that friction without changing the underlying capacity being inferred. In such cases the adaptation improves the evidential interface rather than manufacturing a new target property.

The distinction is important for fairness. Treating every act of self-presentation as suspicious would disadvantage actors who must perform documentary labor precisely because institutions do not already recognize their histories. An independent professional assembling verifiable project records can be responding to an infrastructural deficit rather than attempting to simulate competence. The relevant question is whether the improved legibility preserves a defensible relation to the target inference.

Definition 17.3 (Legibility investment)**.** *Legibility investment* is strategic adaptation that primarily increases the accessibility, interpretability, verifiability, or portability of target-relevant evidence while preserving the underlying historical events to which the evidence refers.

Legibility investment therefore belongs inside the trajectory framework rather than outside it. Trajectories do not become credible merely because they are difficult to fake; they must also become interpretable at tolerable relational bandwidth. Strategic effort can legitimately be directed toward that translation problem.

17.3 Trajectory Gaming

A second form of adaptation targets the evidential rule more directly. An actor can learn which traces, sequences, witnesses, or interaction patterns receive positive interpretation and then reorganize conduct to generate those observables. The resulting trajectory may satisfy the visible criteria while providing less information about the property that originally motivated the criteria.

This section uses *trajectory gaming* for that narrower case. The term does not require fraud. It includes lawful and transparent behavior whenever the optimization target becomes the evaluative proxy rather than the underlying target inference.

Definition 17.4 (Trajectory gaming)**.** *Trajectory gaming* occurs when strategic adaptation increases the apparent evidential strength of a trajectory for target inference q substantially more than it changes the target-relevant history that originally justified the evidential rule.

The distinction can be illustrated across domains. In education, repeated revision can indicate learning, yet a workflow can also be arranged to generate visible revisions without corresponding conceptual development. In professional evaluation, a portfolio can contain many documented projects while substantive responsibility remains narrow. In markets, a seller can optimize review solicitation or platform-visible responsiveness without improving the underlying product. Luca and Zervas's study of review fraud shows one stronger form of strategic response inside reputation systems, where incentives can affect the production of evaluative information itself (Luca and Zervas 2016).

Trajectory gaming is therefore a relation between an evaluation rule and an adaptive environment. A trace can be informative under one regime and lose diagnostic value after actors learn how strongly it affects later decisions. This does not imply that the trace should be discarded. Its weight may need to be recalibrated, supplemented, or interpreted through additional relations.

Table 10 separates adaptation modes that can otherwise be collapsed into a generic category of gaming. The distinction matters because institutional responses differ. Substantive development should

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Table 10: Illustrative modes of strategic adaptation in trajectory-sensitive credibility.

Adaptation mode	Primary change	Possible credibility contribution	Possible distortion
Substantive development	target-relevant conduct or capacity	underlying property becomes stronger	improvement may remain difficult to observe
Legibility investment	documentation, translation, portability	existing history becomes easier to evaluate	resource-rich actors can gain larger visibility advantages
Historical seeding	early creation of evaluation-relevant traces	later history becomes temporally extended	duration can be engineered around known criteria
Attestation strategy	selection or cultivation of recognized witnesses	observation can become more portable	witness structure can become optimized for prestige
Process optimization	workflow shaped around observable criteria	procedures can become more consistent	proxy performance can displace target-relevant work
Representation engineering	curation of the portable trajectory surface	recipients face lower interpretation cost	omitted context can make the trajectory appear more coherent than it was

ordinarily be encouraged. Legibility investment may require access support. Historical seeding calls for attention to evaluation-aware production. Attestation strategy raises questions about witness independence. Representation engineering requires scope and omission to remain legible.

17.4 Manufactured Historical Depth

Trajectory-based credibility gives temporal structure evidential value. That value can create incentives to manufacture the appearance of depth. The simplest form is historical seeding: actors begin producing traces long before a known evaluation so that the eventual record appears temporally extended. A more elaborate form distributes traces across repositories, collaborators, or institutions to create multiple anchors.

These practices reveal an important limit of historical resistance. Distributed and pre-outcome records can reduce the feasible space of retrospective reconstruction, but they cannot eliminate strategic foresight. An actor who knows the target years in advance can produce a long, internally coherent history designed around that target. The historical record remains real; what changes is the inference that can safely be drawn from its existence.

This problem resembles the general reactivity of audit regimes. Power argues that audit practices can induce organizations to develop auditable performances and structures (Power 1997). Trajectory systems can similarly generate *trajectory-ready conduct*: projects, communications, revisions, and interactions organized partly for future evidential extraction.

The response is not to prefer undocumented activity. A history that leaves no trace can be impossible to evaluate across distance. The more defensible implication is that credibility should rely on several kinds of constraint. Temporal depth can be combined with consequence-bearing events, heterogeneous witnesses, role-specific agency traces, selective co-experience, and uncertainty about which future events will become informative. No single structural feature should become a universal credential.

17.5 Attestation Strategy

Section 11 treated bounded attestation as a mechanism for making local observation portable. Strategic adaptation adds a new layer: once attestations carry value, actors have incentives to cultivate observers

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whose testimony will later receive greater weight.

This process can improve matching. An actor may rationally seek mentors, supervisors, certifiers, or collaborators capable of observing target-relevant work. The same mechanism can also deepen trajectory inequality because recognized witnesses are themselves scarce resources. Section 16 showed that institutional sponsorship can multiply later opportunities for recognized evidence. Attestation strategy can turn that sponsorship into an explicit object of investment.

The credibility of an attestation therefore depends partly on the relation between observer, actor, event, and evaluative target. Prestige can help recipients economize on interpretation, yet prestige is not equivalent to observational proximity. A famous endorser with little direct access to the relevant events can provide weaker target-specific evidence than a less prestigious collaborator who repeatedly witnessed the work.

Working Claim 17.5 (Witness relevance)**.** The evidential weight of an attestation should remain sensitive to the witness's access to target-relevant events and role relations, even when the witness's institutional standing affects portability.

The claim separates two functions that institutions often combine: recognized status makes testimony easier to circulate, while observational access makes the testimony informative about the target. Strategic adaptation becomes less distorting when these functions remain analytically distinguishable.

17.6 Institutional Recalibration

Strategic adaptation makes credibility governance recursive. Institutions specify evidential practices; actors learn those practices; trajectories change; the diagnosticity of the evidence can then change; institutions respond again. A stable credibility system is therefore better understood as a temporarily stabilized interaction between evaluators and evaluated actors than as a fixed technical solution.

Recalibration can take several forms. An institution can reduce the weight placed on a highly optimized trace, request complementary evidence, vary evaluation tasks, introduce bounded direct interaction, or redesign the target declaration. It can also alter which parts of the evidential rule remain predictable. Complete opacity would undermine procedural fairness, while complete predictability can intensify proxy optimization. The design problem therefore concerns the degree and type of rule transparency rather than a simple choice between secrecy and disclosure.

Institutions also face a timing problem. Rapid rule changes can impose new record burdens and disadvantage actors who prepared under earlier standards. Slow adaptation can leave known distortions in place. Historical governance therefore requires versioning of evaluative regimes as well as versioning of records. A trajectory should ideally be interpreted in relation to the rules and institutional expectations under which its events were generated.

Proposition 17.6 (Recursive calibration)**.** *When trajectory evidence becomes consequential and actors can anticipate its interpretation, the diagnostic value of that evidence becomes partly endogenous to the evaluation regime. Credibility practices therefore require periodic recalibration against the behaviors they induce.*

Recursive calibration preserves the paper's historical orientation. A credibility architecture can work well for a period and later become less discriminating because the surrounding population has learned to produce its preferred evidence more efficiently.

17.7 Second-Order Symbol Inflation

Trajectory-based credibility begins as a response to reduced diagnosticity of isolated symbolic surfaces. Yet institutional translation necessarily produces portable representations of trajectories: verified portfolios, longitudinal summaries, badges, structured references, provenance reports, credibility profiles,

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or other compressed interfaces. These representations can themselves become socially consequential symbols.

Once they become valuable, markets and organizations can standardize, proliferate, and strategically optimize them. A rich trajectory can then be compressed into a familiar emblem of having a rich trajectory. The original framework has returned to the problem identified in Paper 2: recipients encounter a portable surface and infer a larger history from it.

This is a form of second-order symbol inflation. The point is not that trajectory systems inevitably fail. It is that successful evidential innovations can become symbolic infrastructures, and symbolic infrastructures can later become targets of strategic production. The same historical cycle can therefore recur at a different layer.

Remark 17.7 (Recursive symbolism)**.** A credibility practice that successfully makes histories portable can eventually create new symbolic surfaces whose diagnosticity depends on the institutions, costs, and strategic practices surrounding their production.

The remark prevents the paper from treating trajectory evidence as an endpoint. Trajectory-based credibility is a direction of adaptation under present conditions of symbol inflation, while its future forms remain subject to the same historical dynamics of compression, institutionalization, strategic response, and reinterpretation.

17.8 Adaptive Openness

The framework therefore requires adaptive openness rather than a universal final protocol. Institutions need sufficient stability for actors to understand evidential expectations, sufficient plurality for heterogeneous trajectories to remain recognizable, and sufficient revisability for criteria to respond when their diagnostic meaning changes.

Adaptive openness also protects generative activity. A system that specifies every valued trace in advance can channel actors toward already-recognized forms of credibility. It may become efficient at producing legible histories while reducing the space in which unplanned questions, anomalous encounters, unconventional collaborations, or exploratory failures can acquire significance. Strategic adaptation can thereby narrow the very field from which future valuable trajectories emerge.

This tension gives retrospective significance a distinctive epistemic role. When credibility practices reward histories that can be anticipated, documented, and translated in advance, encounters, deviations, and emerging questions whose value becomes visible only later can be systematically undervalued. The contingency analysis therefore examines how such events enter an inquiry trajectory after their significance has developed.

18 Contingency in Inquiry

This section limits excessive anticipation within the trajectory framework. Some events acquire importance only after later questions, anomalies, or interpretive structures make their significance visible. *Contingency* is therefore treated as target-relative under-specification rather than randomness. The analysis develops retrospective activation and asks how institutions can preserve enough historical openness for unexpected significance to remain recoverable under bounded documentation.

A trajectory can remain coherent while retaining substantial unplanned development. Research, learning, professional practice, and collaborative work frequently contain events whose later relevance was not specified at the time they occurred. A conversation can redirect a research problem. A failed experiment can expose an assumption. A discrepancy in a routine workflow can later become evidence of a structural defect. A visual pattern encountered outside the original search space can reorganize a conceptual vocabulary. The importance of such events lies neither in their unpredictability alone nor in

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a romantic appeal to luck. Their importance lies in the relation between an initially underdetermined event and a later trajectory that makes the event newly interpretable.

This perspective belongs to a long intellectual history. Dewey's account of inquiry begins from the transformation of an indeterminate situation rather than from the mechanical execution of a fully specified answer procedure (Dewey 1938). Hanson turned attention from completed systems toward patterns of discovery and the formation of theoretically meaningful observations (Hanson 1958). Kuhn's account of anomaly likewise emphasizes that an observation becomes consequential relative to an established field of expectation, while Merton and Barber document the changing meanings and scientific uses attached to serendipity (Kuhn 1962; Merton and Barber 2004). These traditions motivate a narrower claim here: trajectories can contain events whose target relevance emerges through later relations and therefore exceeds what was specified at the moment of occurrence.

Definition 18.1 (Contingent encounter)**.** A *contingent encounter* is an event or event cluster whose later contribution to an inquiry trajectory is materially greater than could be specified from the actor's operative target, evaluation rule, or search structure at the time of occurrence. Contingency therefore concerns target-relative under-specification rather than absence of causes or complete unpredictability.

The definition avoids equating contingency with randomness. An event can have a clear causal history and still be contingent relative to an inquiry because its later significance was not among the functions for which the surrounding activity was organized. Conversely, a random disturbance can remain epistemically irrelevant. What matters is the later relation between event, question, and trajectory.

18.1 Pre-Specified Relevance

Trajectory systems require selection because relational bandwidth and record burden are finite. Selection commonly begins from declared targets: an institution decides which properties matter, which evidence can bear on those properties, and which traces should be preserved. This target-sensitive structure is valuable because it limits indiscriminate collection. It also creates a boundary. Evidence whose value cannot yet be stated can be omitted precisely because the current framework lacks a category under which to preserve it.

The problem is especially visible in inquiry. A predefined evaluation can reward completion of an expected task, yet the most consequential development may be a deviation from that task. A student notices a contradiction that the rubric does not mention. A researcher encounters an unexpected regularity while testing another hypothesis. A professional realizes that a standard operating procedure is generating a recurrent edge case. If the evidential system recognizes only predeclared outputs, the trajectory can become highly legible with respect to compliance while remaining poorly legible with respect to discovery.

This does not justify preserving everything. Exhaustive preservation would reproduce the record-burden problem developed in Section 15. The relevant distinction is between *pre-specified relevance* and *prospective openness*. A credibility system can remain explicit about its present targets while preserving limited channels through which unanticipated events can later enter the evidential structure.

Working Claim 18.2 (Open relevance)**.** A trajectory-sensitive inquiry regime gains epistemic range when it permits some events to acquire target relevance after their occurrence, provided that later reinterpretation remains distinguishable from retrospective fabrication.

The qualification is essential. If any past event can be freely redescribed as important after success becomes visible, contingency becomes a narrative license. Historical resistance therefore remains necessary. The event should have a defensible temporal location, and the relations through which its later importance is claimed should remain inspectable enough to distinguish genuine retrospective activation from unrestricted storytelling.

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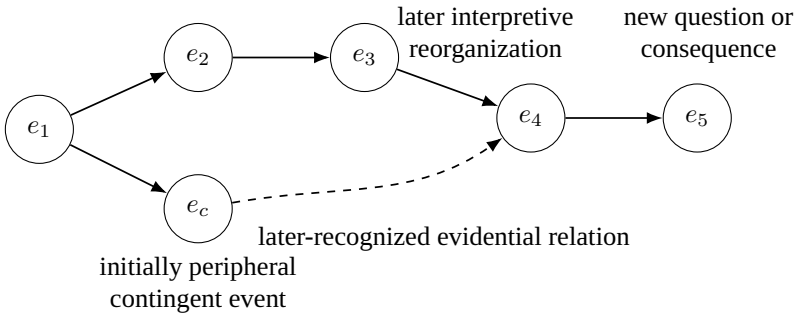

Figure 3: Retrospective activation in an event-poset trajectory. Event e_c is historically present before its later importance is known. Subsequent events create a target-relevant relation through which the earlier event acquires new evidential salience. The dashed edge indicates later-recognized relevance rather than a newly invented past event.

18.2 Retrospective Activation

The event-poset model from Section 5 provides a natural representation. Let $\mathcal{T}_\tau$ denote the portion of a trajectory available at an evaluation cut τ, and let $\sigma_q(v \mid \mathcal{T}_\tau)$ denote the target-relative salience of event v for inquiry target q under the relations visible by that cut. Retrospective activation occurs when the salience of an earlier event crosses a relevance threshold only after the trajectory has developed further. This condition is stated in Equation 19.

$$\sigma_q(v \mid \mathcal{T}_{\tau_0}) < \theta_q, \qquad \sigma_q(v \mid \mathcal{T}_{\tau_1}) \geq \theta_q, \qquad \tau_0 < \tau_1. \tag{19}$$

Equation 19 does not assume that salience is objectively measurable on a universal scale. It represents a structural change in interpretation. At τ_0, event v is preserved but peripheral to the active target. By τ_1, later events have created relations through which v becomes materially relevant. The informational contribution lies partly in the fact that the event existed before its later role was known.

Figure 3 distinguishes retrospective activation from retrospective insertion. The contingent event e_c already belongs to the historical structure. What changes is the relation through which later inquiry interprets it. This distinction is important for credibility because a polished final narrative can make discovery appear inevitable. A trajectory that preserves earlier low-salience events can reveal that the eventual path emerged through revision and reinterpretation rather than through a continuously foreknown plan.

Retrospective activation also clarifies why trajectory evidence can add information unavailable from final outputs. A completed paper, design, judgment, or product usually presents a stabilized structure. It rarely shows which earlier observations appeared irrelevant, which failed attempts became informative, or which relation was recognized only after another event occurred. The event-poset can preserve some of that asymmetry between historical occurrence and later understanding.

18.3 Question Formation

Contingency becomes especially important at the level of questions. A credibility system centered only on answer quality can overlook how an inquiry target itself emerged. Yet question formation can contain substantial evidence about attention, judgment, conceptual flexibility, and the capacity to recognize significance under incomplete specification.

Dewey's formulation of inquiry as the transformation of an indeterminate situation provides one neighboring model for this process (Dewey 1938). The initial situation need not arrive already partitioned into a clean question and a finite answer space. Distinctions become articulated through inquiry. In trajectory terms, the target q can itself be an emergent object produced through relations among earlier events.

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Let Q_τ denote the set of articulated inquiry targets available by evaluation cut τ. A new question q^* can enter the trajectory after several events have occurred. Earlier events can then become relevant to q^* even though they were generated under a different target structure. This produces a form of historical reuse that differs from simple archival retrieval. The past is not merely consulted for stored answers; its events are reorganized under a newly emergent problem.

Definition 18.3 (Question-forming trajectory)**.** A *question-forming trajectory* is a trajectory in which the set of operative inquiry targets changes through the relations among events, so that later questions alter the evidential relevance of earlier observations, actions, or encounters.

The definition connects contingency to credibility without making originality a prerequisite for trust. Many valuable forms of work involve faithful execution of well-specified tasks. The point is target-relative. Where a role or inquiry requires problem formulation, evidence about how questions emerged can be more diagnostic than the polished wording of the final question alone.

This distinction matters under symbol inflation because question-like symbolic forms can also become cheap to generate. A list of sophisticated research questions, strategic prompts, or speculative hypotheses can be produced with limited relation to a sustained inquiry history. A trajectory can supply a different evidential basis by showing how a question became coupled to observations, revisions, failures, conversations, and consequences over time.

18.4 Anomaly Recognition

Unexpected events acquire epistemic force only when they are noticed and interpreted. Kuhn's analysis of anomaly emphasizes that deviations become visible against a background of expectation (Kuhn 1962). The trajectory framework adds a credibility-oriented question: what evidence indicates that an actor recognized a deviation, preserved it, and changed inquiry in response?

An anomaly trace need not be dramatic. It can be a marginal note, an unexpected residual, a recurring complaint, an observation that does not fit the current classification, or a disagreement between two otherwise reliable sources. Its evidential value can arise from the sequence surrounding it: the anomaly appears, the actor does not immediately discard it, later evidence strengthens its relevance, and the inquiry target changes.

Hanson's emphasis on discovery and theory-finding is useful here because observation is not well represented as passive accumulation of neutral data (Hanson 1958). What becomes visible depends partly on conceptual and practical preparation. Contingency-mediated inquiry therefore contains two components that should remain distinct: an event arrives outside the planned relevance structure, and an actor possesses or develops enough interpretive capacity to recognize that the event may matter.

Remark 18.4 (Prepared contingency)**.** Contingency in inquiry can depend simultaneously on an unplanned encounter and on historically developed capacities that make the encounter recognizable. The contingent status of the event does not imply that its interpretation is effortless or unprepared.

The remark prevents the framework from turning contingency into pure luck. A researcher who notices an unusual pattern can draw on years of prior reading. A professional who recognizes an edge case can draw on accumulated experience. A learner who connects two distant topics can rely on concepts acquired earlier for unrelated purposes. The significance of the contingent encounter is therefore relational: it emerges from the coupling between event and prior trajectory.

18.5 Historical Context of Serendipity

Serendipity provides a familiar vocabulary for valuable outcomes emerging through unexpected encounters. Merton and Barber's historical study shows that the term has carried multiple scientific, cultural, and political meanings rather than one stable technical definition (Merton and Barber 2004). The present

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paper therefore uses contingency as the broader analytical category and treats serendipity as one possible interpretation of particular trajectories.

This distinction avoids several distortions. First, not every unexpected event is beneficial. Second, beneficial consequences can become visible only after substantial subsequent work. Third, narratives of serendipity can conceal the institutional conditions that made the encounter possible: access to laboratories, libraries, collaborators, travel, time, or protected exploratory space. Fourth, a successful outcome can invite retrospective storytelling that overstates the inevitability or importance of the original accident.

Trajectory evidence can partially discipline these narratives by preserving temporal asymmetry. If an event was recorded before the later result, historical resistance limits some forms of post-hoc invention. If subsequent actions show that the event changed the inquiry path, the claim of significance receives relational support. If the event is mentioned only after success and has no earlier trace, the narrative can still be true, but the evidential basis is different.

This is another reason to separate historical resistance from exhaustive documentation. The aim is not to demand proof for every moment of inspiration. It is to recognize that when a contingent event later bears substantial credibility weight, independently deposited or consequence-bearing traces can help recipients distinguish historically constrained accounts from highly revisable retrospective narratives.

18.6 Preservation Discipline

Contingency creates an apparent conflict with record proportionality. If later significance cannot always be anticipated, then selecting records only by present relevance risks losing future evidence. Preserving everything, however, would impose unacceptable burdens and can alter the activity being recorded.

A more defensible approach is *preservation discipline*: maintaining low-burden channels through which potentially meaningful events can be retained without converting all activity into permanent telemetry. Examples include sparse research notes, versioned conceptual sketches, bounded event logs, selected photographs, short voice memos, anomaly registers, or institutionally protected scratch spaces. The specific medium is secondary. What matters is that preservation remains cheap enough to coexist with generative activity and selective enough to avoid becoming continuous surveillance.

Definition 18.5 (Contingency reserve)**.** A *contingency reserve* is a bounded evidential capacity reserved for events whose future target relevance is uncertain at the time of capture. It preserves the possibility of later trajectory integration without requiring that every recorded event receive immediate evaluative interpretation.

The reserve can be temporal, informational, or institutional. A research group can allow provisional notes to remain outside formal assessment. An educational setting can preserve exploratory drafts without scoring every draft. A professional system can retain incident observations for a limited period while restricting their use. These arrangements create a buffer between occurrence and evaluation.

A contingency reserve should include forgetting as well as preservation. Section 15 emphasized preservation horizons and retirement. Events that never become target-relevant need not remain indefinitely accessible. The possibility of later significance does not justify permanent retention of all low-salience traces.

18.7 Institutional Openness

Contingency-sensitive inquiry also requires institutional conditions that extend beyond record design. If all time, attention, and recognition are allocated to predefined deliverables, the probability that unexpected events can redirect inquiry may decrease even when recording infrastructure is excellent. Institutions can therefore influence contingency by shaping the field in which trajectories unfold.

Relevant conditions can include discretionary time, cross-domain contact, access to heterogeneous information, permission to pursue anomalies, low-cost exploratory failure, and channels through which

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a newly formed question can receive attention before it fits an established program. These conditions should not be treated as universally optimal. Highly regulated or safety-critical settings can require narrow procedural adherence. The point is again target-relative: inquiry environments that value discovery need some capacity for deviations to become legible before they are fully justified.

Institutional openness also has a distributional dimension. Actors with abundant time, financial security, mobility, and broad networks may encounter more diverse contingencies and have greater capacity to pursue them. The generativity attributed to an individual can therefore depend partly on the field of encounters made available by institutional and economic position. This extends the trajectory-inequality analysis from the legibility of past events to the distribution of potentially generative future events.

Working Claim 18.6 (Contingency access)**.** Where contingent encounters contribute materially to valued inquiry, unequal access to exploratory time, heterogeneous contact, and recoverable failure can become a source of trajectory inequality even before any event is recorded or evaluated.

The claim widens the paper's political-economy perspective. A credibility regime that rewards histories rich in discovery can unintentionally reward prior access to environments in which discovery-bearing contingency was easier to encounter and pursue.

18.8 Credibility Contribution

Contingency should enter credibility assessment carefully. An unexpected origin does not make an outcome more true, ethical, or competent. Nor should evaluators prefer meandering histories over efficient ones. The contribution of contingency is narrower: in some domains, a preserved relation between unexpected event, subsequent judgment, and changed trajectory can provide evidence about capacities that a final symbolic surface does not reveal well.

Those capacities can include anomaly recognition, question formation, revisability, cross-context integration, and judgment under incomplete specification. Their relevance depends on the target. A routine compliance task may place little value on them. Exploratory research, strategy, diagnosis, design, or complex coordination may place more.

Contingency evidence also resists simple standardization. Once institutions prescribe a fixed number of anomalies, surprises, or cross-domain encounters, actors can produce visible markers of exploratory behavior for evaluation. Section 17 then applies immediately. The evidential value can migrate away from the surface marker toward the historical relations showing how the event actually changed later action.

Research Obligation 18.7 (Contingency Openness)**.** Trajectory-sensitive evaluation should preserve the possibility that target-relevant significance emerges after an event occurs, while avoiding requirements that actors manufacture, maximize, or continuously document "serendipitous" behavior for evaluative purposes.

The contingency analysis completes the conceptual architecture by adding a final temporal asymmetry: some relations become epistemically important only after later history exists. A credible trajectory can therefore show how initially underdetermined events were preserved, reinterpreted, and integrated without presenting the path as fully planned in advance.

The conceptual architecture therefore yields a set of separable empirical objects: diagnosticity, historical resistance, agency legibility, credibility depth, record burden, trajectory inequality, strategic adaptation, and contingency-sensitive inference. Their study requires target-relative designs that can establish where the framework generalizes and where domain-specific limits emerge.

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19 Empirical Research Program

This section translates the conceptual architecture into an empirical research program. The methodological requirement is target-relative identification: each construct is tested against a specified inference or decision, preserving separation among diagnosticity, depth, burden, inequality, and related constructs. The analysis specifies how diagnosticity, historical resistance, agency legibility, credibility depth, record burden, trajectory inequality, strategic adaptation, and contingency sensitivity can be operationalized and distinguished from neighboring proxies such as prestige, record volume, or output quality. It then outlines experimental, longitudinal, field, and boundary designs capable of challenging the framework.

The empirical program begins from a simple distinction. A trajectory construct becomes scientifically useful only when researchers can show that it captures variation beyond familiar proxies such as prestige, record volume, tenure, reputation, or output quality. Construct validation therefore requires both convergence with indicators that should measure related properties and discrimination from neighboring constructs that the framework treats as distinct. This follows the broader methodological logic of construct validation and multimethod comparison developed by Cronbach and Meehl and by Campbell and Fiske (Cronbach and Meehl 1955; Campbell and Fiske 1959). The present framework adds a temporal and relational requirement: validation should preserve the ordering, anchoring, and target structure that give trajectory evidence its proposed meaning.

19.1 Measurement Architecture

The first empirical task is to specify the target property before selecting trajectory features. Let q denote a target inference, Y_q an independently specified criterion relevant to that target, and E the evidence available to a recipient. A receiver or institutional procedure produces an estimate $\widehat{Y}_q(E)$. For a proper scoring or loss function ℓ, empirical diagnosticity can be represented through the expected loss associated with that estimate. The corresponding gain from a richer evidence condition is defined in Equation 20.

$$\begin{aligned} D_q(E) &= -\mathbb{E}\Big[\ell\Big(Y_q, \widehat{Y}_q(E)\Big)\Big], \\ \Delta D_q(E_1; E_0) &= D_q(E_1) - D_q(E_0). \end{aligned} \tag{20}$$

Equation 20 is deliberately generic. Depending on the domain, Y_q can be a later work-performance criterion, verified responsibility assignment, independently scored competence, observed fulfillment of a commitment, successful transfer to a new task, or another target-specific outcome. The loss function can represent calibration error, classification loss, prediction error, or another validated criterion. The framework therefore does not require that credibility become a single psychometric scale. It requires that researchers state what recipients are trying to infer and how evidential improvement will be distinguished from confidence alone.

This distinction is important because richer histories can increase subjective confidence without increasing accuracy. A detailed portfolio, long narrative, or prestigious sequence of affiliations can feel informative while adding little target-relevant discrimination. Empirical work should therefore record both receiver confidence and criterion-relative performance. Overconfidence under richer evidence would itself be a theoretically important result.

Table 11 treats each construct as an empirical family rather than a fixed indicator. The table also identifies the main confound that should be addressed for each construct. A high-quality empirical program would therefore use multiple operationalizations within a construct and multiple methods across constructs. The logic of convergent and discriminant validation is especially relevant here because several trajectory concepts are expected to correlate while remaining analytically distinct (Campbell and Fiske 1959).

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Table 11: Illustrative measurement architecture for trajectory-based credibility. Each construct requires target-relative operationalization and should be distinguished from simple record volume, prestige, or output quality.

Construct	**Empirical unit**	**Illustrative operationalization**	**Primary validity risk**
Diagnosticity	inference episode	criterion-relative calibration or discrimination after an evidence condition	confidence mistaken for accuracy
Historical resistance	trajectory segment	pre-outcome deposition, distributed anchoring, constrained reconstruction alternatives	record density mistaken for resistance
Agency legibility	event-role assignment	agreement or posterior concentration over initiation, generation, revision, endorsement, and responsibility roles	tool disclosure mistaken for role clarity
Credibility depth	evidence arrangement	incremental target-relevant information across surface, context, trajectory, and co-experience conditions	depth mistaken for exposure volume
Record burden	recording regime	capture time, disclosure effort, correction cost, privacy exposure, and behavioral reactivity	hidden burden shifted to low-power actors
Trajectory inequality	institutional pathway	target-relevant evidence strength conditional on comparable underlying performance	prestige mistaken for capacity
Strategic adaptation	repeated evaluation cycle	change in visible evidence after criteria become known	substantive learning conflated with gaming
Contingency sensitivity	inquiry episode	preservation and later activation of initially low-salience events	retrospective storytelling mistaken for prior trace

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19.2 Construct Validation

Construct validation should proceed through contrasts that mirror the conceptual distinctions of the paper. Historical resistance should correlate with evidence deposited before an evaluation cut and with independent anchoring, while remaining separable from simple duration. Agency legibility should improve when role-resolved traces are available, while remaining separable from the amount of technical provenance. Credibility depth should increase when evidence supports the declared target through multiple historically connected layers, while remaining separable from the number of pages, files, interactions, or endorsements presented.

One useful design is a multitrait–multimethod architecture. The same underlying work episode can be represented through several evidence forms: final output, provenance record, selected trajectory, bounded witness attestation, and repeated interaction. Researchers can then measure several target properties such as competence, attention, agency, responsibility, and commitment. Convergent patterns should appear when different methods support the same target property. Discriminant patterns should appear when evidence that is informative for one target contributes little to another. This design would directly test the paper's repeated claim that credibility is target-relative.

Hypothesis 19.1 (Target-relative convergence)**.** *When multiple evidence methods preserve information*

relevant to the same target property, their criterion-relative judgments will converge more strongly than judgments concerning different target properties drawn from the same evidence surface.

A failure of this hypothesis would be informative. If trajectory evidence simply produces a generalized halo, then recipients may rate competence, sincerity, responsibility, and commitment upward together regardless of target-specific content. Such a result would weaken the claim that trajectory-based credibility supports differentiated inference and would redirect attention toward reputation or narrative persuasion mechanisms.

Construct validation also requires adversarial cases. Researchers should include trajectories with long duration but weak anchoring, dense records but low role clarity, prestigious affiliations with limited target relevance, and short histories containing strong consequence-bearing events. These cases help determine whether empirical measures respond to the structural properties proposed in the paper or merely reproduce familiar status cues.

19.3 Experimental Contrasts

Controlled experiments can isolate the contribution of specific trajectory features while holding the final symbolic surface constant. A common stimulus can therefore be paired with different histories. One condition can show only the final output. Another can add technical provenance. A third can add temporally ordered revision and decision traces. A fourth can add bounded attestation or co-experience evidence. Random assignment permits estimation of how each evidential layer changes calibration, discrimination, confidence, perceived legitimacy, and decision behavior.

The experimental logic should preserve realistic uncertainty. Participants should sometimes encounter cases in which the final surface is excellent but the underlying target property is weak, as well as cases in which the surface is modest while the target property is strong. Without such cross-classification, richer trajectory information can appear useful simply because all cues point in the same direction.

Hypothesis 19.2 (Trajectory supplementation)**.** *For target properties weakly identified by an isolated symbolic surface, adding target-relevant trajectory evidence will improve criterion-relative diagnosticity more than adding an equivalent volume of target-irrelevant historical detail.*

Hypothesis 19.3 (Historical anchoring)**.** *Pre-outcome, independently anchored trajectory traces will improve discrimination between constrained histories and retrospectively constructed histories more strongly than equally detailed records created after the evaluation target becomes known.*

Hypothesis 19.4 (Role resolution)**.** *Role-resolved evidence will improve calibration concerning human participation, endorsement, and responsibility more strongly than generic disclosure of tool use or nominal authorship alone.*

These hypotheses can be tested across scholarly evaluation, educational assessment, hiring, professional advice, online exchange, and institutional communication. Cross-domain replication is important because the framework predicts heterogeneity. A trajectory feature that is diagnostic in one setting can be irrelevant or misleading in another.

Experimental and quasi-experimental designs also provide a way to separate evidential effects from selection effects when randomization is feasible or when institutional changes create usable comparison groups. The broader design principles concerning internal, construct, and external validity developed by Shadish, Cook, and Campbell are therefore relevant to this program (Shadish et al. 2002). The aim is not to privilege laboratory control over field realism. Different designs answer different parts of the trajectory problem.

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19.4 Longitudinal Identification

The event-poset model developed in Section 5 creates a natural longitudinal agenda. Researchers can observe trajectories as they accumulate rather than reconstructing them entirely after an outcome is known. Each evaluation cut supplies a partial history. Later cuts reveal which earlier events persisted, which branches ended, which consequences appeared, and which previously peripheral events became relevant.

A longitudinal design can therefore compare prospective and retrospective interpretations of the same trajectory. Participants or institutions can record what they considered relevant at time τ_0, what evidence they preserved, and what decisions they made. After later outcomes occur, researchers can measure which earlier events are reinterpreted at τ_1. This design directly examines retrospective activation without requiring that researchers infer prior salience from a final narrative.

The partial order should remain analytically distinct from a causal graph. Temporal precedence can constrain possible causal relations, yet precedence alone does not identify causation. Causal claims require additional assumptions about intervention, confounding, and structural dependence. Graphical causal frameworks provide one established language for making those assumptions explicit (Pearl 2009). The trajectory framework can therefore supply event structure while causal identification remains a separate modeling step.

Longitudinal work can also test historical resistance. Researchers can preserve snapshots of the admissible reconstruction space at multiple cuts and later ask independent evaluators to reconstruct plausible histories from incomplete evidence. If distributed pre-outcome anchors reduce the number or diversity of compatible reconstructions, the proposed resistance concept receives empirical support. If record-rich histories remain just as reconstructively flexible as sparse histories, the framework would need refinement.

19.5 Field Translation

Field studies are necessary because institutional translation changes the evidence itself. Hiring systems, educational platforms, professional licensing, market reputation systems, and research organizations do not merely observe trajectories. They select, summarize, certify, discard, and contest them. The empirical object therefore includes the translation infrastructure described in Section 11.

One field design can compare decisions before and after an institution introduces a trajectory-sensitive procedure. Outcomes can include predictive validity, evaluator agreement, applicant burden, correction frequency, subgroup disparities, decision time, and later reversal. A second design can compare institutions using different translation rules while matching cases on target-relevant outcomes. A third can embed randomized information treatments inside an existing procedure, exposing evaluators to different evidential layers while leaving the underlying cases unchanged.

Field translation also permits study of bounded attestation. References and witness statements can be experimentally or observationally coded according to observational access, duration, target specificity, and consequence exposure. Their later predictive contribution can then be compared with prestige-based features such as title or institutional rank. This would test whether the framework's proposed shift from status of witness to scope of witnessed relation produces measurable informational gains.

19.6 Adaptive Dynamics

Section 17 implies that a one-shot validation study is insufficient. Once trajectory criteria become consequential, actors can adapt. Empirical research should therefore examine repeated evaluation cycles in which the evidential rule becomes known and behavior has time to change. Reactivity to rankings and public measures provides a neighboring precedent for this type of institutional feedback (Espeland and Sauder 2007).

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A simple repeated design can measure a cue before publication of an evaluation rule, immediately after publication, and after several cycles of strategic adjustment. Researchers can then estimate whether the cue's criterion-relative diagnosticity remains stable, improves through substantive behavioral change, or declines as presentation becomes optimized.

Hypothesis 19.5 (Adaptive depreciation)**.** *When a visible trajectory cue becomes a consequential evaluation target, its diagnosticity will tend to change over repeated evaluation cycles, with the direction depending on whether adaptation improves the underlying target process or primarily improves the cue's presentation.*

This hypothesis deliberately allows positive adaptation. A requirement for clearer responsibility records can genuinely improve organizational accountability. A requirement for revision evidence can encourage reflective learning. The empirical problem is to distinguish these cases from surface compliance, historical seeding, witness shopping, or other forms of evidential optimization that leave the target property comparatively unchanged.

Strategic adaptation also suggests an experimental audit design. Researchers can seed equivalent target-relevant performance into cases whose visible trajectory cues differ in how easy they are to manufacture. If evaluators increasingly rely on easily optimized cues after those cues become conventional, second-order symbol inflation becomes empirically observable.

19.7 Distributional Analysis

Trajectory inequality requires designs that separate underlying performance from institutional legibility. Researchers can construct matched cases with comparable target-relevant outcomes but different access to recognized institutions, stable records, high-status witnesses, or standardized documentation. Evaluator responses can then reveal how much of the credibility difference is attributable to trajectory legibility rather than the target property itself.

Administrative and observational data can provide a complementary approach. Within institutions, researchers can estimate which actors receive opportunities that generate attestable events, which events become formally recorded, whose records are portable across organizational boundaries, and who can successfully contest errors. These processes can then be related to later recognition, selection, or resource allocation. The cumulative-advantage literature provides one neighboring model for studying how early differences can compound across careers (DiPrete and Eirich 2006).

Hypothesis 19.6 (Legibility transfer)**.** *Conditional on comparable target-relevant performance, actors with stronger institutional sponsorship of capture, attestation, translation, and portability will receive higher trajectory-based credibility judgments unless evaluative procedures explicitly support plural evidential pathways.*

Record burden should be analyzed in the same distributional frame. A trajectory system can improve average diagnosticity while imposing disproportionate capture, disclosure, or correction costs on actors with fewer administrative resources. Evaluation should therefore report both informational gains and burden incidence. A system that shifts verification labor downward can create apparent efficiency at the institution level while increasing total social cost.

19.8 Contingency-Sensitive Designs

Contingency creates a special methodological challenge because later relevance can be unknown at the moment of observation. Prospective preservation is therefore valuable. Research teams can establish low-burden contingency reserves in which selected anomalies, abandoned paths, unexpected encounters, or provisional questions are timestamped without being immediately scored. Later inquiry outcomes can then reveal which preserved events became activated and how often such activation altered the trajectory.

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A useful comparison separates three conditions: events recorded prospectively before later significance was known, events reconstructed retrospectively after success, and events generated on request as plausible origin stories. Independent evaluators can compare historical resistance, perceived plausibility, and actual relation to later decision changes. The design would test whether pre-outcome preservation contributes information beyond narrative quality.

Contingency-sensitive work should also examine institutional access. Researchers can compare environments with different amounts of exploratory time, cross-domain contact, and recoverable failure while controlling for baseline resources where possible. The outcome need not be a count of "serendipitous events." More defensible measures include emergence of new inquiry targets, cross-domain recombination, anomaly retention, and later activation of previously peripheral traces.

Hypothesis 19.7 (Prospective contingency trace)**.** *When an initially low-salience event later becomes target-relevant, a prospectively preserved trace of that event will provide stronger evidence of historical continuity than an equally coherent account first recorded after the later target becomes known.*

19.9 Boundary Tests

A mature research program should search for domains in which trajectory evidence adds little. Such cases are theoretically important because the framework does not predict universal migration toward deeper histories. Some symbolic systems remain strongly anchored by law, measurement, material constraint, standardized testing, or externally enforced authorization. In these settings, isolated surfaces can retain high diagnosticity for the relevant target.

Boundary tests should therefore compare low-ambiguity and high-ambiguity domains. If trajectory supplementation improves judgments equally everywhere, the framework may be capturing a generic preference for additional information. If gains concentrate where production histories are heterogeneous and target properties are weakly identified by surfaces, the results would support the paper's proposed mechanism.

The same logic applies to co-experience. Repeated interaction should add limited value where the target property is already externally verified and highly stable. It should contribute more where responsiveness, judgment under uncertainty, reciprocal updating, or consequence-bearing conduct matters. Empirical work should therefore estimate marginal evidential value rather than treating deeper relation as intrinsically superior.

Finally, the research program should preserve falsifiability at the level of the paper's central proposition. Several findings would weaken the trajectory account: trajectory information could fail to improve criterion-relative inference after controlling for prestige and record volume; historical resistance measures could fail to constrain retrospective reconstruction; role-resolved traces could add no information beyond generic disclosure; deeper recording could produce burden without diagnostic gains; or trajectory-sensitive institutions could systematically amplify inequality while providing little additional accuracy. These outcomes would indicate that the proposed migration in credibility either occurs only within narrower domains or requires a different explanatory mechanism.

The empirical program therefore treats trajectory-based credibility as a family of testable relations rather than a finished institutional solution. Its core objects—diagnosticity, historical resistance, agency legibility, depth, burden, inequality, adaptation, and contingency—can be operationalized separately and then studied in combination. The final section draws together the conceptual and empirical implications while preserving the paper's historical openness concerning the future forms of credibility practice.

20 Conclusion

This section consolidates the paper's argument at the level needed for later empirical and institutional work. The starting problem is a change in the relation between symbolic surfaces and the histories they

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are used to indicate. Under symbol inflation, a surface can remain semantically useful while becoming compatible with a wider range of generative histories. Credibility can then draw more heavily on evidence that reaches beyond the terminal surface. This paper has developed *trajectory-based credibility* as one possible form of that evidential migration.

A trajectory places a present artifact, action, or claim inside a temporally extended relational structure. The relevant unit is an event structure rather than a chronological list. Partial ordering permits parallel activity, branching, convergence, delayed consequence, and relations whose importance becomes visible only later. This structure matters because credibility is often supported by relations among events: an earlier commitment and a later consequence, a draft and a revision, an intervention and a response, an attestation and the bounded experience that grounds it. Documentary quantity alone does not provide the same structure.

The event model also separates evidential properties that are easily conflated. *Historical resistance* concerns the extent to which a later preferred account remains constrained by traces deposited before the evaluative outcome was known. *Agency legibility* concerns how clearly relevant roles can be located across human and technical participants. Provenance can contribute to both while remaining narrower than either: a technically reliable chain of origin or transformation may still leave judgment, understanding, commitment, or responsibility underdetermined. These distinctions keep trajectory-based evidence target-relative rather than turning history into a generalized score.

The trajectory framework remains constrained by relational bandwidth. Direct co-experience can reveal responsiveness, practical judgment, revision, and conduct under changing conditions with a richness that portable records rarely reproduce. Its informational value is accompanied by substantial time, attention, and participation costs. Credibility depth therefore varies by context. Some decisions can remain appropriately surface-based; others justify historical anchoring, role-resolved evidence, or selective co-experience. The relevant depth depends on the inference being made, the consequences of error, and the burdens introduced by additional evidence.

Institutions introduce a second compression problem. Rich histories must be translated into forms that can travel across classrooms, organizations, professions, and markets. Translation can make trajectories usable through selection, bounded attestation, normalization, and portable representation. It can also reproduce the earlier diagnosticity problem when the representation becomes detached from its evidential basis. A trajectory summary, longitudinal indicator, verification mark, or reputation interface can itself become a symbolic surface. Its usefulness therefore depends partly on whether relevant evidence remains recoverable and whether the representation continues to support the inference for which it is used.

The applications developed in the paper illustrate this principle without requiring a single institutional template. Educational settings can place more weight on formation, revision, transfer, and supervised performance when a terminal product provides weak evidence of learning. Professional settings can combine role-conditioned work samples, bounded attestations, consequence-bearing practice, and repeated interaction. Market settings can supplement brands, reviews, warranties, and provenance claims with histories of delivery, correction, exchange, or externally anchored origin. In each domain, trajectory evidence is useful to the extent that it improves discrimination for a declared target while remaining portable enough for the decision context.

Working Claim 20.1 (Trajectory migration)**.** Where symbol inflation weakens the target-relative diagnosticity of an isolated symbolic surface, credibility can migrate toward temporally extended and relationally anchored evidence when the resulting gain in discrimination justifies its relational, institutional, and privacy costs.

The conditional form of this claim is important. Symbolic mediation remains necessary for social scale, and many symbolic systems retain strong institutional, material, or technical anchoring. Additional history can provide little benefit where the target property is already measured directly or where the con-

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sequences of error are modest. Trajectory-based credibility therefore describes a possible redistribution of evidential weight rather than a general replacement of symbols by histories.

The same conditionality also limits the expansion of record systems. Historical evidence carries capture, maintenance, disclosure, verification, contestation, and retirement costs. These burdens are distributed unevenly. Institutions with stable archives, recognized witnesses, standardized procedures, and portable credentials can make some trajectories highly legible, while fragmented or unconventional histories may remain harder to translate despite comparable target-relevant capacity. A trajectory-sensitive regime can therefore improve some forms of diagnosticity while reproducing or intensifying inequalities in recognition.

Strategic adaptation introduces a further recursive pressure. Once trajectory features affect selection, status, or demand, actors have reasons to improve those features. Some adaptation can strengthen the underlying practice through clearer responsibility, better provenance, or more reflective revision. Other adaptation can increase the appearance of historical depth without a comparable change in the target property. Trajectory interfaces can consequently become new sites of symbolic optimization. The framework therefore treats successful credibility practices as historically provisional rather than as a permanent solution to symbol inflation.

Contingency reinforces this historical openness. The relevance of an event is not always known when the event occurs. A question, anomaly, failed attempt, or encounter can acquire significance only after later events change the structure of inquiry. Selective preservation can make such relations recoverable, while exhaustive capture would impose costs and can narrow exploratory freedom. The trajectory model therefore requires room both for recoverable history and for parts of experience whose future significance remains unsettled.

Research Obligation 20.2 (Proportional historical evidence)**.** Trajectory-sensitive credibility practices should preserve enough temporal, agency, and relational structure to support the declared inference while limiting documentary burden, unnecessary exposure, status lock-in, and premature standardization of histories whose relevance remains open.

This obligation places institutional design inside the same target-relative logic as credibility itself. The relevant question concerns which historical relations improve a particular inference enough to justify their costs, how those relations can be represented with limited distortion, and how actors can correct or contest the resulting representation.

Section 19 turns these propositions into separable research objects. Diagnosticity, historical resistance, agency legibility, credibility depth, record burden, trajectory inequality, strategic adaptation, and contingency sensitivity can be studied independently and in combination. Experimental designs can hold terminal surfaces constant while varying access to trajectory evidence. Longitudinal and field designs can test whether event structure, bounded attestation, consequence exposure, or role resolution add predictive or explanatory value after ordinary contextual information is taken into account. Repeated-cycle studies can examine whether initially informative trajectory cues lose diagnosticity after they become visible targets of optimization.

Trajectory-based credibility should therefore be understood as a research direction rather than an institutional destination. Its central proposition is that a present symbolic surface can become more interpretable when selected parts of its generative history remain recoverable as an event-structured, agency-sensitive, and relationally anchored trajectory. The value of that history remains bounded by social scale, privacy, inequality, strategic response, and historical contingency.

Under symbol inflation, societies continue to require compression. The problem is to preserve enough relation between portable symbols and the histories they are used to indicate when a consequential inference can no longer be carried by the surface alone. Trajectories provide one possible bridge. How that bridge is stabilized, contested, simplified, optimized, and later transformed remains an empirical and historical question.

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