

A Preliminary Generative Relational Formalism of Epistemic Translation in the Age of AI

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Abstract

This paper develops a preliminary Generative Relational (GR) formalism for epistemic translation across heterogeneous, historically formed language systems in the age of artificial intelligence. The inquiry begins from a restrictive literature boundary: translation studies, epistemic-translation research, conceptual history, hermeneutic approaches, and translation-and-power scholarship already treat translation as contextual, historical, transformative, and politically structured. The proposed contribution is therefore limited to a formal decomposition of a narrower object. The paper distinguishes manifestational and structural translation from *generative epistemic translation*, defined here as mediation in which selected source-side formation conditions are assigned declared generative roles and those roles are realized through target-side resources so that an addressee can form a locally generated epistemic object. Two forms of openness are then separated. Terminal non-closure prevents reproduction of a source-preferred terminal object from becoming a hidden success condition; bridge-warrant discipline prevents source-local evaluative criteria from acquiring target-side filtering force without an explicit warrant. Interpretive power is represented through effective capacities over these already-defined decision sites rather than introduced as a new general theory of translation and power. The AI extension distinguishes target-system resources from the subset made accessible by an AI-mediated configuration and, more provisionally, distinguishes historical uptake of mediated outputs from evidence that such uptake changes a bounded family of later formable objects. The paper remains preliminary: its formal objects are analytical representations under ontological suspension, and empirical, historical, linguistic, and normative validation remains domain specific.

Keywords: Generative Relational Theory; generative epistemic translation; epistemic humility; interpretive power; AI-mediated translation

Research Scope Note

This manuscript belongs to the broader Generative Relational (GR) research programme. Its immediate object is epistemic translation across heterogeneous, historically formed language systems, with particular attention to a proposed mode termed *generative epistemic translation*. The paper uses *language system* in a broad but task-bounded analytical sense: a historically situated relational organization of distinctions, concepts, inferential habits, expressive forms, problem structures, evaluative practices, and conditions of intelligibility. Natural languages can participate in such systems without exhausting them.

Translation studies supplies an essential boundary condition for the inquiry. Mature work already addresses equivalence, function, norms, culture, ideology, power, translator agency, digital mediation, and transfer across epistemic systems. The GR contribution developed here is correspondingly narrower. It examines mediation in which formation-relevant source conditions are selected, represented through declared generative roles, and reconstructed through heterogeneous target-side resources so that target formation can remain locally generated within explicit admissibility constraints.

The inquiry adopts ontological suspension. GR language concerning relational systems, histories, operators, generative conditions, continuation families, and power functions as a conditional analytical representation rather than a claim about ultimate ontology. The manuscript separates historical reconstruction, generative-role attribution, cross-system bridge claims, effective power, AI-mediated resource accessibility, generative consequence, and normative assessment so that stronger conclusions require additional warrants.

The twelve-section paper develops the research boundary, minimum GR representation, historical formation profiles, translation modes, generative-condition reconstruction, non-closure conditions for target formation, epistemic humility, interpretive power, AI-mediated power distribution, historical inheritance and generative consequences, scope conditions, and a concluding synthesis. External literature is inserted only after source verification and recording in the manuscript reference ledger. The formalism remains preliminary in epistemic status: its empirical, historical, linguistic, and normative adequacy must be assessed within particular domains and translation episodes.

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Status. Release version dated 2 October 2026. This preprint contains the complete twelve-section paper, Sections 1–12. The designation “preliminary” in the title refers to the epistemic status of the proposed formalism rather than to incomplete drafting. The paper develops a task-relative GR representation of epistemic translation, generative-condition reconstruction, non-closure, bridge-warranted cross-system evaluation, interpretive power, AI-mediated resource accessibility, mediated inheritance, and bounded generative consequences, together with explicit validation and scope conditions.

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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, literature-oriented boundary checking, argumentative criticism, drafting in $\text{\LaTeX}$, and technical checking. The author selected the research questions, supplied the core conceptual distinctions, directed and approved the theoretical commitments and epistemic status of the claims, and bears sole responsibility for the manuscript, including its definitions, formal constructions, arguments, conclusions, and errors. Authorship credit remains with the human author.

1 Introduction

This section establishes the analytical object, research boundary, and manuscript architecture of a preliminary Generative Relational (GR) formalism of epistemic translation. Its role is to identify a translation problem that remains meaningful after mature work in translation studies on equivalence, function, target-system norms, culture, ideology, power, digital mediation, and inter-epistemic transfer is taken seriously. The section develops the argument in six stages. It first positions the paper relative to translation studies and recent inter-epistemic translation research. It then specifies language systems as historically formed relational environments, introduces generative-condition reconstruction as the paper's narrower research object, connects open-ended target formation to epistemic humility, locates interpretive power within asymmetric translation relations, and explains why AI mediation changes the scale and institutional importance of these relations. The method in this section is conceptual and architectural. Formal definitions, operators, and typed conditions are deferred until the relevant objects have been motivated and bounded.

1.1 Research Boundary within Translation Studies

Translation theory already supplies a wide intellectual field for analysing relations among source expressions, target expressions, purposes, norms, cultures, translators, institutions, technologies, and audiences. Contemporary surveys treat equivalence, functional theories, discourse, systems approaches, cultural and ideological turns, translator ethics and sociology, and digital and machine translation as established parts of the field [1]. Descriptive Translation Studies also places translated products within target cultures and treats translation as a norm-governed activity whose analysis requires contextualization [2]. Work on translation and power has further examined selection, construction, omission, institutional influence, cultural dominance, and resistance within translation processes [3]. A GR paper that redescribed translation as context-sensitive, culturally embedded, historically situated, or power-laden would therefore provide little independent contribution.

Recent epistemic-translation research makes the boundary still sharper. Bennett and Neves organize a research programme around translation between epistemic systems, while Robinson develops interepistemic translation as a mode of transfer across heterogeneous knowledge systems [4, 5]. Lan's formulation of Epistemic Translation Studies explicitly foregrounds the locality, historicity, and mobility of knowledge and treats translation as implicated in knowledge production and the history of knowledge [18]. The EPISTRAN programme likewise makes epistemic systems and their transformations direct objects of translation research. The present paper consequently does not claim that translation can occur between knowledge systems, that translation participates in knowledge formation, or that cultural and historical conditions matter. Those propositions belong to an existing and developing literature.

A further terminological caution concerns the phrase *generative translation*. Bradford used that expression for a literary practice in which translation becomes a creative continuation capable of producing a new work rather than a conventional reproduction of an original [6]. The present paper therefore does not claim priority over the phrase and does not treat its proposed *generative epistemic translation* as a synonym for Bradford's literary category. The shared adjective identifies a family resemblance around generation, while the analytical object developed here concerns the reconstruction of conditions under which another epistemic or language system can generate its own manifestation.

These boundaries motivate a narrower formal question. The paper asks whether a translation episode can be decomposed so that source-side formation conditions, their claimed generative roles, target-side resources, admissibility criteria, and terminal outcomes remain separately inspectable. Under this decomposition, a mediator may identify historical problems, distinctions, constraints, relations, and inferential resources through which a source concept became generable, assign selected elements explicit generative roles, and ask which target-local resources can realize those roles. The objective is not to claim discovery of historically informed or transformative translation. It is to make a particular condition-to-role-to-resource architecture auditable, including the possibility that the target system generates, revises,

or rejects a locally intelligible formation. The paper uses *generative-condition reconstruction* as a provisional name for this operation until Sections 4–6 establish the typed vocabulary.

The distinction is relevant because an apparently successful target expression can conceal two materially different epistemic situations. In one situation, the recipient acquires a source-derived conclusion expressed in familiar vocabulary. In another, the recipient acquires access to a problem structure, a family of distinctions, or a set of relations through which a corresponding conclusion can be generated, revised, or rejected inside the recipient’s own system. Both situations can be valuable. The second situation introduces a specific research object concerning the relation between translation and generativity.

1.2 Historical Formation of Language Systems

The term *language system* is used broadly in this paper. It refers to a historically situated relational organization within which expressions become intelligible and judgments become possible. A language system can include vocabulary, syntax, symbols, examples, metaphors, disciplinary classifications, inferential habits, problem formulations, accepted contrasts, narrative resources, institutional conventions, and criteria of relevance. Natural language is one carrier of this organization. A scientific discipline, legal tradition, philosophical school, professional community, local knowledge practice, or hybrid interdisciplinary community can also sustain a partially distinct language system at the analytical scale relevant to a translation problem.

Historical formation matters because concepts can be responses to problems that were available only within particular relational configurations. A concept may condense earlier disputes, technical limitations, institutional needs, material conditions, and inherited distinctions. Its current definition can therefore underdescribe the reasons that made the concept intelligible and useful. Historical inquiry recovers part of this generative structure by asking which problems were salient, which alternatives were available, which earlier concepts failed relative to the local objectives, which relations enabled the new formulation, and how later uses altered the concept’s position in the surrounding system.

This historical emphasis also has substantial precedent outside GR. Conceptual-history and translation scholarship has examined how concepts move across languages, contexts, and historical times, including the transformations and asymmetries produced by conceptual translation [19, 20]. The present paper therefore treats historical formation as inherited methodological ground. Its narrower task is to represent which historically reconstructed elements are subsequently claimed to perform a generative role in a particular mediation episode and to keep that claim distinct from historical presence alone.

The paper does not treat historical recovery as a requirement for every translation task. Many ordinary translations succeed under narrower objectives, and practical contexts can justifiably privilege speed, fluency, terminological consistency, legal equivalence, or another bounded criterion. Historical structure becomes relevant when the translation claim concerns epistemic transfer at a level where the source concept’s generative role matters. A technical term whose use depends on a prior distinction may be intelligible only when the distinction is reconstructed. A political concept may carry an institutional history that determines which contrasts it presupposes. A mathematical or scientific concept can inherit a problem lineage that explains why some formal properties are central while others remain incidental. The appropriate depth of reconstruction is therefore task dependent.

This treatment also avoids identifying a language system with a closed worldview. Language systems can overlap, borrow, hybridize, and change through interaction. A scholar can participate in several systems simultaneously and can create local bridges among them. The boundary of a system is analytical and purpose relative: it marks the relational organization retained for a particular inquiry rather than a permanent partition of intellectual life. This feature is important for the present paper because generative translation can itself alter the systems it connects.

A relational account also changes the unit of translation. A concept can be represented provisionally as a manifestation supported by relations to other manifestations, problems, practices, and historical events. Translating only the visible expression can preserve enough for some purposes while leaving the supporting relations implicit. Structural translation can attempt to recover more of that network.

Generative-condition reconstruction asks a different question: which parts of the supporting organization need to become available in the target system for the target participant to be able to form, test, modify, or reject a corresponding concept through local reasoning and judgment? The question concerns the conditions of generation rather than a requirement to copy the complete source history.

The difference also establishes an important economy condition. A complete reconstruction of the source language system is usually impossible and often unnecessary. Generative translation therefore requires selection. The translator must identify a bounded set of source-side conditions that are relevant to the target generative task and determine whether the target system already contains adequate resources, requires newly introduced distinctions, or supports a different route to the underlying problem. Sections 3–5 represent this selection explicitly so that generative translation does not become an unrestricted metaphor for deep explanation.

1.3 Generative-Condition Reconstruction in Target Formation

The central proposal of the paper concerns a translation mode in which the target manifestation is generated through the target system after selected generative conditions have been reconstructed or made accessible. The translator begins from an epistemic object whose source-side manifestation is already available. The analysis then moves to the conditions that support the object's formation: relevant problems, distinctions, relations, constraints, operations, and historical dependencies. The translation task becomes the construction of an interface through which a target participant can encounter enough of this generative organization to form a manifestation within the target system.

The resulting target manifestation need not reproduce the source manifestation exactly. A target system may possess different primitive distinctions, different conceptual decompositions, different institutional histories, or different expressive resources. A locally generated result can therefore exhibit partial correspondence, additional structure, or principled divergence. The paper treats such divergence as analytically informative. A difference can reveal an omitted bridge, an irreducible distinction between systems, a locally generated alternative, or a power relation that constrained the translation interface. Generative translation consequently requires a reporting architecture that can distinguish these possibilities.

Open-ended target formation is a central feature of the proposed mode. A translation procedure that fixes the acceptable target conclusion in advance can still be pedagogically effective, rhetorically sophisticated, or culturally sensitive. Its generative structure is nevertheless limited by terminal closure. Generative epistemic translation, as developed in this paper, permits a bounded family of target outcomes whose admissibility is determined by declared constraints rather than identity with the source conclusion. The target participant may reproduce a close analogue, produce a differently structured counterpart, suspend judgment, or reject the proposed source-side organization after reconstructing enough of its generative conditions to understand the disagreement.

This open-endedness does not imply unrestricted relativism. The translator can still specify fidelity conditions concerning the source problem, historical claims, formal relations, empirical evidence, or argumentative dependencies. A target participant can also be wrong about the source system. The analytical point concerns the distinction between preserving access to a generative problem and prescribing the terminal concept that another system must form. Sections 6–7 therefore separate source-fidelity constraints, bridge conditions, and target-generation freedom rather than placing them under one undifferentiated adequacy criterion.

The distinction also creates a natural interface with education and scholarly dialogue. An experienced scholar can often explain an unfamiliar concept by reconstructing the problems that made the concept necessary, comparing the relational structures that different disciplines use to approach those problems, and allowing an interlocutor to form a corresponding object through familiar conceptual resources. Such practice can cross disciplinary boundaries because the translator is operating on problem structures and generative conditions rather than relying exclusively on discipline-specific vocabulary. The present paper treats this observation as a motivating pattern, not as empirical evidence that expert

scholars uniformly behave in this way. Paper-specific empirical studies would be required to test how frequently such practices occur and under which conditions they improve understanding.

Generative-condition reconstruction also differs from a general recommendation to provide more context. Context can be indefinitely large, while a generative condition has a declared functional role in making a particular formation possible. A historical episode belongs to the formal analysis only if the model states how the episode constrains, enables, distinguishes, or otherwise participates in the generation being studied. A comparison with another discipline belongs only if the comparison supplies a bridge relevant to the target operation. This requirement is intended to keep the eventual formalism economical and falsifiable at the level appropriate to a conceptual framework.

1.4 Epistemic Humility: Interpretive Closure Constraints

Generative translation introduces a corresponding epistemic discipline. A translator who enters another language system can evaluate unfamiliar claims immediately through the source system's categories, or can temporarily suspend some source-side judgments while reconstructing the internal relations that make the target claim intelligible. The paper calls the latter stance *epistemic humility* when the suspension is deliberate, bounded, revisable, and directed toward improved understanding of the other system's generative organization.

Epistemic humility in this sense is neither deference nor the abandonment of criticism. The translator can resume evaluation after the relevant relations have been reconstructed and can conclude that a target claim is empirically unsupported, internally inconsistent, normatively objectionable, or incompatible with another justified commitment. The disciplined element concerns the order and basis of judgment. Evaluation is postponed where immediate projection of source categories would obscure the target system's own distinctions or problem structure. The suspension remains local to the translation task and can end when its stated epistemic purpose has been met.

The concept is especially relevant when systems differ in status or institutional power. Some language systems possess greater capacity to define legitimate categories, publication standards, administrative vocabularies, educational curricula, model-training corpora, or recognized forms of evidence. Participants from a less powerful system can then face a recurring requirement to render their concepts intelligible within a dominant vocabulary, while participants operating inside the dominant system encounter less pressure to perform reciprocal reconstruction. Translation becomes asymmetrical even when bidirectional linguistic conversion remains technically possible.

The paper treats one component of this asymmetry as *interpretive closure*: the capacity of an actor, institution, platform, or dominant language system to constrain which target manifestations count as intelligible, admissible, rigorous, relevant, or equivalent. Interpretive closure can be exercised through explicit rules, professional norms, interface design, model behavior, or resource distributions. The concept remains descriptive at this stage. Whether a particular closure is justified depends on its domain, purpose, evidential basis, alternatives, and normative consequences.

Translation-and-power scholarship already provides an extensive basis for examining institutional and cultural asymmetries [3]. The GR contribution proposed here is therefore narrower. Sections 8–9 examine how power operates specifically over the generative interface: who can determine which source-side conditions are represented, which target-side resources are recognized, which bridges are available, which outcomes remain admissible, and when an interpretive process is considered complete. This formulation connects translation to the broader GR research programme on power while preserving translation studies as an independent literature with its own concepts and methods.

Epistemic humility and interpretive power are related because the capacity to suspend one's own categories is unevenly distributed and unevenly incentivized. A powerful system can afford to treat its vocabulary as the default medium through which other systems must become legible. A scholar or institution that deliberately reconstructs another system on its own terms temporarily relaxes that default privilege. Such relaxation can create space for reciprocal generation, although the paper does not assume that humility by itself removes material, institutional, or geopolitical asymmetries. The relation between

epistemic stance and structural power therefore requires separate treatment.

1.5 AI-Mediated Translation Infrastructure

Artificial intelligence changes the practical setting of epistemic translation because generative systems increasingly mediate multilingual writing, explanation, summarization, disciplinary communication, and access to unfamiliar vocabularies. The relevant change is not that machines have suddenly created the problems of context, culture, interpretation, or power. Those problems precede contemporary AI and are extensively studied in translation theory. The AI-era question concerns scale, recurrence, interface concentration, and feedback: a small number of systems can mediate very large numbers of cross-system interactions, and their outputs can subsequently enter educational material, professional communication, public discourse, and future training corpora.

Recent empirical work illustrates why this infrastructure deserves separate attention. Shterionov, van Helleman, and Vanmassenhove report greater homogeneity among outputs of several generative-AI translation systems in an English–Dutch comparison across news, literature, and poetry, while also finding domain-dependent variation in lexical and grammatical richness [7]. The result does not establish a universal homogenization law for AI translation. It does show that diversity and output convergence can become measurable properties of generative translation systems and that such properties can vary by domain.

For the present paper, AI systems are therefore treated as translation infrastructures capable of mediating several layers of a generative interface. They can provide candidate explanations, historical context, conceptual comparisons, reformulations, counterexamples, and target-language manifestations. They can also select which distinctions are surfaced, which analogies are offered, which uncertainties are compressed, and which forms are repeatedly presented as natural equivalents. The same system can expand access to unfamiliar knowledge while narrowing the space of representations available through a default interaction pattern.

This dual capacity makes open-ended target formation especially important. An AI system optimized only for fluent answer production can terminate an epistemic process by supplying a polished target concept before the user has encountered the problem structure that made the source concept meaningful. A differently designed interaction can expose competing formulations, preserve uncertainty, reconstruct historical motivations, or offer generative prompts that allow the user to form a locally intelligible concept. The relevant research question concerns the structure of the mediation, not an essential property of AI as either epistemically beneficial or epistemically harmful.

AI mediation also intensifies the power question because platform-level defaults can operate across many language systems simultaneously. Training data distributions, model architecture, system instructions, safety rules, product interfaces, evaluation benchmarks, and user expectations can jointly influence which translations become readily available. These influences need not constitute a single intentional act of domination. They can nevertheless redistribute the capacity to define normal formulations, recognized distinctions, and efficient routes of intelligibility. Section 9 therefore analyses AI-mediated translation as a field of distributed epistemic power rather than attributing translation outcomes to a single actor by default.

The paper maintains a corresponding empirical boundary. A conceptual formalism can identify variables and relations that empirical work should examine; it cannot determine in advance how particular models, languages, disciplines, or communities behave. Claims about homogenization, cultural loss, educational benefit, or epistemic dependence require domain-specific evidence. The formal programme developed here is intended to support such investigation by distinguishing direct manifestation transfer, structural mediation, generative-condition reconstruction, target open-endedness, epistemic humility, and power over interpretive closure.

1.6 Manuscript Architecture

The manuscript is organized in twelve sections. Section 1 establishes the research boundary and motivates the proposed GR object. Section 2 develops the GR representation of epistemic translation and defines the status of language systems, manifestations, translation relations, and analytical scale. Section 3 develops the historical formation of language systems, including the role of problems, inherited distinctions, institutions, and path-dependent conceptual organization.

Section 4 distinguishes translation modes at the levels of manifestation, structure, and generativity as separate analytical forms whose adequacy conditions need not coincide. Section 5 develops meta-level mediation for generative-condition reconstruction, including criteria for selecting which source-side conditions require target-side representation. Section 6 develops open-ended target formation through explicit non-closure conditions, with explicit conditions that separate generative mediation from procedures that pre-specify the acceptable terminal concept.

Section 7 develops epistemic humility as a bounded translation stance and distinguishes it from relativism, deference, and suspension without a defined epistemic purpose. Section 8 analyses interpretive power in epistemic translation, with particular attention to asymmetries in the capacity to define categories, require translation, establish admissible bridges, and close interpretation. Section 9 examines epistemic power distribution in AI-mediated translation across users, institutions, and language systems.

Section 10 develops the generative consequences of cross-system knowledge formation, including cases in which generative translation produces locally novel concepts, disagreements, or hybrid structures. Section 11 states the scope conditions of the proposed formalism across conceptual, formal, empirical, historical, normative, and ontological dimensions. Section 12 consolidates the formalism and identifies interfaces with translation studies, education, philosophy of science, political theory, AI studies, and the wider GR research programme.

The resulting architecture assigns translation studies a constitutive boundary-setting role rather than treating it as a preliminary literature to be superseded. The proposed GR formalism earns its place only where it specifies an additional object with independent analytical work: the reconstruction of selected generative conditions across heterogeneous language systems, the openness of target formation, the discipline of epistemic humility, and the distribution of power over the generative interface. These objects provide the criteria against which the later formal sections should be evaluated and revised.

2 GR Representation of Epistemic Translation

This section establishes the minimum Generative Relational (GR) representation required for the later analysis of epistemic translation. Its role is foundational: it specifies the analytical status of language systems, the history-bearing configurations from which they are selected, the relation between epistemic objects and their manifestations, the event-relative assignment of source and target roles, and the partial translation interface through which selected content becomes available across systems. The section proceeds from the broadest carrier to progressively narrower translation objects. The method is formal and representational. The construction remains under ontological suspension and does not yet define manifestational, structural, or generative translation as distinct modes; those distinctions are developed in Section 4 after the historical structure of language systems has been specified.

2.1 Representational Scale and Ontological Status

The present formalism requires a carrier capable of retaining relational history without treating an epistemic object as a point-like item detached from the conditions through which it became intelligible. As a candidate representation, let a history-bearing GR carrier be given by Equation 1.

$$K = (V, E, F, \partial, \lambda). \quad (1)$$

Here V , E , and F denote retained vertices, edges, and faces; ∂ records incidence and attachment data; and λ records application-defined labels on cells or selected composite regions. A vertex can represent

an event or another localized relational unit, an edge can represent dependence, interaction, or transition, and a face can retain a higher-order compatibility or compositional relation. These readings are representational choices. Equation 1 supplies a flexible history-bearing carrier and does not assert that language, knowledge, or social reality possesses a cellular ultimate ontology.

A declared historical slice is denoted by Σ , and $K_{\leq \Sigma}$ denotes the part of the modeled configuration whose retained history is available at that slice. Section 3 states the historical ordering and formation assumptions in detail. The present section needs only the weaker point that an epistemic configuration at Σ can contain antecedent relations whose relevance is not exhausted by its currently visible expressions.

The scale of representation is written ρ . It records the resolution at which cells, relations, practices, institutions, expressions, or other structures are distinguished for a particular inquiry. A disciplinary vocabulary can therefore be represented at one resolution, while a research community, a multilingual institution, or a local argumentative exchange can be represented at another. The symbol ρ does not imply that these scales form a universal linear hierarchy. It records a declared analytical resolution sufficient to identify what has been retained and what has been suppressed.

GR's ontological suspension applies at each scale. The formalism distinguishes a represented relational organization from its manifestations while leaving the ultimate ontological status of the represented entities open. A concept, theory, legal category, mathematical object, institutional vocabulary, or translation practice can be relationally stable and causally consequential within an inquiry without being treated as an ontologically primitive object. This restraint is especially important in cross-system translation, where treating one system's conceptual decomposition as the natural ontology of another would prejudice the translation problem.

Remark 2.1 (Status of the GR carrier). The carrier in Equation 1 is a candidate representation for organizing historical and relational information. A correspondence between structures represented on two carriers does not by itself establish identity of the epistemic formations represented by those structures.

Remark 2.1 sets a recurring boundary for the paper. Later commutativity, compatibility, or preservation conditions are statements about declared representations and retained content. Their philosophical or empirical significance depends on the interpretation supplied by the application.

2.2 Language Systems as History-Bearing Relational Projections

A language system is represented as a task- and resolution-relative projection from a history-bearing configuration. Let Π_ρ^{lang} denote the projection that retains the structures treated as constitutive of a language system at resolution ρ . The represented system is stated in Equation 2.

$$\mathcal{L}_{\Sigma, \rho} := \Pi_\rho^{\text{lang}}(K_{\leq \Sigma}). \quad (2)$$

Equation 2 formalizes the broad usage introduced in Section 1.2. The projection can retain natural-language expressions, disciplinary concepts, symbols, problem formulations, inferential practices, narrative resources, evaluative distinctions, institutional conventions, or other structures relevant to the local translation task. The projection need not retain every feature of the underlying modeled history.

The boundary of $\mathcal{L}_{\Sigma, \rho}$ is therefore analytical. Two represented language systems may overlap in vocabulary, participants, institutions, historical events, or technical operations. One person can participate in several systems, and one expression can circulate through several systems with different relational roles. Equation 2 does not require a partition of $K_{\leq \Sigma}$ into disjoint epistemic territories.

Three derived structures recur in the later formalism. For a represented language system $\mathcal{L}$, let $\text{Man}(\mathcal{L})$ denote the retained manifestation carrier, $\text{Rel}(\mathcal{L})$ the retained relational organization relevant to the inquiry, and $\text{Op}(\mathcal{L})$ the retained family of epistemically relevant operations. Their relation to the language-system representation is summarized in Equation 3.

$$\mathcal{M}_{\mathcal{L}} := \text{Man}(\mathcal{L}), \quad \mathcal{R}_{\mathcal{L}} := \text{Rel}(\mathcal{L}), \quad \mathcal{O}_{\mathcal{L}} := \text{Op}(\mathcal{L}). \quad (3)$$

The manifestation carrier $\mathcal{M}_{\mathcal{L}}$ can include words, sentences, formulas, diagrams, classifications, examples, gestures, conventionalized practices, or other context-accessible forms. The relational organization $\mathcal{R}_{\mathcal{L}}$ retains selected dependencies, contrasts, associations, compositional relations, institutional connections, and historical linkages. The operation family $\mathcal{O}_{\mathcal{L}}$ records selected activities through which participants distinguish, combine, infer, interpret, evaluate, revise, or otherwise work with represented epistemic content.

Equation 3 is not a factorization theorem. The three structures can overlap in their represented supports and can constrain one another. A formula can be simultaneously a manifestation, a component of a relational structure, and an instrument within an operation. An institutional practice can condition which manifestations are legitimate and which operations are recognized. The derived notation separates analytical roles without assuming independent components.

Definition 2.2 (Represented language system). A represented language system at slice Σ and resolution ρ is a projection $\mathcal{L}_{\Sigma, \rho}$ of the form in Equation 2, together with the declared interpretation that identifies which manifestations, relations, and operations are retained for the translation inquiry. The definition is application relative and does not require closure, disjointness, or a unique scale-independent boundary.

Definition 2.2 prevents the term *language system* from functioning as an unrestricted synonym for culture, worldview, or society. An application must state which relational organization is being represented and at what resolution. This requirement also constrains later claims about translation between systems: the claimed source and target cannot exceed what their declared projections retain.

2.3 Epistemic Objects and Manifestation Relations

Translation often begins from a visible expression, while the analytical target can concern a concept, problem, distinction, argument, practice, or other epistemic object supported by a wider relational organization. The formalism therefore separates represented epistemic objects from their manifestations. Let $\mathcal{X}_{\mathcal{L}}$ denote the class of epistemic objects selected inside a represented language system $\mathcal{L}$. An element $x \in \mathcal{X}_{\mathcal{L}}$ is not assumed to be an atom. It can be a represented subconfiguration whose identity at the adopted resolution depends on relations retained in $\mathcal{R}_{\mathcal{L}}$.

Manifestation is represented by a context-indexed relation rather than by a single-valued function. Let γ denote a local context of manifestation, such as a disciplinary setting, genre, interlocutor configuration, institutional procedure, or problem situation. The manifestation relation is stated in Equation 4.

$$\text{Man}_{\mathcal{L}, \gamma} \subseteq \mathcal{X}_{\mathcal{L}} \times \mathcal{M}_{\mathcal{L}}. \quad (4)$$

If $(x, m) \in \text{Man}_{\mathcal{L}, \gamma}$, the manifestation m is treated as a locally admissible presentation of x in context γ under the adopted representation. The relational form permits one epistemic object to admit several manifestations and one manifestation to participate in the presentation of several objects. Polysemy, notation reuse, contextual reformulation, metaphor, and disciplinary recoding can therefore be represented without forcing a globally one-to-one correspondence.

The relation in Equation 4 also gives formal content to the distinction between relational and manifestational status. A translated sentence can correspond closely to a source sentence as a manifestation while the represented object supported by the target relations differs. Conversely, distinct surface forms can participate in manifestations of closely corresponding relational objects. The paper therefore avoids deriving object-level equivalence directly from expression-level similarity.

Caution 2.3 (Manifestation coincidence). For $x \in \mathcal{X}_{\mathcal{L}_A}$ and $y \in \mathcal{X}_{\mathcal{L}_B}$, similarity or identity between selected manifestations of x and y establishes only a manifestational correspondence at the declared context and resolution. A relational, historical, inferential, or generative correspondence requires additional conditions.

Caution 2.3 is methodologically important in AI-mediated settings because fluent output can make surface correspondence unusually salient. The caution does not depreciate manifestational translation. Many tasks have manifestational fidelity as their appropriate objective. It only limits the inferences licensed by that success.

2.4 Translation Episodes and Event-Relative Roles

Source and target are roles assigned within a translation episode rather than permanent properties of language systems. Let ε denote a translation episode. The role assignments are given by Equation 5.

$$\text{src}(\varepsilon) = \mathcal{L}_{\Sigma_A, \rho_A}^A, \quad \text{tgt}(\varepsilon) = \mathcal{L}_{\Sigma_B, \rho_B}^B. \quad (5)$$

The superscripts A and B identify represented systems; they carry no ranking. A later episode ε' can reverse the assignments or place either system in relation with a third system. Role reversal does not imply that the translation relation is invertible, because the retained task, context, historical information, and admissible target operations can differ across episodes.

When an episode is fixed, later sections abbreviate $\text{src}(\varepsilon)$ by $\mathcal{L}^S$ and $\text{tgt}(\varepsilon)$ by $\mathcal{L}^T$. The symbols S and T therefore denote episode-relative roles rather than additional language systems; the underlying system identifiers can be restored whenever cross-episode identity matters.

Each episode also carries a declared translation specification κ_ε . The specification records the purpose and retained content relevant to the local task together with constraints that materially affect interpretation. Depending on the application, κ_ε can include a genre requirement, legal or technical terminology, historical fidelity requirement, pedagogical objective, allowed explanatory resources, target audience, uncertainty policy, or other task-specific conditions. The specification is not intended to encode the whole situation. Its role is to prevent a local translation relation from silently becoming a claim about complete equivalence between language systems.

When one episode is fixed, later sections write κ as shorthand for κ_ε . They likewise use ρ for the declared resolution data of the local analysis. This shorthand does not require the source and target systems to have identical resolutions: when ρ_A and ρ_B differ, ρ can encode the ordered resolution information needed for the comparison rather than a single common scalar. The indices are suppressed only after their episode-specific interpretation has been declared.

A mediator can participate in the episode, although the mediator need not be a single human translator. The mediating arrangement can include one or more human interlocutors, institutional procedures, dictionaries, retrieval systems, machine-translation models, generative AI systems, or hybrid combinations. Section 9 distinguishes the power-relevant positions occupied by these arrangements. At the present stage, the mediator is treated as part of the episode context through which the translation interface is realized.

The event-relative formulation has two consequences. First, translation can be studied even when the same communities share extensive linguistic resources, because source and target roles can be assigned to partially overlapping systems for a specific epistemic task. Second, a translation episode can occur within one natural language when disciplinary or conceptual systems differ sufficiently for an explicit bridge to be required. The formal object is therefore broader than interlingual conversion while remaining narrower than unconstrained interpersonal understanding.

2.5 Partial Translation Interfaces

The paper represents translation through a partial relation on selected carriers rather than through a total function from one complete language system to another. Let $\mathcal{D}_{\varepsilon, \kappa}^S$ and $\mathcal{D}_{\varepsilon, \kappa}^T$ denote the source-side and target-side carriers selected by episode ε and specification κ_ε . Their elements can be manifestations, epistemic objects, relational fragments, operation records, or later generative-condition structures, depending on the translation mode under study. The translation interface is stated in Equation 6.

$$\mathsf{T}_{\varepsilon, \kappa} \subseteq \mathcal{D}_{\varepsilon, \kappa}^S \times \mathcal{D}_{\varepsilon, \kappa}^T. \quad (6)$$

Equation 6 allows one source item to be related to several target candidates, several source items to converge on one target candidate, and some source items to have no admissible target within the declared specification. A target-side suspension of judgment or an explicit representation of unresolved remainder can therefore be part of the translation episode without being forced into an artificial point-to-point map.

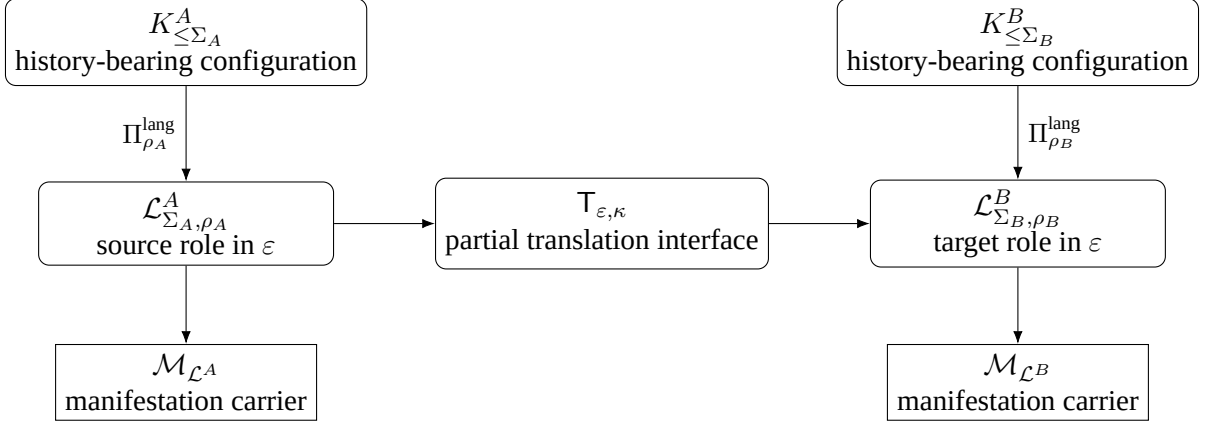


Figure 1: Event-relative GR representation of an epistemic translation episode. Language systems are analytical projections from history-bearing configurations; source and target are roles assigned by episode ε ; and κ_ε selects the carriers on which the partial translation interface is defined.

The relation is also intentionally typed by κ_ε . A legal translation and a pedagogical explanation can connect the same source and target language systems while selecting different carriers and different admissibility conditions. A formal-scientific translation can privilege operation-preserving structure, while a historical explanation can retain lineage and problem context. These differences do not require one global translation relation whose meaning changes informally from case to case.

Figure 1 summarizes the architecture. The two language systems are projections from history-bearing configurations at declared resolutions. A translation episode assigns source and target roles, selects carriers through κ_ε , and realizes a partial interface between them. Manifestations remain associated with each system rather than constituting the whole system.

The interface in Equation 6 is deliberately more general than the translation modes developed later. Section 4 specializes the selected carriers to distinguish manifestational, structural, and generative translation. Section 5 then identifies a more specific generative interface that acts on selected conditions of formation rather than merely on already formed epistemic objects.

2.6 Resolution, Retained Content, and Comparison Discipline

A translation claim becomes interpretable only when the relevant scale and retained content are declared. Let Π_ρ^κ denote a task-specific projection that extracts the content selected by specification κ at resolution ρ . For any represented language system $\mathcal{L}$, the retained translation object is defined in Equation 7.

$$z_{\mathcal{L}; \kappa, \rho} := \Pi_\rho^\kappa(\mathcal{L}). \quad (7)$$

The object $z_{\mathcal{L}; \kappa, \rho}$ is the part of the represented system on which a local translation or comparison claim is evaluated. It can retain only a manifestation, a relational neighborhood, a historical dependency, a formal operation, a generative condition, or a compound structure. Equation 7 makes explicit that the relevant target of translation is selected rather than automatically identical with the complete language-system representation.

This selection discipline prevents three common overextensions. A successful translation at one resolution does not establish success at a finer resolution where distinctions absent from the coarse representation become relevant. A translation that preserves the retained content specified by κ does not establish preservation of omitted structures. A failure to translate one retained structure does not establish that the two systems are globally incommensurable. Each conclusion remains indexed to the represented carrier and the translation specification that generated it.

The same discipline applies to comparison relations. The present section introduces no universal predicate of translation adequacy. Later sections can declare a relation appropriate to a task, such as

Table 1: Core notation for the GR representation of epistemic translation.

Symbol	Analytical role	Principal formal location
$K = (V, E, F, \partial, \lambda)$	Candidate history-bearing GR carrier	Equation 1
Σ, ρ	Declared historical slice and analytical resolution	Section 2.1
$\mathcal{L}_{\Sigma, \rho}$	Represented language system	Equation 2
$\mathcal{M}_{\mathcal{L}}, \mathcal{R}_{\mathcal{L}}, \mathcal{O}_{\mathcal{L}}$	Manifestation carrier, relational organization, and retained epistemic operations	Equation 3
$\mathcal{X}_{\mathcal{L}}$	Selected class of represented epistemic objects	Section 2.3
$\text{Man}_{\mathcal{L}, \gamma}$	Context-indexed manifestation relation	Equation 4
ε	Translation episode assigning source and target roles	Equation 5
κ_{ε}	Translation specification containing purpose, retained content, and relevant constraints	Section 2.4
$\text{T}_{\varepsilon, \kappa}$	Partial translation interface on selected carriers	Equation 6
$\mathcal{Z}_{\mathcal{L}; \kappa, \rho}$	Task- and resolution-relative retained translation object	Equation 7

exact formal correspondence, preservation of a selected dependency, practical substitutability, historical continuity, or a generative compatibility condition. The admissible comparison depends on the analytical object. A legal definition, a mathematical construction, a historical concept, and a pedagogical explanation can legitimately require different relations.

Proposition 2.4 (Locality of translation claims). *Within the present formalism, a translation claim concerning $\mathcal{Z}_{\mathcal{L}; \kappa, \rho}$ licenses conclusions only about the structures retained by Π_{ρ}^{κ} and the comparison relation declared for that task. Extension of the claim to additional structures or resolutions requires an explicit bridge condition.*

Proof. By Equation 7, the evaluated object contains only the content retained by Π_{ρ}^{κ} . Structures outside that projection are not arguments of the local translation relation and are therefore unconstrained by its satisfaction. A conclusion about omitted structure can follow only when an additional relation connects the retained content to that structure. The same reasoning applies across resolutions, where the finer representation can distinguish information absent from the coarser carrier. $\square$

Proposition 2.4 is intentionally modest. It does not establish that translation across heterogeneous systems is impossible or fragile. It establishes a bookkeeping requirement that later permits positive translation results to be stated without silently converting a local success into global equivalence.

2.7 Foundational Boundaries for Later Translation Modes

Table 1 collects the symbols introduced in this section. The notation is deliberately small because later sections should derive additional objects only when they perform independent analytical work.

The architecture establishes several limits before more specific translation modes are introduced. First, a language system is a represented relational projection rather than a closed worldview or an on-

tological substance. Second, epistemic objects are distinguished from context-dependent manifestations without assuming a unique mapping between them. Third, source and target are episode-relative roles. Fourth, translation is represented by a partial typed relation on selected carriers rather than a total map between complete systems. Fifth, every translation claim is indexed by analytical resolution and retained content.

These limits define the interface with Section 3, which analyses how problems, distinctions, institutions, prior translations, and inherited practices become part of a language system's history without treating present vocabulary as a timeless container. Once that historical formation has been specified, Section 4 can define the distinct analytical demands of manifestational, structural, and generative translation on the common foundation developed here.

3 Historical Formation of Language Systems

This section specifies the historical structure presupposed by the represented language systems introduced in Section 2. Its role is to identify how present manifestations, distinctions, operations, and criteria of relevance can depend on antecedent problems, inherited conceptual contrasts, institutional practices, and earlier cross-system encounters. The objective is narrower than a general theory of conceptual history. The section develops a task-relative representation of historical formation that can later support the distinction between structural translation and generative-condition reconstruction. The discussion proceeds through historical ordering, formation support, problem and distinction structures, institutional stabilization, prior translation and hybridization, and the limits of historical reconstruction. The method is formal and interpretive: historical scholarship supplies reasons to reject timeless or context-free representations of concepts, while GR supplies a bookkeeping architecture for retaining selected formation relations without treating the represented history as a complete causal account.

3.1 Historical Ordering and Formation Support

The historical slice Σ introduced in Section 2.1 requires an ordering adequate to the application. The present framework does not assume that intellectual history forms a single linear sequence. Let $\preceq_H$ denote a declared historical precedence relation on the retained events or composite regions of K . The relation can encode temporal precedence together with application-specific compatibility constraints, provided that the interpretation states which ordering claims are being made. A slice Σ then separates retained antecedent structure from structures treated as later than the analytical present of the inquiry.

Assumption 3.1 (Historical indexability). For a declared inquiry, the retained carrier K admits a historical precedence relation $\preceq_H$ sufficient to identify the antecedent region $K_{\leq \Sigma}$ relevant to the selected slice Σ . The assumption does not require a total order, a universal historical clock, or a unique decomposition of simultaneous and mutually conditioning events.

Assumption 3.1 is deliberately weak. It permits a historian of a scientific concept to retain publication sequences, experimental developments, institutional reorganizations, and disciplinary disputes at one resolution, while another inquiry can retain educational transmission, multilingual circulation, or changes in professional practice at another. The requirement is traceability of the historical claims used in the translation analysis, not a universal chronology of intellectual life.

A present epistemic object can depend on only a small part of the antecedent carrier. Let $z_{\mathcal{L};\kappa,\rho}$ be the retained translation object defined in Equation 7. Introduce a task-relative historical relevance relation $\rightsquigarrow_{\kappa,\rho}^H$ between retained antecedent cells or regions and $z_{\mathcal{L};\kappa,\rho}$. The corresponding historical formation support is stated in Equation 8.

$$\mathcal{H}_{\kappa,\rho}(z; \Sigma) := K_{\leq \Sigma} \upharpoonright \{c \mid c \rightsquigarrow_{\kappa,\rho}^H z\}. \quad (8)$$

Here c ranges over retained cells or composite regions at resolution ρ , and the restriction symbol denotes the represented subconfiguration selected by the declared historical relevance relation. The relation can

be established through documentary evidence, conceptual analysis, institutional records, scientific genealogy, or another method adequate to the application. Equation 8 therefore records an evidentially supported historical selection rather than an intrinsic property of the source concept.

Historical and conceptual scholarship gives strong reasons for this restraint. Skinner’s contextualist programme criticizes readings that treat classic texts as contributions to a fixed stock of timeless questions and concepts, emphasizing the linguistic and argumentative contexts in which interventions became intelligible [8]. Koselleck’s conceptual history similarly examines changes in historical-political semantics and the relation between concepts, social history, experience, and expectation [9]. Translation-oriented conceptual history further treats translation itself as constitutive of conceptual movement across linguistic and historical contexts, while recent work on translation and metahistory emphasizes mobility, transformation, and shifting historical boundaries [19, 20]. In the history and philosophy of science, Kuhn’s account of paradigms, normal science, anomalies, and scientific revolutions places problem selection and standards of solution within historically developing disciplinary structures [10]. Fleck’s earlier account of thought collectives and the development of scientific facts likewise treats scientific concepts and theories as historically and socially conditioned formations [11]. The present formalism does not merge these traditions into a single theory and does not claim historical contextualization as a GR contribution. They support the narrower methodological point that a present expression can underdescribe the historical relations through which its epistemic role became stabilized; the GR-specific bookkeeping begins with the explicit separation of historical support, formation profile, and later generative-role selection.

3.2 Formation Profiles and Present Epistemic Organization

The historical support in Equation 8 can contain heterogeneous antecedents. For translation analysis, the relevant task is to identify which types of relation contribute to the present organization of a selected epistemic object. Let $\Phi_{\kappa,\rho}^{\text{form}}$ denote a typed projection that retains the formation-relevant structures required by the inquiry. The resulting formation profile is defined in Equation 9.

$$\mathfrak{F}_{\kappa,\rho}(z; \Sigma) := \Phi_{\kappa,\rho}^{\text{form}}(\mathcal{H}_{\kappa,\rho}(z; \Sigma)) . \quad (9)$$

The profile can retain several kinds of structure without assuming that each application needs all of them. Typical components include problem configurations that made a distinction salient; inherited contrasts that constrained admissible formulations; examples, models, metaphors, or formal operations through which a concept became usable; institutional practices that stabilized terminology or authority; material and technological conditions that altered available problems; and earlier translations or borrowings that changed the local conceptual repertoire. The profile remains a represented selection from historical support rather than a complete explanation of why the epistemic object exists.

The distinction between $\mathcal{H}_{\kappa,\rho}$ and $\mathfrak{F}_{\kappa,\rho}$ performs useful analytical work. Historical support can include antecedents whose significance is established for understanding the development of an object even when they need not be reproduced in a later translation task. The formation profile identifies the subset and typing of that history relevant to the local analytical objective. Section 5 makes a further selection from formation-relevant structure when it defines generative conditions. Historical formation and generative necessity are therefore kept separate from the outset.

A present manifestation can conceal substantial variation in formation profile. The manifestation relation $\text{Man}_{\mathcal{L},\gamma}$ defined in Equation 4 is context indexed and need not be injective with respect to historical support. Two epistemic objects can therefore admit the same or closely similar present manifestation while occupying different historical and relational positions. Conversely, one historically continuous epistemic object can acquire several manifestations across periods, institutions, or communities.

Proposition 3.2 (Historical underdetermination by present manifestation). *Within the present representation, equality of selected present manifestations does not by itself establish equality of historical formation support or formation profile.*

Proof. The manifestation relation in Equation 4 does not impose injectivity from represented epistemic objects or their historical supports into the manifestation carrier. Equation 8 is selected from $K_{\leq \Sigma}$

through a separate historical relevance relation, and Equation 9 applies an additional typed projection to that support. Equality at the manifestation level therefore constrains neither selection unless an explicit bridge condition is supplied. $\square$

Proposition 3.2 gives a precise reason for historical caution in translation. A shared word, formula, or apparently interchangeable definition can provide strong evidence for a local translation task while remaining insufficient for claims about problem lineage, institutional role, or generative organization. The proposition also prevents the reverse overstatement: different historical profiles do not establish that present communication is impossible. The appropriate conclusion depends on the retained content specified by κ .

3.3 Problem Configurations and Inherited Distinctions

Problems and distinctions occupy a privileged place in the present paper because generative translation asks which conditions allow a target participant to form a concept through local reasoning. A concept can become salient because a community faces a recurring anomaly, institutional dilemma, classificatory tension, technical limitation, or normative dispute for which available distinctions provide insufficient resolution. The resulting concept can then preserve traces of the problem configuration that made its introduction useful.

The formalism represents a problem configuration as part of the formation profile rather than as a free-standing universal object. For a selected z , $\Phi_{\kappa,\rho}^{\text{form}}$ can retain a subconfiguration whose nodes and relations represent the questions, constraints, failed or partial responses, and criteria of relevance documented for the historical episode. The same projection can retain distinctions that organize the available solution space. Such distinctions may be lexical, formal, institutional, normative, methodological, or practical. Their analytical importance lies in the relations they enable and exclude within the represented system.

Kuhn’s treatment of normal science is instructive for this limited purpose because paradigms and exemplary problem solutions help define legitimate problems and acceptable forms of solution within a scientific community [10]. Skinner’s contextual approach supplies a related caution for political and intellectual history: understanding an intervention requires attention to what an author could have been doing within the available linguistic conventions and controversies rather than only to the apparent time-less content of isolated propositions [8]. The present framework generalizes neither account. It records the weaker structural possibility that problem selection and distinction systems can be historically formed components of an epistemic object’s support.

This perspective also clarifies why historical reconstruction need not seek an exhaustive biography of a term. The relevant problem structure is task dependent. A translator explaining a mathematical construction may need to recover the distinction that motivated a definition and the operations that make the construction useful, while omitting institutional details that do not affect the local task. A historian examining the same construction can require the omitted institutional structure. A cross-disciplinary translator can need still another subset when the target field organizes analogous problems through different formal resources. The translation specification κ therefore controls historical granularity.

The same concept can also change its problem relation over time. A term introduced to solve one problem can later become a routine classificatory device, a pedagogical shorthand, a contested symbol, or a component of a different theory. Historical continuity of the expression does not guarantee continuity of problem function. A GR representation should therefore permit the relation between a manifestation and its problem configuration to vary across slices rather than treating the first documented motivation as the permanent essence of the concept.

3.4 Institutional Stabilization and Epistemic Operations

Language systems are sustained by practices as well as by semantic relations. Journals, courts, laboratories, professional associations, schools, standards bodies, software ecosystems, archives, and informal communities can stabilize which expressions are recognized, which operations are legitimate, and which

distinctions receive repeated use. Institutional structure therefore enters the formation profile when it materially affects the epistemic role under analysis.

This point can be represented through the operation family $\mathcal{O}_{\mathcal{L}}$ introduced in Equation 3. Historical formation concerns not only which manifestations entered $\mathcal{M}_{\mathcal{L}}$ but also how communities learned to perform recognized operations with them. A term may become consequential because it can license a legal classification, organize an experimental procedure, structure a proof, determine an accounting treatment, or delimit a disciplinary problem. Institutional stabilization can make such operations reproducible across participants even when their individual conceptual histories differ.

Fleck’s thought-collective framework is particularly relevant as a historical precedent for treating scientific cognition as socially organized and for examining how concepts and facts develop through collective styles of thought [11]. Toury’s descriptive translation studies likewise emphasizes norm-governed translational activity embedded in target cultures [2]. The present paper uses these literatures as boundary conditions rather than as derivations of GR. They establish that social and institutional organization already belongs to mature historical and translation scholarship. The GR contribution sought here is the typed relation between such formation structures and the later question of which conditions a generative translation interface needs to reconstruct.

Institutional stabilization can increase persistence without establishing correctness. A category can become standard because it coordinates action, satisfies administrative needs, fits existing infrastructures, or receives authoritative endorsement. Historical reconstruction should therefore distinguish explanatory questions about stabilization from normative judgments about whether the stabilized structure is justified. This distinction matters when Section 8 analyses interpretive power and Section 9 examines AI-mediated epistemic power.

3.5 Prior Translation, Borrowing, and Hybrid Formation

A language system’s history can already contain translations from other systems. Present source and target systems therefore need not be historically independent before a translation episode ε begins. Loan terms, imported formal methods, multilingual institutions, disciplinary migrations, educational exchange, colonial and postcolonial encounters, and machine-mediated communication can make earlier cross-system relations constitutive of the present formation profile. Recent inter-epistemic translation research explicitly studies transfer across heterogeneous knowledge systems, providing an existing translation-studies context for this problem [4, 5].

The GR representation handles this situation without requiring a pure pre-translation state. If a prior translation episode ε' is historically relevant to z , the events and relations associated with ε' can belong to $\mathcal{H}_{\kappa,\rho}(z; \Sigma)$ and can be retained by $\Phi_{\kappa,\rho}^{\text{form}}$. The resulting formation profile can therefore contain cross-system ancestry. A later translation from $\mathcal{L}^A$ to $\mathcal{L}^B$ may operate on systems whose vocabularies and operations have already been mutually transformed.

This feature blocks a simple model in which translation always connects two internally complete and historically isolated systems. The relevant objects can be hybrid, layered, and partially shared. A concept treated as characteristic of one discipline may have entered through an earlier borrowing and become locally reorganized. A term that appears to provide an obvious bilingual correspondence may itself be the stabilized result of earlier translation. Historical reconstruction can expose these dependencies when they matter to the current translation task.

Figure 2 summarizes the section’s representation. Antecedent problems, distinctions, practices and institutions, and prior cross-system encounters contribute to a task-relative historical support. A typed formation projection then retains the structures relevant to the present epistemic object. The figure intentionally separates formation support from later generative-condition selection.

3.6 Path Dependence and Counterfactual Restraint

Historical formation can be path dependent in the modest sense that a present epistemic organization can depend on which antecedent events and relations actually occurred. The formation support in Equa-

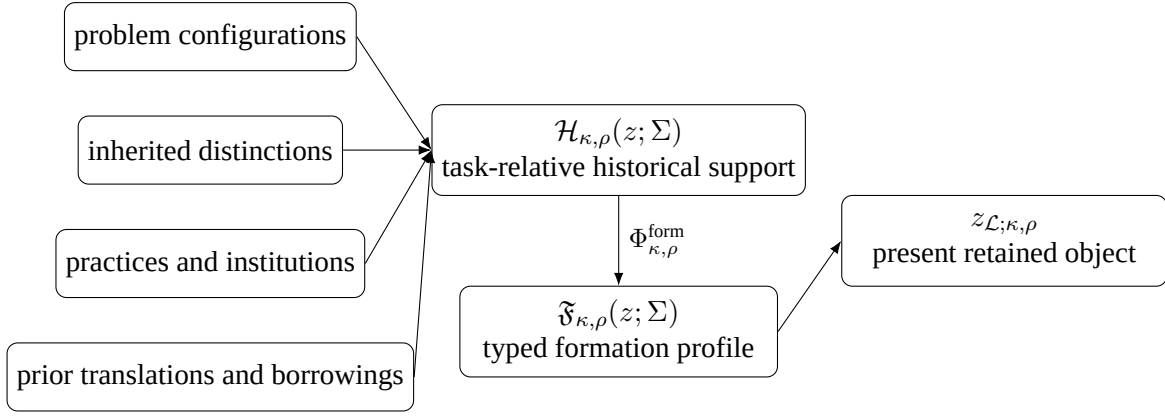


Figure 2: Task-relative representation of historical formation. Several kinds of antecedent structure can enter the historical support of a present retained object. The formation projection selects and types the historical relations relevant to the inquiry. Section 5 makes a further selection when generative conditions are defined; the complete formation profile is not presumed to require reconstruction in the target system.

tion 8 can therefore matter even when the present manifestation admits a concise synchronic definition. Such dependence is especially relevant when earlier distinctions constrain later vocabulary, when institutional adoption creates durable standards, or when prior translations supply the categories through which subsequent translation becomes possible.

Path dependence does not imply historical necessity. The actual formation profile documents one represented route through which an epistemic object became stabilized. It does not establish that the same object, an equivalent object, or a functionally adequate counterpart could not have emerged through another route. This distinction is central to generative translation. If target-side generation required literal replay of the source history, generative translation would reduce to historical replication and would be infeasible across substantially heterogeneous systems.

Caution 3.3 (Actual formation and generative necessity). Membership in $\mathfrak{F}_{\kappa,\rho}(z; \Sigma)$ records a relation retained as relevant to the represented formation of z . It does not by itself establish that the same relation is necessary for generating a target-side counterpart, nor that replaying the source history is normatively desirable.

Caution 3.3 creates an explicit boundary between Sections 3 and 5. Section 3 reconstructs formation relations. Section 5 asks which selected conditions perform generative work for a declared target task and whether the target system already contains alternative resources capable of supporting that work. The distinction allows historical understanding to inform translation without turning source history into a template that the target system must reproduce.

The same restraint applies to failed historical alternatives. A source tradition may have rejected a conceptual route for reasons specific to its institutional, technological, or normative environment. A target system operating under different constraints may legitimately reactivate an analogous route. Historical reconstruction can identify why the source path stabilized without treating the source outcome as the unique rational endpoint for every system.

3.7 Historical Reconstruction for Translation Tasks

The practical output of this section is a disciplined historical input to later translation modes. For a translation episode ε , the specification κ_ε determines which present object is being translated, which historical claims matter to the task, and what evidential resolution is justified. Historical reconstruction then identifies $\mathcal{H}_{\kappa,\rho}$ and derives the formation profile $\mathfrak{F}_{\kappa,\rho}$. This procedure does not require historical reconstruction for every translation episode. It activates historical structure when the declared translation

Table 2: Formation components that can be retained for historically sensitive translation analysis.

Formation component	Historical question	Relevance to later translation analysis
Problem configuration	Which problems, anomalies, tensions, or practical demands made the object salient?	Identifies candidate problem structures that may need target-side reconstruction.
Inherited distinctions	Which contrasts and classifications organized the available conceptual space?	Indicates relations whose omission can alter the role of a translated concept.
Epistemic operations	Which inferential, formal, interpretive, or practical operations made the object usable?	Connects historical formation to operation-sensitive structural translation.
Institutional stabilization	Which practices or institutions reproduced terminology, authority, or recognized uses?	Separates semantic intelligibility from historically stabilized legitimacy and authority.
Prior translation and borrowing	Which cross-system encounters already contributed to the present formation?	Prevents source and target systems from being treated as historically isolated by default.
Historical alternatives	Which documented alternatives were available, displaced, or abandoned?	Supports counterfactual restraint and helps avoid treating the realized path as necessary.

claim depends on problem lineage, inherited distinctions, institutional role, prior borrowing, or another formation relation.

Table 2 summarizes the principal formation components used in the present paper. The entries are analytical roles rather than a universal checklist.

The section yields three constraints for the remainder of the paper. First, a present language system is historically indexed: its manifestations, relations, and operations can carry formation dependencies that are invisible in a synchronic snapshot. Second, historical support is task relative and evidentially selected; the framework does not claim access to a complete causal history. Third, formation history and target-side generative requirements are distinct analytical objects. This distinction allows Section 4 to compare manifestational, structural, and generative translation on a common historical foundation, while Section 5 can derive generative-condition reconstruction through an additional selection rather than equating generativity with historical duplication.

4 Translation Modes: Manifestation, Structure, Generativity

This section distinguishes three analytical modes that can be realized through the partial translation interface introduced in Section 2. Its role is classificatory and preparatory. The objective is to separate translation of manifestations, translation of already-formed epistemic structure, and translation oriented toward target-side generation without treating the three as a hierarchy of increasingly superior translation. The section first types the translation interface by mode, then specifies manifestational and structural translation, introduces a provisional criterion for generative epistemic translation, and states the bridge conditions required for claims across modes. The method is formal and comparative. Established translation studies remains the primary disciplinary context for manifestational and structural translation; the narrower GR proposal begins where translation is analysed as reconstruction of selected generative conditions within another represented language system.

4.1 Mode Typing for Translation Episodes

The partial interface $\mathsf{T}_{\varepsilon, \kappa}$ in Equation 6 was defined on carriers selected by a translation episode and its specification. A mode declaration identifies which analytical role those carriers perform. Let $\mu \in \{\mathsf{M}, \mathsf{S}, \mathsf{G}\}$ denote, respectively, manifestational, structural, and generative mode. For each mode, let $\mathcal{D}_{\varepsilon, \kappa}^{S, \mu}$ and $\mathcal{D}_{\varepsilon, \kappa}^{T, \mu}$ denote the corresponding source-side and target-side selected carriers. The mode-specific interface is the restriction stated in Equation 10.

$$\mathsf{T}_{\varepsilon, \kappa}^{\mu} := \mathsf{T}_{\varepsilon, \kappa} \upharpoonright (\mathcal{D}_{\varepsilon, \kappa}^{S, \mu} \times \mathcal{D}_{\varepsilon, \kappa}^{T, \mu}), \quad \mu \in \{\mathsf{M}, \mathsf{S}, \mathsf{G}\}. \quad (10)$$

Equation 10 does not create three independent translation theories. It records which represented objects carry the local translation claim. One episode can involve several modes when, for example, a target text is produced at the manifestational level while an accompanying explanation reconstructs historical or relational structure. The mode index prevents these distinct achievements from being compressed into a single undifferentiated assertion that the translation is “accurate.”

The distinction is also task relative. A manifestational translation can be fully adequate for an administrative notice, a technical label, or a local communicative task even when no structural reconstruction is required. A structural translation can be appropriate when an argument, formal operation, institutional category, or historical concept must be situated inside a wider relational organization. A generative episode becomes relevant only when the translation objective includes enabling target-side formation through selected conditions rather than supplying an already completed target object. The present taxonomy therefore organizes analytical demands; it does not rank ordinary translation tasks by intellectual value.

Translation studies already contains sophisticated treatments of equivalence, function, descriptive norms, culture, ideology, power, and knowledge-system transfer [1, 2, 4, 5, 18]. The mode distinction developed here should therefore be read as a GR bookkeeping device rather than a new taxonomy of translation studies. Its argumentative payoff is limited to making three claims separately testable: whether an episode translates accessible manifestations, whether it represents relations among already-formed epistemic objects, and whether it additionally claims to reconstruct formation-relevant conditions through target-local resources. The third claim is specified more narrowly by the role-mediated architecture developed in Sections 4–6.

4.2 Manifestational Translation

Manifestational translation operates on locally accessible presentations. For an episode with source system $\mathcal{L}^S$ and target system $\mathcal{L}^T$, the manifestational carriers satisfy the inclusions stated in Equation 11.

$$\mathcal{D}_{\varepsilon, \kappa}^{S, \mathsf{M}} \subseteq \mathcal{M}_{\mathcal{L}^S}, \quad \mathcal{D}_{\varepsilon, \kappa}^{T, \mathsf{M}} \subseteq \mathcal{M}_{\mathcal{L}^T}. \quad (11)$$

The manifestations can be words, sentences, formulas, diagrams, examples, classifications, gestures, or other forms retained by the application. Manifestational translation in this paper therefore does not mean word-for-word substitution or context-free literalism. A highly contextual, function-sensitive, genre-sensitive, or audience-sensitive translation can still be manifestational when the local claim is evaluated on the adequacy of the produced presentations rather than on an explicit reconstruction of the source object’s wider relational formation.

Definition 4.1 (Manifestational translation). A translation episode is manifestational with respect to (ε, κ) when its evaluated source and target carriers satisfy Equation 11 and the declared adequacy criteria concern relations among the retained manifestations in their specified contexts. Any stronger claim concerning epistemic objects, historical formation, operations, or generative conditions requires an additional bridge.

Definition 4.1 treats manifestational adequacy as a legitimate terminal objective. The source expression can be translated into a fluent target expression, a mathematically equivalent notation, a procedurally

usable instruction, or another form appropriate to the declared task. The definition only limits what follows from that result. Caution 2.3 already established that similarity or identity of manifestations does not determine relational or generative correspondence.

The context index in the manifestation relation remains important. Suppose $(x_S, m_S) \in \text{Man}_{\mathcal{L}^S, \gamma_S}$ and $(x_T, m_T) \in \text{Man}_{\mathcal{L}^T, \gamma_T}$. A pair $(m_S, m_T) \in \mathbf{T}_{\varepsilon, \kappa}^M$ can be admissible because m_T performs the task specified by κ_ε in γ_T . The formalism does not require the target manifestation to reproduce the source form, and it does not infer from that admissibility that x_S and x_T possess identical relational neighborhoods. This separation is particularly useful when fluent AI output makes the target manifestation appear self-sufficient while the user’s inquiry actually concerns a concept’s historical or disciplinary organization.

4.3 Structural Translation

Structural translation evaluates relations among already-formed epistemic objects and the operations through which they function inside a represented language system. The structural carrier should therefore retain more than the accessible manifestation. Let $\Pi_{\kappa, \rho}^{\text{str}}$ denote a task-specific projection that selects from the represented language system the epistemic objects, relations, operations, and, where historically required, retained formation linkages relevant to the structural comparison. The retained structural object is defined in Equation 12.

$$s_{\mathcal{L}; \kappa, \rho} := \Pi_{\kappa, \rho}^{\text{str}}(\mathcal{L}). \quad (12)$$

Equation 12 is intentionally permissive. A formal-scientific application can retain compositional relations and permitted operations; a historical-conceptual application can retain contrasts, problem roles, and selected formation relations; a legal application can retain authority, scope, conditions of application, and relations to neighboring categories. The projection states which structure matters to the translation task rather than imposing one universal representation of semantic structure.

Definition 4.2 (Structural translation). A translation episode is structural with respect to $(\varepsilon, \kappa, \rho)$ when its evaluated carriers contain retained structural objects of the form in Equation 12 and the declared translation criteria concern correspondence, compatibility, preservation, or explicit transformation of selected relations or operations among already-formed epistemic objects.

The phrase “already-formed” identifies the analytical role of the mode. Structural translation can reconstruct substantial historical context and can be highly sophisticated. It can explain why a source concept occupies a particular position, preserve distinctions among neighboring concepts, reproduce inferential operations, or identify a target-side structure that performs comparable work. The translation task nonetheless begins with structures that are represented as available for comparison. Its success is evaluated by a declared relation between those structures.

This distinction prevents the present paper from claiming as generative every translation that conveys context, conceptual relations, or historical background. Such work has long-standing counterparts across translation studies, conceptual history, history of science, and inter-epistemic translation. Structural translation is therefore an essential mode in the framework while remaining largely a boundary object between GR representation and established scholarship rather than the proposed paper’s principal novelty.

Structural translation also need not preserve the source structure point by point. The target system can lack a source distinction, realize a relation through different categories, or reorganize an operation through another institutional or conceptual architecture. A structural translation can represent these differences explicitly. What makes the episode structural is the object of evaluation: the relation between already available source and target organizations. The framework therefore permits transformation and remainder within structural translation without converting every non-isomorphic case into generative translation.

4.4 Generative Epistemic Translation

Generative epistemic translation changes the analytical object. Its purpose is to mediate selected conditions under which a target-side epistemic object can be formed within the target language system. The source terminal object remains evidentially important because its formation history helps identify candidate generative conditions, yet the target terminal object is not treated as the item to be reproduced in advance. The generative task therefore depends on a distinction established in Section 3: the actual formation profile $\mathfrak{F}_{\kappa,\rho}(z; \Sigma)$ contains historically relevant relations, while only a further selected subset may need to be reconstructed or functionally replaced for target-side generation.

The phrase *generative translation* has prior uses, including literary work in which translation becomes a productive source for new writing [6]. The present paper does not claim the phrase itself as new. *Generative epistemic translation* is used here as a narrower technical term for condition-mediated cross-system formation inside the GR representation.

Definition 4.3 (Generative epistemic translation). A translation episode is generative with respect to $(\varepsilon, \kappa, \rho)$ when the episode is organized around four requirements: (i) a declared selection is made from formation-relevant source structure; (ii) the selected source structure is used to identify conditions whose generative role, rather than historical identity, matters to the task; (iii) mediation reconstructs, activates, or identifies target-side resources through which an epistemic object can be locally formed within $\mathcal{L}^T$; and (iv) the translation specification does not require the target terminal object or manifestation to be identical to a source-prescribed terminal object merely in order for the generative episode to count as successful.

Definition 4.3 is intentionally preliminary. Section 5 derives the selection of generative conditions from the formation profile and distinguishes source conditions from target-side functional resources. Section 6 formalizes the non-closure requirement and states how constraints can remain strong without pre-specifying one acceptable terminal concept. The present definition fixes the mode boundary before those constructions are introduced.

The third requirement is central. Generative translation aims to let the target system do epistemic work with its own available distinctions, examples, inferential practices, historical resources, and problem formulations. A source-side condition can therefore be reconstructed by a non-identical target-side arrangement when the declared task justifies the substitution. For example, the source history may have generated a distinction through a particular institutional controversy, while a target community can encounter an analogous problem through a different institutional configuration. Reproducing the source controversy is unnecessary when another target-side resource can perform the relevant generative role.

The fourth requirement separates generation from a disguised procedure of persuasion. A mediator may know the source concept and may even regard it as valuable. If the mediation is constructed so that only reproduction of that concept can count as an acceptable target outcome, the target is being guided toward a predetermined terminal object. Such guidance can be appropriate in instruction, legal standardization, technical training, or other tasks, but it is analytically different from the open-ended generative mode proposed here. Generative epistemic translation retains constraints while allowing the target system’s own organization to participate in the resulting formation.

The relation between structural and generative translation can now be stated more sharply. Structural translation asks whether selected source organization can be represented, compared, preserved, or transformed in target organization. Generative translation asks which conditions need to become available in the target system for a locally formed object to emerge and remain intelligible there. A generative episode can therefore produce a target object whose present relational organization differs from the source object while still being responsive to the generative problem that motivated the mediation. Conversely, a close structural analogue can be supplied directly without giving the target participant access to the conditions through which the analogue could have been formed or critically revised.

4.5 Cross-Mode Bridge Conditions

The three modes can coexist in one translation episode, but their success conditions are logically distinct within the present representation. Proposition 2.4 already limits claims to structures retained by the task-specific projection. Applied to the mode restriction in Equation 10, the same discipline yields the corollary below.

Table 3 provides a comparative summary of the three modes developed across this section. The entries describe the present GR formalism and are not proposed as a replacement taxonomy for translation studies.

Corollary 4.4 (Cross-mode non-entailment). *For a fixed translation episode, satisfaction of the declared criteria in one mode does not by itself establish satisfaction of the criteria in another mode. An inference from mode μ to mode ν requires an explicit bridge condition connecting the structures retained by $\mathcal{D}_{\varepsilon,\kappa}^{S,\mu}$ and $\mathcal{D}_{\varepsilon,\kappa}^{T,\mu}$ to those retained by $\mathcal{D}_{\varepsilon,\kappa}^{S,\nu}$ and $\mathcal{D}_{\varepsilon,\kappa}^{T,\nu}$.*

Proof. Equation 10 restricts each mode to its selected source and target carriers. Proposition 2.4 permits conclusions only about retained structures unless an additional relation connects them to omitted structures. Because distinct modes can retain different objects and criteria, success in one mode supplies no general constraint on another mode without such a bridge. $\square$

Corollary 4.4 formalizes a modest but important discipline. Fluent manifestational translation can coexist with structural divergence. Structural correspondence can coexist with failure to reconstruct conditions from which a target participant could independently form, question, or extend the concept. A generative episode can yield a target formulation that differs manifestationally and structurally from a familiar source formulation. None of these combinations is automatically defective; adequacy depends on the declared task.

A bridge can nevertheless be established in particular domains. In a tightly standardized mathematical notation, a manifestational correspondence can under stated assumptions determine a formal structural correspondence. In a controlled technical procedure, structural reconstruction can supply conditions sufficient for a learner to reproduce a required operation. In historical interpretation, documentary evidence can connect a present expression to a formation relation. The framework therefore treats cross-mode inference as an application-specific achievement rather than a prohibited move.

The same discipline constrains evaluation of AI-mediated translation. A model can perform extremely well on manifestational benchmarks while the relevant educational task concerns structural understanding or generative capacity. Another system can produce lengthy contextual explanations without enabling the user to generate or evaluate a concept independently. Conversely, a concise prompt or example can sometimes activate substantial target-side generation even when it does not reproduce the source exposition. Evaluation should therefore declare the translation mode before selecting metrics or interpreting apparent success.

4.6 Comparative Scope of Translation Modes

The comparison in Table 3 clarifies why generative translation is not a universal endpoint of translation practice. Many translation tasks are appropriately completed at the manifestational level. Others require structural precision and may legitimately constrain the terminal target form. Generative translation becomes analytically useful where the aim includes cross-system understanding through target-side formation, especially in scholarly dialogue, education, interdisciplinary exchange, conceptual mediation, and other contexts where participants need to reproduce the problem-forming capacity of an idea rather than merely receive its finished expression.

The section therefore establishes the mode boundary used by the generative reconstruction that follows. Manifestational translation concerns the admissibility of target presentations. Structural translation concerns relations among already-formed organizations. Generative epistemic translation concerns mediation of conditions for local formation and introduces a non-closure requirement on the terminal

Table 3: Analytical scope of manifestational, structural, and generative translation modes in the present GR formalism.

Mode	Primary retained object	Local translation objective	Principal limit of a successful local claim
Manifestational	Context-accessible presentations in $\mathcal{M}_{\mathcal{L}}$	Produce an admissible target manifestation for the declared task and context	Does not establish relational, historical, or generative correspondence without a bridge
Structural	Selected epistemic objects, relations, operations, and formation relations	Represent, compare, preserve, or explicitly transform already-formed organization	Does not establish that the target can locally generate the represented object or its alternatives
Generative	Selected formation-relevant conditions together with target-side resources for local formation	Reconstruct or activate conditions through which the target system can form an intelligible local object	Does not require replication of source history or a source-prescribed terminal manifestation; adequacy depends on justified condition selection and target-side role realization

target object. Section 5 develops the missing formal step: how a task-relative subset of a source formation profile can be identified as generatively relevant and how a heterogeneous target system can supply non-identical resources that perform corresponding generative work.

5 Meta-Level Mediation for Generative-Condition Reconstruction

This section develops the condition-selection step left open by Section 4. Its role is to specify what is mediated when a translation episode aims to support target-side formation rather than to deliver a completed target object. The objective is to derive a task-relative relation among source formation structure, candidate generative conditions, generative roles, and target-side resources while preserving the distinction between historical identity and functional contribution. The section first selects candidate generative conditions from a source formation profile, then types the roles those conditions perform, defines a target-side resource carrier and realization relation, and finally states the underdetermination and validation obligations that follow from heterogeneous target realization. The method is formal and reconstructive. The resulting objects remain analytical representations: they organize claims about generative mediation without establishing that one universal set of conditions governs conceptual formation across domains.

5.1 Candidate Generative Conditions: Formation-Profile Selection

Section 3 distinguished a historically supported formation profile from the stronger claim that each retained historical relation is generatively required. Generative translation therefore begins with an additional selection. For a fixed translation episode ε , write $z_S := z_{\mathcal{L}^S; \kappa, \rho}$ for the retained source object

defined by Equation 7, and let $\mathfrak{F}_{\kappa,\rho}^S(z_S; \Sigma_S)$ denote its source-side formation profile. Introduce a task-relative generative selector $\text{Sel}_{\varepsilon,\kappa,\rho}^G$ whose output is stated in Equation 13.

$$\mathcal{C}_{\varepsilon,\kappa,\rho}^S(z_S) := \text{Sel}_{\varepsilon,\kappa,\rho}^G(\mathfrak{F}_{\kappa,\rho}^S(z_S; \Sigma_S)). \quad (13)$$

The elements of $\mathcal{C}_{\varepsilon,\kappa,\rho}^S(z_S)$ are *candidate generative conditions*. The adjective *candidate* is substantive. Membership records a justified hypothesis that a retained source-side condition performs generative work relevant to the declared task. It does not by itself establish necessity, sufficiency, historical uniqueness, or universal portability.

The selector in Equation 13 must be methodologically grounded. Depending on the domain, a condition can be selected because historical evidence shows that it reorganized a problem space, a formal dependency shows that an operation cannot be performed without a prerequisite, a pedagogical intervention shows that learners can form a distinction after a particular contrast is introduced, or an interpretive reconstruction identifies a problem configuration that makes a concept intelligible. The evidential mode and claim strength should be recorded with the local application. A remembered genealogy or a plausible analogy is insufficient when the application requires historical or empirical support.

Definition 5.1 (Candidate generative condition). For a fixed episode $(\varepsilon, \kappa, \rho)$, a retained source-side condition $c \in \mathfrak{F}_{\kappa,\rho}^S(z_S; \Sigma_S)$ is a candidate generative condition when c is selected by $\text{Sel}_{\varepsilon,\kappa,\rho}^G$ under an explicitly stated justification that links c to the formation task represented by κ . The definition assigns no stronger modal status than the justification establishes.

Definition 5.1 prevents the generative formalism from converting intellectual history into a catalogue of necessary causes. A historically important institution can be dispensable for target-side formation. A distinction absent from the source’s realized path can become useful in the target system. A source condition can also matter because it constrains a problem rather than because it directly produces a terminal concept. The selector therefore identifies formation-relevant contributions at the resolution required by the translation task.

5.2 Generative Roles and Condition Abstraction

Cross-system mediation becomes overly restrictive if it requires the target system to reproduce selected source conditions in their historical identity. The present formalism therefore separates a condition from the generative role for which the condition is retained. Let $\mathcal{R}_{\varepsilon,\kappa,\rho}^G$ denote the declared role vocabulary for the episode, and let the role assignment be given by Equation 14.

$$\text{Role}_{\varepsilon,\kappa,\rho}^S : \mathcal{C}_{\varepsilon,\kappa,\rho}^S(z_S) \longrightarrow \mathcal{R}_{\varepsilon,\kappa,\rho}^G. \quad (14)$$

A role describes the contribution for which a source condition matters to the declared formation task. Possible roles include making a problem salient, opening or stabilizing a distinction, enabling an epistemic operation, constraining an admissible solution class, providing a counterexample, connecting previously separate domains, or stabilizing a practice sufficiently for subsequent development. These labels are examples rather than a closed ontology of generativity. An application can refine or replace them when another role vocabulary better fits its evidence.

The source-side generative package is the condition–role relation stated in Equation 15.

$$\mathcal{G}_{\varepsilon,\kappa,\rho}^S(z_S) := \{ (c, \text{Role}_{\varepsilon,\kappa,\rho}^S(c)) \mid c \in \mathcal{C}_{\varepsilon,\kappa,\rho}^S(z_S) \}. \quad (15)$$

Equation 15 is the first meta-level step in the present sense. The term *meta-level* does not mean that mediation must move to more abstract vocabulary. A concrete example, experiment, contrast, institutional scenario, or mathematical construction can serve as a generative condition. The change of level concerns analytical role: mediation addresses conditions that organize the formation of an epistemic object rather than only the terminal manifestation of that object.

Caution 5.2 (Role abstraction and historical explanation). A role assignment in Equation 14 is a task-relative analytical abstraction. It does not replace the source condition’s historical description, establish that the role exhausts its significance, or imply that conditions assigned the same role are historically equivalent.

Caution 5.2 is especially important for cross-disciplinary and cross-cultural applications. Two traditions can contain resources that make comparable distinctions available while the meanings, institutional histories, normative implications, and surrounding operations of those resources remain substantially different. Generative mediation can use the declared role correspondence without converting that local compatibility into a global equivalence claim.

5.3 Target-Side Resource Carriers

The target system should be searched for resources before source conditions are reproduced by default. Let $\mathcal{L}^T$ be the target language system assigned by episode ε . A task-specific resource projection $\Pi_{\varepsilon, \kappa, \rho}^{\text{res}}$ selects from the represented target system those epistemic objects, relations, operations, historically retained linkages, and other local structures that can participate in formation. The target resource carrier is defined in Equation 16.

$$\mathcal{U}_{\varepsilon, \kappa, \rho}^T := \Pi_{\varepsilon, \kappa, \rho}^{\text{res}}(\mathcal{L}^T). \quad (16)$$

The carrier can include already available concepts, examples, distinctions, inferential operations, practices, institutional forms, historical analogies, or combinations of these resources. It can also be empty at the declared resolution, in which case the mediation task can remain unresolved or require an explicit revision of the represented target system before a later analysis. The present episode does not silently add new primitive resources to $\mathcal{U}_{\varepsilon, \kappa, \rho}^T$; novelty is permitted at the level of configurations and formed target objects. Equation 16 therefore does not assume that every source-side generative role already has a target counterpart.

A target resource should be evaluated by the work it can perform inside the target system rather than by resemblance to the source condition alone. Let $\text{Sub}(\mathcal{U}_{\varepsilon, \kappa, \rho}^T)$ denote the family of target-resource subconfigurations admitted by the representation at the declared resolution. Introduce the target realization relation in Equation 17.

$$\text{Real}_{\varepsilon, \kappa, \rho}^T \subseteq \mathcal{R}_{\varepsilon, \kappa, \rho}^G \times \text{Sub}(\mathcal{U}_{\varepsilon, \kappa, \rho}^T). \quad (17)$$

A pair $(r, U_T) \in \text{Real}_{\varepsilon, \kappa, \rho}^T$ means that the target-side subconfiguration U_T is supported, under the declared method and constraints, as capable of realizing role r for the local formation task. The relation is deliberately many-to-many. One target configuration can realize several roles, and one role can admit several target realizations.

The relation in Equation 17 also permits partial failure. A role can lack a supported target realization. A proposed realization can remain contested or evidentially unresolved. In such cases the formalism records the missing bridge rather than filling it with a familiar-looking source analogue. This feature is central to epistemic humility developed in Section 7: the absence of an immediately recognized target resource does not license the conclusion that the target system lacks the relevant capacity at every resolution or under every reformulation.

5.4 Meta-Level Mediation through Generative Roles

The preceding constructions permit a precise statement of meta-level mediation. The source system supplies candidate generative conditions and their declared roles; the target system supplies locally available or constructible resources; and the mediation relation links them through role realization. Define the family of target realizations compatible with the complete source generative package by Equation 18.

$$\mathfrak{U}_{\varepsilon, \kappa, \rho}^T(z_S) := \{U_T \in \text{Sub}(\mathcal{U}_{\varepsilon, \kappa, \rho}^T) \mid \forall (c, r) \in \mathcal{G}_{\varepsilon, \kappa, \rho}^S(z_S), (r, U_T) \in \text{Real}_{\varepsilon, \kappa, \rho}^T\}. \quad (18)$$

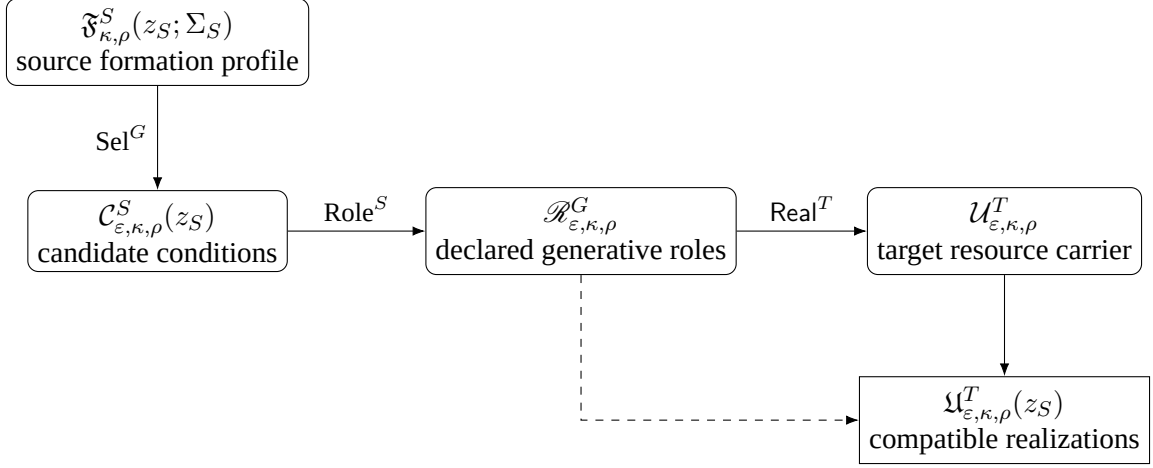


Figure 3: Meta-level generative mediation before terminal target formation. Source formation structure is selected into candidate generative conditions, conditions are typed by their declared generative roles, and target-side resources are evaluated for realization of those roles. The compatible realization family supplies inputs to the open-ended formation analysis in Section 6.

Equation 18 requires a candidate target subconfiguration to realize each role retained in the source generative package. The condition does not require one-to-one matching between source conditions and target resources. A single target structure can jointly realize several source roles, while several target resources can cooperate to realize one role. The equation also does not yet generate a terminal target epistemic object. It identifies target-side configurations under which Section 6 can analyse open-ended formation.

If the source generative package is empty, the universal condition in Equation 18 would be satisfied vacuously. The paper therefore does not classify an empty package as successful meta-level generative mediation. Absence of any supported candidate generative condition is recorded as an unresolved or differently specified translation task rather than as trivial generative success.

Figure 3 summarizes the architecture before target formation is introduced. The middle layer carries generative roles rather than source terminal objects. This organization makes room for target-local resources whose historical identity differs from the source conditions that motivated the role selection.

Definition 5.3 (Meta-level generative mediation). A generative translation episode exhibits meta-level mediation with respect to (ϵ, κ, ρ) when it constructs a nonempty source generative package as in Equation 15, evaluates target-side resources through Equation 17, and retains at least one supported target realization in the family defined by Equation 18. The mediated object is the declared generative-role structure and its target realization, not a requirement that the target reproduce the source condition in historical identity.

Definition 5.3 gives the present paper a more restrictive meaning of meta-translation than a generic move toward abstraction. A mediator can use the target system’s examples, inherited concepts, disciplinary practices, or problem formulations when these resources realize the relevant generative roles. The source concept can remain untranslated at the terminal level during this stage. The success claim concerns reconstruction of a formation-enabling configuration, whose eventual target manifestations remain to be determined.

5.5 Multiplicity, Underdetermination, and Interpretive Closure

Generative mediation can admit more than one target realization. This multiplicity is analytically important because a heterogeneous language system can contain several ways to make the same formation role available. The compatible family in Equation 18 therefore should not be collapsed to a single preferred configuration unless the translation specification supplies an additional criterion.

Table 4: Validation obligations for generative-condition reconstruction.

Claim type	Formal object	Required local justification
Source selection	$c \in \mathcal{C}_{\varepsilon, \kappa, \rho}^S(z_S)$	Evidence or argument linking the retained source condition to the formation task represented by κ
Role assignment	$\text{Role}_{\varepsilon, \kappa, \rho}^S(c) = r$	Explicit account of the contribution for which the condition is retained, with claim strength matched to the supporting method
Target realization	$(r, U_T) \in \text{Real}_{\varepsilon, \kappa, \rho}^T$	Target-side evidence or analysis showing that the proposed resource configuration can perform the declared role under relevant constraints
Realization selection	choice of one U_T from $\mathfrak{U}_{\varepsilon, \kappa, \rho}^T(z_S)$	Additional criterion when several compatible target realizations remain available

Proposition 5.4 (Target realization multiplicity). *If $U_T^{(1)}$ and $U_T^{(2)}$ are distinct members of $\mathfrak{U}_{\varepsilon, \kappa, \rho}^T(z_S)$, the source generative package alone does not select one of them as the unique target realization.*

Proof. Membership in $\mathfrak{U}_{\varepsilon, \kappa, \rho}^T(z_S)$ is determined by satisfaction of the role-realization conditions in Equation 18. If two distinct subconfigurations satisfy those conditions, the definition supplies no additional ordering relation between them. A unique selection therefore requires a further criterion not contained in the source generative package or the realization relation alone. $\square$

Proposition 5.4 creates a direct bridge to interpretive power. A translator, institution, or AI system can choose one admissible realization and present it as the target system’s natural or necessary counterpart. Such a selection may be justified by pedagogical efficiency, legal uniformity, technical interoperability, or another declared objective. The choice becomes epistemically consequential when the criterion remains hidden and alternative target realizations are treated as unavailable merely because the mediation interface did not surface them. Sections 8–9 analyse this closure problem through the paper’s account of interpretive authority and AI-mediated translation infrastructure.

The proposition also limits the role of source-side expertise. Detailed knowledge of the source formation profile can improve selection of generative roles without granting unilateral authority over target realization. Assessing whether a target configuration genuinely performs the relevant work can require target-side linguistic, historical, disciplinary, or practical knowledge. Generative translation is therefore structurally compatible with collaborative mediation in which source and target participants contribute different evidential access.

5.6 Validation Obligations for Generative-Condition Reconstruction

The formalism developed in this section introduces three distinct claims that should be validated separately. First, the source-selection claim states that a retained source condition is generatively relevant to the declared task. Second, the role-assignment claim states what contribution the selected condition performs. Third, the target-realization claim states that a target-side configuration can perform that contribution under the target system’s constraints. Evidence for one claim does not automatically establish the others.

Table 4 summarizes these obligations. The table is a methodological checklist for applications of the present formalism rather than a universal hierarchy of evidence.

The separation in Table 4 helps prevent a common overextension. A persuasive history of the source concept can identify why certain conditions mattered in its formation, yet it does not establish that the same conditions should be imported into the target system. Conversely, a target-side practice can realize an analogous generative role without sharing the source history. The formalism therefore treats historical reconstruction and target realization as coupled but partially independent evidential tasks.

The section yields the mediation object required for target-side formation analysis. A source formation profile is filtered into candidate generative conditions, those conditions are typed by declared roles, and heterogeneous target resources are evaluated for their capacity to realize the same task-relative roles. Meta-level mediation therefore transports neither a terminal expression nor a complete historical package. It reconstructs a supported formation-enabling configuration while retaining multiplicity where several target realizations remain admissible. Section 6 adds the missing terminal condition: how a target epistemic object can emerge from such a configuration while the mediation remains open to more than one admissible target formation.

6 Open-Ended Target Formation: Non-Closure Conditions

This section specifies the terminal-formation condition left open by Sections 4 and 5. Its role is to distinguish generative epistemic translation from mediation that reconstructs generative conditions only as an indirect route to a predetermined target conclusion. The objective is to define how a compatible target realization can support formation of one or more target-local epistemic objects while retaining explicit task, evidential, logical, procedural, and normative constraints. The section first introduces a target-formation relation, then defines a constrained family of admissible target outcomes, formalizes non-closure as a condition on the success criterion of the episode, and distinguishes *ex ante* openness from *ex post* convergence. The method is formal and reconstructive. The resulting representation does not treat plurality as intrinsically desirable and does not suspend ordinary requirements of truth, evidence, coherence, safety, legality, or domain-specific validity.

6.1 Target-Local Formation: Compatible Realizations

Section 5 ended with a family $\mathfrak{U}_{\varepsilon, \kappa, \rho}^T(z_S)$ of target-side resource configurations that realize the declared generative roles selected from the source formation profile. The next analytical step concerns what can be formed when one such configuration becomes available inside the target language system. Let $\mathcal{X}_{\mathcal{L}^T}$ denote the target epistemic-object class introduced in Section 2. Define the task-relative target-formation relation in Equation 19.

$$\text{Form}_{\varepsilon, \kappa, \rho}^T \subseteq \mathfrak{U}_{\varepsilon, \kappa, \rho}^T(z_S) \times \mathcal{X}_{\mathcal{L}^T}. \quad (19)$$

A pair $(U_T, x_T) \in \text{Form}_{\varepsilon, \kappa, \rho}^T$ records the local claim that, under the declared episode and resolution, the target resource configuration U_T can participate in the formation of the target epistemic object x_T . The relation is intentionally weaker than a deterministic production law. It can represent historical, pedagogical, dialogical, inferential, institutional, or computational formation processes whose relevant evidence differs across applications.

The word *formation* also remains task relative. In a scholarly dialogue, x_T can be a newly articulated distinction or problem formulation. In education, it can be an independently generated explanation or conceptual organization. In interdisciplinary mediation, it can be a target-disciplinary construction that responds to a source problem while using different primitives. In a formal domain, formation can be represented more strictly through derivation or construction rules. The present paper does not identify these processes with one another. Equation 19 provides a common place to state which target-local formation claim an application is actually making.

The relation in Equation 19 should therefore be supported by evidence appropriate to the domain. A translator’s intuition that a target audience *could* form a concept is insufficient when the application requires historical, pedagogical, empirical, or formal support. The relation is a representation of a claim to be justified, not a device that converts an interpretive preference into a proven generative mechanism.

6.2 Constraint Families and Admissible Target Outcomes

Open-ended formation requires constraints. Without them, the fact that a target system can generate many objects says little about whether the mediation remains responsive to the source-side problem or to the declared task. Let $\mathcal{Q}_{\varepsilon, \kappa, \rho}^T$ denote a finite or otherwise application-manageable family of declared admissibility predicates. Each predicate $q \in \mathcal{Q}_{\varepsilon, \kappa, \rho}^T$ acts on a pair (U_T, x_T) and returns whether a local requirement is satisfied. The requirements can concern empirical adequacy, logical consistency, fidelity to a retained problem, legal or institutional constraints, safety, evidential support, disciplinary practice, normative commitments, or another criterion explicitly included in the translation specification.

The family of admissible target outcomes is defined in Equation 20.

$$\mathfrak{X}_{\varepsilon, \kappa, \rho}^T(z_S) := \left\{ x_T \in \mathcal{X}_{\mathcal{L}^T} \mid \begin{array}{l} \exists U_T \in \mathfrak{U}_{\varepsilon, \kappa, \rho}^T(z_S) \text{ such that } (U_T, x_T) \in \text{Form}_{\varepsilon, \kappa, \rho}^T, \\ q(U_T, x_T) = 1 \text{ for each } q \in \mathcal{Q}_{\varepsilon, \kappa, \rho}^T \end{array} \right\}. \quad (20)$$

Equation 20 makes two restrictions explicit. First, an admissible terminal object must be connected to at least one target resource configuration that realizes the selected generative roles. Second, it must satisfy the declared target-side constraints. The outcome family is therefore neither a set of arbitrary expressions nor a catalogue of everything the target system can say. It is a task-relative set of locally formable and constraint-compatible epistemic objects.

The admissibility predicates should be stated at the lowest level required by the application. A historical interpretation may require documentary compatibility and consistency with the target concept's attested usage. A scientific translation may require empirical or formal constraints. A normative dialogue can require consistency with declared rights, procedural commitments, or other justified standards. The framework permits strong constraints. Its non-closure condition concerns the basis on which terminal success is defined, rather than the weakness of those constraints.

Definition 6.1 (Constraint-compatible target formation). A target epistemic object x_T is constraint-compatible for a generative translation episode $(\varepsilon, \kappa, \rho)$ when $x_T \in \mathfrak{X}_{\varepsilon, \kappa, \rho}^T(z_S)$ as defined by Equation 20.

Definition 6.1 separates open-endedness from unrestricted relativism. A target-local formation can depart substantially from the source concept and still fail the episode because it does not respond to the retained problem, violates a declared formal requirement, contradicts relevant evidence, or fails another justified constraint. Conversely, a target object can differ from a familiar source formulation while remaining admissible when the generative roles and declared constraints are satisfied through target-local resources.

6.3 Terminal Prescription and the Non-Closure Condition

The outcome family in Equation 20 does not yet distinguish generative mediation from a procedure that permits target-side activity only until the target reproduces a preferred source result. An additional object is needed to represent terminal prescription. Let $\mathcal{P}_{\varepsilon, \kappa, \rho}^T(z_S) \subseteq \mathcal{X}_{\mathcal{L}^T}$ denote a *source-prescribed terminal family*: the set of target objects that an episode designates as successful because they reproduce, instantiate, or fall within a source-preferred terminal interpretation of z_S . The family may contain one object, an equivalence class, or several explicitly permitted variants.

Terminal prescription is not inherently defective. Technical standardization, legal implementation, safety-critical instruction, language certification, and many forms of education legitimately specify a required terminal result. The formal distinction matters because these tasks make a different success claim from generative epistemic translation as defined in this paper.

Definition 6.2 (Generative non-closure). A generative translation episode satisfies non-closure with respect to $(\varepsilon, \kappa, \rho)$ when terminal success is determined by constraint-compatible target formation in $\mathfrak{X}_{\varepsilon, \kappa, \rho}^T(z_S)$. Membership in the source-prescribed terminal family $\mathcal{P}_{\varepsilon, \kappa, \rho}^T(z_S)$ is not an additional success requirement. A source-preferred outcome can remain admissible, while its source-preferred status alone does not define generative success.

Definition 6.2 gives precise content to the fourth requirement in Definition 4.3. The condition does not require the translator to be indifferent among outcomes. A mediator can argue that one target formation has stronger evidence, greater coherence, better explanatory reach, or greater normative justification than another. Those judgments become part of the declared constraint and evaluation structure and remain open to examination. The condition only separates such reasons from a circular criterion in which the target counts as successful because it has reproduced the conclusion that the source system supplied at the outset.

This distinction is particularly important for scholarly and interdisciplinary dialogue. Suppose a source concept z_S was generated through a problem configuration that can be reconstructed in the target system. If the target participant, using locally available resources, forms x_T that addresses the retained problem through a different conceptual architecture, non-closure permits evaluation of x_T on the declared criteria. A closed episode would treat the divergence itself as failure because the target did not return to the source-preferred concept. The former procedure allows the translation event to become epistemically productive for both systems; the latter can still be useful, but its analytical form is closer to transmission, instruction, standardization, or persuasion.

The non-closure condition also clarifies the meaning of *meta-level* in Section 5. The mediator moves to a level at which formation-relevant roles can be identified and reconstructed, then releases terminal determination back to the target-side formation process under explicit constraints. Merely redescribing the source conclusion in increasingly abstract language does not satisfy this condition when the abstraction remains organized so that only one preselected terminal reproduction can count as success.

6.4 Ex Ante Openness and Ex Post Convergence

A non-closed translation episode does not require the admissible outcome family to remain permanently plural. Strong target-side evidence or structural constraints can narrow the family substantially. In some applications, the final family can contain one supported target object. The relevant distinction concerns how that result is reached.

Proposition 6.3 (Ex post uniqueness under generative non-closure). *Suppose a generative translation episode satisfies Definition 6.2. If the declared formation relation and admissibility predicates yield $\mathfrak{X}_{\varepsilon, \kappa, \rho}^T(z_S) = \{x_T^*\}$, then the uniqueness of x_T^* does not by itself convert the episode into a terminally closed translation.*

Proof. By Definition 6.2, generative success is evaluated through the constraint-compatible family in Equation 20. No additional source-prescribed terminal membership is required. If the formation relation and declared predicates admit only x_T^* , the singleton result follows from the target-side formation and constraint structure. Terminal closure would require a further success condition defined by source prescription. Singleton cardinality alone supplies no such condition. $\square$

Proposition 6.3 prevents open-endedness from being confused with an obligation to preserve disagreement or multiplicity. A generative procedure can converge. Its distinctive feature is that convergence remains an outcome of the mediated formation process and its explicit evaluative constraints rather than a condition silently imposed by the source terminal object.

The reverse point also matters. A large admissible family does not prove that an episode is epistemically open in the relevant sense. A mediator can present many stylistic variants while restricting each variant to the same source-prescribed conceptual endpoint. Surface diversity then coexists with terminal closure. The unit of analysis is therefore the success criterion operating on target epistemic objects, not the number of sentences, examples, or formulations produced by the interface.

This distinction becomes especially useful for AI systems. A language model can generate dozens of apparently diverse responses while all are organized around one latent framing selected by the prompt, retrieval corpus, system instruction, benchmark, or model’s learned defaults. Conversely, a short interaction can be genuinely generative when it exposes formation-relevant conditions and permits the user to construct an outcome whose admissibility is assessed through explicit reasons rather than resemblance

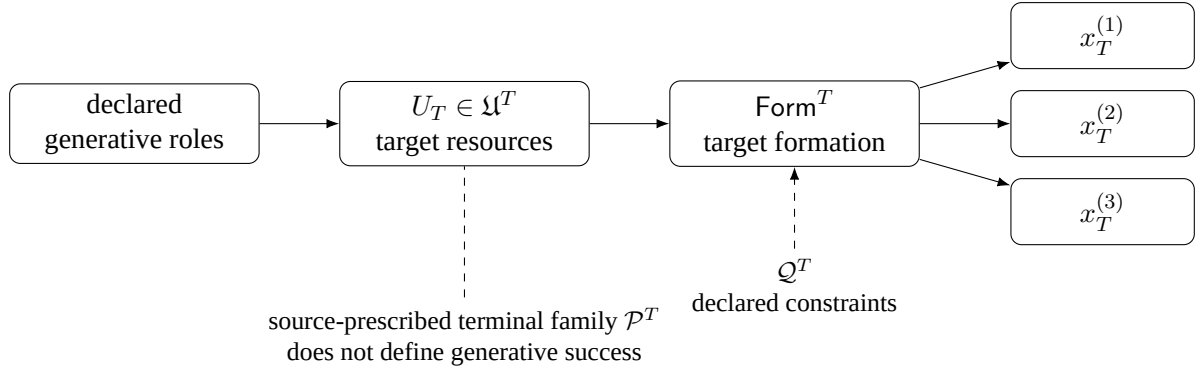


Figure 4: Open-ended target formation under generative non-closure. Declared generative roles are realized through target-local resources. The target-formation relation and explicit constraint family determine admissible outcomes. A source-preferred terminal family may be known to the mediator, yet membership in that family does not define generative success. The displayed plurality is illustrative; the admissible family can converge to one object under target-side evidence and constraints.

to a hidden answer key. Section 9 returns to this issue when analysing how AI mediation distributes the capacity to select frames, admissibility criteria, and terminal interpretations.

6.5 Open-Ended Formation as a Relational Process

The preceding construction can be summarized as a relation among source formation support, declared generative roles, target-local resources, and terminal outcomes. Figure 4 displays the architecture. The source-side contribution narrows the problem through role selection; target-side resources realize those roles; the formation relation and explicit constraints define an admissible outcome family; and non-closure prevents a source-preferred terminal family from serving as an additional hidden success filter.

The architecture in Figure 4 should be read relationally. The terminal target object is formed through a configuration that includes the target language system, the selected resources, the participant or institution performing the formation, the translation episode, and the declared criteria. An object generated in one configuration need not remain equally available after those relations change. Generative translation therefore concerns the creation or activation of a formation-supporting relation rather than the delivery of a detachable informational payload.

This relational view also allows the source system to learn from the target outcome. If x_T diverges from the source-preferred terminal object while satisfying the declared constraints, the divergence can reveal that the source concept bundled together conditions that the target system can separate, relied on a historically local distinction, or failed to represent a possibility available in the target language system. A subsequent translation episode can therefore revise the source-side generative package. The present section does not formalize this reciprocal updating dynamics; Section 10 considers broader generative consequences of cross-system knowledge formation.

6.6 Validation Obligations for Open-Ended Formation

The formalism in this section adds three validation obligations to those stated in Table 4. First, an application must justify the target-formation relation: evidence is needed for the claim that the proposed resource configuration can participate in the formation of the target object. Second, admissibility predicates must be explicit enough to distinguish target-local generation from arbitrary variation. Third, the episode must disclose any terminal prescription that operates in practice, especially when a benchmark, curriculum, institution, or AI interface treats one conclusion as the expected answer while describing the process as open inquiry.

Table 5: Validation obligations for open-ended target formation.

Validation object	Formal representation	Required local justification
Formation support	$(U_T, x_T) \in \text{Form}_{\varepsilon, \kappa, \rho}^T$	Evidence or argument that the target resource configuration can participate in formation of the claimed target epistemic object
Admissibility constraints	$\mathcal{Q}_{\varepsilon, \kappa, \rho}^T$	Explicit reason for each retained constraint and a statement of the domain in which it applies
Outcome admissibility	$x_T \in \mathfrak{X}_{\varepsilon, \kappa, \rho}^T(z_S)$	Demonstration that the object is both locally formable and compatible with the declared constraints
Terminal prescription	$\mathcal{P}_{\varepsilon, \kappa, \rho}^T(z_S)$	Disclosure and justification when a source-preferred terminal family is imposed for instructional, legal, technical, safety, or other purposes
Non-closure claim	Definition 6.2	Evidence that generative success is assessed through target formation and declared constraints rather than an undisclosed source-prescribed terminal filter

Table 5 also marks a boundary between generative translation and adjacent practices. A classroom exercise with a required canonical answer can still use generative pedagogy, but its terminal criterion is closed for the local exercise. A legal translation can legitimately require terminological uniformity. A safety-critical technical translation can restrict outputs more strongly than an exploratory scholarly conversation. The present framework does not rank these arrangements. It asks that the terminal condition be represented accurately so that openness, instruction, standardization, persuasion, and enforcement are not conflated.

The section completes the minimum formal architecture of generative epistemic translation. A source formation profile supplies candidate generative conditions; those conditions are typed by generative role; target-local resources realize the roles; a target-formation relation connects compatible realizations to locally formed epistemic objects; declared constraints define the admissible outcome family; and generative non-closure prevents source-preferred terminal reproduction from functioning as an additional hidden success criterion. This architecture permits strong evaluation and even unique convergence while preserving a target system’s role in terminal formation. Section 7 develops the epistemic stance required to operate such an architecture responsibly across heterogeneous language systems: epistemic humility as disciplined restraint in the exercise of source-side judgment and interpretive authority.

7 Epistemic Humility: Heterogeneous Language Systems

This section introduces the epistemic stance required by the generative architecture developed in Sections 5 and 6. Its role is to regulate the use of evaluative resources when a source language system encounters target-side formations whose concepts, distinctions, and justificatory practices are only partially shared. The objective is to formalize *epistemic humility* as scope discipline over cross-system judgment: source-side standards may contribute to evaluation when their target-side applicability is justified, while unsupported extensions of source authority are suspended. The section first distinguishes this episode-level notion from broader accounts of intellectual humility, then represents source-side judgment resources and their cross-system lifting, derives a humility condition for the provenance of target

constraints, and finally clarifies the relation among suspension, disagreement, strong evaluation, and reciprocal learning. The method is formal and normative-reconstructive. The resulting condition does not imply equal warrant among claims, cultural relativism, or the abandonment of empirical, logical, legal, ethical, or safety constraints.

7.1 Epistemic Humility as Scope Discipline

Philosophical work on intellectual humility commonly treats humility as involving an appropriate relation to one’s epistemic limitations. Whitcomb, Battaly, Baehr, and Howard-Snyder, for example, develop an account organized around appropriately owning one’s intellectual limitations [12]. The present paper uses a narrower construction. It does not attempt to characterize a person’s global virtue, personality, or intellectual character. It asks when a translation episode should withhold the presumption that an evaluative resource formed inside one represented language system automatically governs another.

Let $\mathcal{J}_{\varepsilon, \kappa, \rho}^S$ denote the family of source-side judgment resources retained for translation episode ε . A judgment resource can be an evidential criterion, inferential rule, classificatory distinction, standard of explanation, disciplinary norm, interpretive convention, or another evaluative operation represented as relevant to the declared task. Its inclusion in $\mathcal{J}_{\varepsilon, \kappa, \rho}^S$ records availability inside the source-side evaluative structure. It does not yet establish target-side authority.

The distinction between availability and authority is necessary because heterogeneous language systems can organize intelligibility through different historical distinctions, practices, and interpretive resources. Work on epistemic injustice supplies an adjacent reason for caution: Fricker’s account of hermeneutical injustice examines cases in which unequal participation in shared interpretive resources can impair a subject’s capacity to render experience intelligible [13]. Medina likewise emphasizes epistemic interaction, social insensitivity, imposed silences, and the possibility of mutually enriching perspectives under conditions of epistemic inequality [14]. Recent philosophy of translation goes closer still: Vannini develops epistemic translatability as a structural response to hermeneutical injustice and explicitly locates translation across conceptual, institutional, material, and political levels [21]. The present paper therefore does not claim that translation requires epistemic humility, mutual intelligibility, or structural attention as new insights. Its narrower formal move is to represent one episode-level test: a source-derived judgment may enter the target admissibility family only through an explicit bridge warrant whose scope can itself be inspected.

Definition 7.1 (Episode-level epistemic humility). For a fixed generative translation episode $(\varepsilon, \kappa, \rho)$, epistemic humility is the discipline of treating source-side judgment resources as scope-limited and requiring an explicit justification before a source-side evaluative resource is used to constrain target-side formation. Where the required justification is unavailable, the source-side judgment is suspended with respect to target admissibility. The definition concerns cross-system authority in the episode and does not imply that the suspended judgment is false, that target-side claims are equally warranted, or that evaluation is generally unavailable.

Definition 7.1 makes humility procedural before it becomes dispositional. A translator can possess deep expertise in the source system and still satisfy the definition by distinguishing source expertise from target jurisdiction. Conversely, a polite or self-effacing translator can violate the condition by silently encoding source-local standards as if they were target-neutral. The relevant object is therefore the structure of evaluation in the translation episode rather than the mediator’s tone.

7.2 Cross-System Lifting of Judgment Resources

Section 6 represented target admissibility through the predicate family $\mathcal{Q}_{\varepsilon, \kappa, \rho}^T$. Some predicates in that family can arise from target-local evidential or disciplinary requirements. Others can originate in the source system and remain appropriate for the target task. A numerical conservation law, a treaty-defined term, an experimentally established measurement constraint, or a formally stated safety requirement can

retain cross-system force when the relevant bridge is justified. Epistemic humility therefore cannot be represented by prohibiting source-derived evaluation.

Introduce the partial source-to-target judgment-lifting relation in Equation 21.

$$\text{Lift}_{\varepsilon, \kappa, \rho}^{S \rightarrow T} \subseteq \mathcal{J}_{\varepsilon, \kappa, \rho}^S \times \mathcal{Q}_{\varepsilon, \kappa, \rho}^T. \quad (21)$$

A pair $(j_S, q_T) \in \text{Lift}_{\varepsilon, \kappa, \rho}^{S \rightarrow T}$ records the claim that source-side judgment resource j_S has a justified target-side realization as admissibility predicate q_T for the declared episode. The relation is partial because some source judgments lack a supported target application. It is relational rather than functional because one source resource can support several target predicates at different resolutions, and several source resources can jointly justify one target predicate.

A valid lift requires a *bridge warrant*. The warrant states why the evaluative role performed by j_S remains applicable to the target formation task and why q_T is an appropriate target-side realization of that role. The warrant can be formal, empirical, legal, historical, procedural, or normative, depending on the judgment being lifted. Source prestige, disciplinary dominance, institutional familiarity, or model frequency are not sufficient warrants by themselves.

Definition 7.2 (Bridge-warranted judgment lift). A pair (j_S, q_T) in Equation 21 is bridge-warranted when the application states evidence or argument connecting the source-side evaluative role of j_S to the target-side use of q_T under the declared translation specification κ and resolution ρ . The warrant must establish target relevance at the level actually claimed; resemblance of terminology or institutional authority alone does not establish the lift.

The lifting relation preserves a difference between *translation of a judgment* and *transfer of jurisdiction*. A source system can explain how it evaluates an object without thereby proving that its criterion should determine target admissibility. The first activity is manifestational or structural translation of an evaluative practice. The second requires the additional bridge represented by Equation 21.

7.3 Constraint Provenance and Second-Order Non-Closure

Generative non-closure in Definition 6.2 prevents membership in a source-prescribed terminal family from serving as an additional hidden success condition. That condition is necessary, yet it is not sufficient to protect target-side formation from source-system closure. A source system could omit an explicit terminal prescription while importing source-local standards into $\mathcal{Q}_{\varepsilon, \kappa, \rho}^T$ so strongly that only source-favored outcomes satisfy the target constraint family. The terminal rule would appear open while the constraint architecture reproduced the same closure indirectly.

To make this possibility visible, let $\mathcal{Q}_{\varepsilon, \kappa, \rho}^{S \rightsquigarrow T}$ denote the subset of target admissibility predicates whose operative justification originates materially from source-side judgment resources. The notation records provenance rather than inferiority. A source-derived constraint can be indispensable. The humility requirement is stated in Equation 22.

$$q_T \in \mathcal{Q}_{\varepsilon, \kappa, \rho}^{S \rightsquigarrow T} \implies \exists j_S \in \mathcal{J}_{\varepsilon, \kappa, \rho}^S \text{ such that } (j_S, q_T) \in \text{Lift}_{\varepsilon, \kappa, \rho}^{S \rightarrow T} \text{ is bridge-warranted.} \quad (22)$$

Equation 22 is a second-order condition on the constraint family. It does not ask whether q_T is satisfied. It asks whether a source-originating reason is entitled to participate in defining target admissibility in the first place. When the condition fails, the relevant source judgment remains available for explanation, criticism, or later reconsideration, while its authority to filter the target outcome family is suspended.

Proposition 7.3 (Non-closure requires constraint-level scrutiny). *Satisfaction of Definition 6.2 does not by itself establish episode-level epistemic humility. A translation episode can omit a source-prescribed terminal requirement while source-derived predicates in $\mathcal{Q}_{\varepsilon, \kappa, \rho}^T$ effectively restrict admissible target formation. Epistemic humility therefore requires independent examination of the provenance and bridge warrants of source-originating target constraints.*

Proof. Definition 6.2 removes membership in $\mathcal{P}_{\varepsilon, \kappa, \rho}^T(z_S)$ as an additional success requirement. Equation 20, however, also requires satisfaction of each predicate in $\mathcal{Q}_{\varepsilon, \kappa, \rho}^T$. A family of source-derived predicates can therefore exclude target outcomes independently of $\mathcal{P}_{\varepsilon, \kappa, \rho}^T(z_S)$. Whether those predicates possess legitimate cross-system force is a distinct question represented by Equation 22. $\square$

Proposition 7.3 gives the humility condition a precise role in the architecture of the paper. Section 6 addressed closure at the level of terminal results. The present section addresses closure at the level of *criterion formation*. A generative interface can therefore be open with respect to conclusions while remaining closed with respect to the evaluative vocabulary through which conclusions become admissible.

7.4 Suspension, Disagreement, and Strong Evaluation

Suspension in Definition 7.1 is local to a cross-system application. It does not erase the source judgment from the source system, and it does not require the source participant to abandon confidence in that judgment. The mediator can continue to state that j_S is well supported within its source domain while withholding the stronger claim that j_S determines target admissibility. This distinction is especially important where the target system lacks an established analogue of the source criterion or where the translation episode itself is investigating whether such an analogue should be constructed.

Suspension also differs from deference. Epistemic humility does not require automatic acceptance of target-local standards. Target-side judgment resources can be historically contingent, internally contested, empirically weak, discriminatory, or otherwise inadequate to the declared task. They remain subject to evidence, argument, and the task-specific admissibility structure. The present framework therefore permits criticism in both directions while demanding that the basis and scope of that criticism be declared.

The compatibility between humility and strong evaluation follows directly from the target outcome definition. Figure 5 summarizes the resulting evaluation architecture, including the distinction between bridge-warranted lifting and suspension.

Proposition 7.4 (Strong evaluation under epistemic humility). *Assume an episode satisfies Equation 22. If a target outcome x_T fails a target-local admissibility predicate or a bridge-warranted source-derived predicate in $\mathcal{Q}_{\varepsilon, \kappa, \rho}^T$, then x_T can be excluded from $\mathfrak{X}_{\varepsilon, \kappa, \rho}^T(z_S)$ without violating episode-level epistemic humility.*

Proof. Equation 20 requires every admissible target outcome to satisfy each declared predicate in $\mathcal{Q}_{\varepsilon, \kappa, \rho}^T$. Equation 22 constrains the authority of source-derived predicates by requiring a bridge-warranted lift. Once a predicate is target-local or bridge-warranted, exclusion for failure of that predicate follows from the declared admissibility architecture rather than from unsupported source jurisdiction. $\square$

Proposition 7.4 separates epistemic humility from a generalized equality of viewpoints. A claim can be rejected because it conflicts with evidence, violates a valid formal constraint, misconstrues an attested historical usage, or fails another justified requirement. The humility condition concerns the legitimacy and scope of the criterion used in making that judgment. It does not weaken a criterion after its applicability has been established.

7.5 Dialogical Revision and Reciprocal Exposure

A cross-system episode becomes epistemically asymmetric when only the target system is required to expose its internal distinctions to scrutiny while the source system’s judgment resources remain fixed and unexamined. Generative translation need not eliminate asymmetry of expertise, evidence, or institutional responsibility. It can, however, expose source-side criteria to revision when target formation reveals that a source distinction had been treated as more general than its bridge warrant supports.

This possibility can be stated without requiring symmetric convergence. If a target-local outcome satisfies the declared admissibility conditions yet cannot be adequately evaluated by an available source

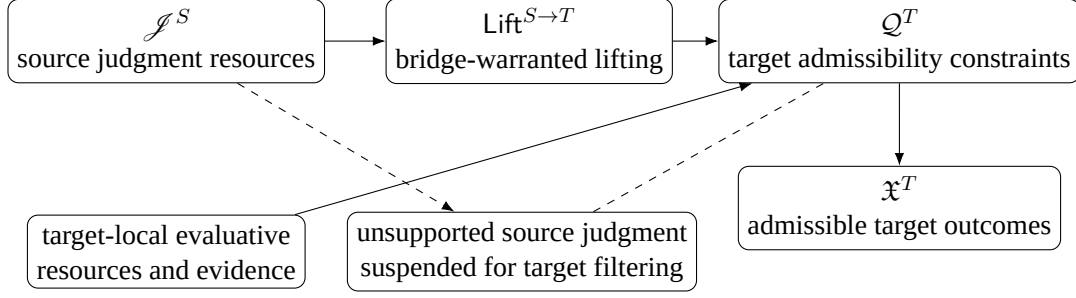


Figure 5: Epistemic humility as scope discipline over cross-system judgment. Source-side judgment resources can contribute to target admissibility through a bridge-warranted lifting relation. Target-local evaluative resources can also contribute directly. A source judgment without a supported lift is retained as an available source judgment while its use as a target filter is suspended.

judgment, the episode has at least three options: construct a stronger bridge warrant, retain the target outcome while marking the source judgment as locally inapplicable, or revise the source-side judgment resource. The correct option depends on evidence and purpose. Epistemic humility requires only that lack of immediate fit not be converted automatically into target deficiency.

Figure 5 summarizes the relation among source judgments, bridge warrants, target constraints, and suspension. The figure places the bridge between source evaluative resources and target admissibility rather than between source and target conclusions. This placement reflects the section’s central claim that humility concerns jurisdiction over evaluation as well as openness of terminal outcomes.

The dashed relation in Figure 5 should not be interpreted as prohibition of discussion. A suspended source judgment can be translated, explained, defended, compared, or tested. Suspension concerns only the presumption that the judgment already possesses target-side filtering authority. This distinction makes room for disagreement without forcing either premature assimilation or premature relativization.

7.6 Validation Obligations for Humble Cross-System Evaluation

Table 6 summarizes the validation obligations added by the preceding construction. An application should identify the source of each materially operative target constraint, justify every source-to-target judgment lift, record judgments whose target authority remains suspended, and distinguish criticism supported by a bridge warrant from criticism based only on source familiarity or prestige.

Table 6 preserves two forms of restraint. Source-side expertise is not dissolved into target-side preference, and target-side difference is not dissolved into source-side deficiency. Cross-system evaluation remains possible through explicit bridges, evidence, and declared constraints. The resulting humility condition is therefore compatible with rigorous disagreement and with domains in which some criteria possess strong cross-system force.

The section also identifies the point at which humility alone becomes insufficient. Equation 22 requires bridge warrants, yet an actual institution, discipline, state, platform, publisher, benchmark, or AI system can possess unequal capacity to decide which warrants count, which constraints enter $Q_{\varepsilon, \kappa, \rho}^T$, and which suspended judgments are treated as authoritative in practice. Section 8 extends the analysis from epistemic stance to relational capacity by examining interpretive power over category selection, bridge recognition, admissibility criteria, and closure of interpretation.

Table 6: Validation obligations for epistemic humility across heterogeneous language systems.

Validation object	Formal representation	Required local justification
Source judgment resource	$j_S \in \mathcal{J}_{\varepsilon, \kappa, \rho}^S$	Evidence that the judgment is relevant to the source-side task and a statement of its source-side scope
Judgment lift	$(j_S, q_T) \in \text{Lift}_{\varepsilon, \kappa, \rho}^{S \rightarrow T}$	Explicit bridge warrant explaining why the evaluative role remains applicable to target formation and why q_T realizes that role
Source-derived target constraint	$q_T \in \mathcal{Q}_{\varepsilon, \kappa, \rho}^{S \rightsquigarrow T}$	Provenance disclosure together with satisfaction of Equation 22
Suspended judgment	source judgment with no supported target lift	Statement that target authority is unresolved rather than silently presumed or categorically denied
Target-local evaluation	target-side evidence or criterion contributing to $\mathcal{Q}_{\varepsilon, \kappa, \rho}^T$	Domain-appropriate justification; target provenance alone does not establish validity
Strong exclusion	$x_T \notin \mathcal{X}_{\varepsilon, \kappa, \rho}^T(z_S)$	Identification of the failed justified predicate rather than appeal to divergence from source familiarity alone

8 Interpretive Power in Epistemic Translation

This section introduces the relational-capacity analysis required once epistemic humility has been stated as a constraint on cross-system judgment. Its role is to identify where unequal capacities can shape a translation episode even when the mediator adopts a humble epistemic stance and the terminal success rule remains non-closed. The objective is to represent *interpretive power* as effective capacity over already defined components of the translation architecture: retained-content selection, generative-condition selection, role assignment, target-resource availability, target-role realization, target-formation support, bridge recognition, admissibility criteria, and terminal prescription. The section first locates the present contribution relative to established translation-and-power scholarship, then bundles the relevant decision sites into an interpretive profile, distinguishes effective power from recognized authority, formalizes upstream and terminal forms of interpretive contraction, and concludes with validation obligations for power analysis. The method is formal and relational. The construction does not treat power as intrinsically illegitimate, does not infer normative domination from asymmetry alone, and does not reduce linguistic or epistemic difference to a scalar hierarchy.

8.1 Translation Power and the Local GR Object

Translation studies already contains extensive analyses of ideology, institutional selection, cultural dominance, resistance, and the political conditions under which translations are produced and received. The present paper therefore does not claim that power in translation is a new research problem. The collection edited by Tymoczko and Gentzler, for example, explicitly treats translation as socially and politically situated and examines how translation can participate in the construction, omission, and reorganization of cultural representations [3]. Heiskanen’s analysis of conceptual translation in international order directly foregrounds hierarchy, asymmetry, and the political economy of conceptual exchange [19]. Work on epistemic injustice and recent structural accounts of translatability likewise analyse unequal interpretive resources and institutionally organized conditions of intelligibility [13, 14, 21]. The claimed contribution here is therefore only a local decomposition of effective capacity over decision sites already defined by the paper’s generative architecture, together with a strict separation among effective power, recognized authority, epistemic warrant, and normative legitimacy.

The narrower GR object developed here concerns the *location of effective interpretive capacity inside the formal architecture already constructed in Sections 2–7*. A translation episode can be institutionally asymmetrical even when its surface wording is reciprocal. One party may determine what counts as the relevant object of translation, which historical conditions are retained, which target resources are admissible, which bridge warrants are recognized, or which outputs count as acceptable. These capacities act on the conditions under which interpretation occurs rather than only on the final wording of a translation.

The relevant bearer of power need not be an individual translator. Let $\mathcal{B}_\varepsilon$ denote the family of represented *power-bearing configurations* for episode ε . An element $b \in \mathcal{B}_\varepsilon$ can represent an individual, scholarly community, institution, state agency, publisher, platform, benchmark, corpus infrastructure, professional norm, or another configuration whose relational position permits it to make an interpretively relevant intervention effective. A language system itself is not treated as a personified agent. Claims about the “power of a language” are represented through the institutions, infrastructures, participation rules, publication systems, data resources, legal statuses, and other configurations through which that language system acquires unequal operative reach.

Definition 8.1 (Episode-level interpretive power). For a fixed translation episode $(\varepsilon, \kappa, \rho)$, episode-level interpretive power is the effective capacity of a represented configuration $b \in \mathcal{B}_\varepsilon$ to make, block, stabilize, or render practically operative a change in a component that shapes what is retained, generated, judged, or accepted within the episode. The definition is relational and episode specific. It does not by itself establish that the capacity is legitimate, illegitimate, beneficial, harmful, intentional, or consciously exercised.

Definition 8.1 keeps power separate from both moral evaluation and psychological intention. A standard can constrain translation because a journal, court, benchmark, or software interface makes it operative even when no participant intends to dominate another language system. Conversely, a participant can intend to impose a preferred interpretation while lacking the relational capacity to make that interpretation govern the episode.

8.2 Interpretive Decision Sites

The formalism developed so far already contains the principal sites at which an episode can be shaped. To avoid introducing a parallel power vocabulary, these objects are collected into the interpretive profile stated in Equation 23.

$$\Theta_{\varepsilon, \kappa, \rho}(z_S) := \left(\Pi_\rho^\kappa, \text{Sel}_{\varepsilon, \kappa, \rho}^G, \text{Role}_{\varepsilon, \kappa, \rho}^S, \Pi_{\varepsilon, \kappa, \rho}^{\text{res}}, \text{Real}_{\varepsilon, \kappa, \rho}^T, \text{Form}_{\varepsilon, \kappa, \rho}^T, \text{Lift}_{\varepsilon, \kappa, \rho}^{S \rightarrow T}, \mathcal{Q}_{\varepsilon, \kappa, \rho}^T, \mathcal{P}_{\varepsilon, \kappa, \rho}^T(z_S) \right). \quad (23)$$

Equation 23 is a bookkeeping tuple rather than a claim that the components share one mathematical type. Each component has already been defined for a different analytical role. Together they identify where an episode can be shaped before a target manifestation is finally produced.

The first component, Π_ρ^κ , determines which content is retained as translation relevant at the declared resolution. Power at this site can privilege one decomposition of a problem while leaving another outside the represented object. The selector $\text{Sel}_{\varepsilon, \kappa, \rho}^G$ determines which historical or relational conditions are treated as generatively relevant. The role assignment $\text{Role}_{\varepsilon, \kappa, \rho}^S$ influences how those conditions are abstracted for mediation. The target-resource projection $\Pi_{\varepsilon, \kappa, \rho}^{\text{res}}$ affects which target-side materials become available. The realization relation $\text{Real}_{\varepsilon, \kappa, \rho}^T$ governs which target configurations are recognized as performing the declared generative roles, while $\text{Form}_{\varepsilon, \kappa, \rho}^T$ records which supported resource configurations are treated as capable of participating in target-object formation. The lifting relation $\text{Lift}_{\varepsilon, \kappa, \rho}^{S \rightarrow T}$ determines which source judgments are recognized as having target-side evaluative force. The family $\mathcal{Q}_{\varepsilon, \kappa, \rho}^T$ determines the operative admissibility criteria, while $\mathcal{P}_{\varepsilon, \kappa, \rho}^T$ records any source-prescribed terminal family.

These sites support a more precise interpretation of language-system power. A dominant scholarly language can exercise structural influence when publication norms, educational requirements, indexing systems, or computational infrastructures repeatedly make its categories the default input to Π_ρ^κ or its

judgment resources the default candidates for $\text{Lift}_{\varepsilon, \kappa, \rho}^{S \rightarrow T}$. The relevant claim is then about a recurrent configuration of decision sites rather than about an intrinsic superiority or agency of the language itself.

For any component D of $\Theta_{\varepsilon, \kappa, \rho}(z_S)$, let the relation in Equation 24 record effective capacity over that site.

$$\text{Pow}_{\varepsilon, \kappa, \rho} \subseteq \mathcal{B}_{\varepsilon} \times \text{Site}(\Theta_{\varepsilon, \kappa, \rho}(z_S)). \quad (24)$$

A pair $(b, D) \in \text{Pow}_{\varepsilon, \kappa, \rho}$ means that, under the represented institutional and relational arrangement, b has effective capacity to make, block, stabilize, or operationalize a materially relevant change at site D . The auxiliary notation $\text{Site}(\Theta)$ refers only to the labeled components of the profile in Equation 23; it introduces no additional ontology.

Caution 8.2 (Potential capacity and observed exercise). Membership in $\text{Pow}_{\varepsilon, \kappa, \rho}$ represents effective capacity under the modeled arrangement. An empirical claim that the capacity was actually exercised in a particular historical episode requires additional evidence connecting an intervention by b to an operative change at the relevant site.

Caution 8.2 prevents a structural representation from becoming an unsupported causal accusation. Institutional position can make an intervention possible without establishing that a specific exclusion, translation choice, or interpretive closure resulted from deliberate use of that position.

8.3 Effective Power and Recognized Interpretive Authority

Interpretive power and interpretive authority are related while remaining analytically distinct. A configuration can possess effective power without being recognized as entitled to exercise it. A platform can determine default translation categories through software architecture even when participants do not treat the platform as an epistemic authority. Conversely, an expert body can possess recognized authority while lacking practical control over whether its standards are implemented.

Let the recognized-authority relation be stated in Equation 25.

$$\text{Auth}_{\varepsilon, \kappa, \rho} \subseteq \mathcal{B}_{\varepsilon} \times \text{Site}(\Theta_{\varepsilon, \kappa, \rho}(z_S)). \quad (25)$$

A pair $(b, D) \in \text{Auth}_{\varepsilon, \kappa, \rho}$ records that the operative arrangement recognizes b as entitled, authorized, or procedurally competent to participate decisively at decision site D . Recognition can arise from law, institutional rule, disciplinary credential, contractual delegation, professional convention, community practice, or another declared source.

Equations 24 and 25 generate four analytically distinct cases. A configuration can possess both power and authority; authority can be recognized while implementation capacity remains weak; effective power can exist without recognized authority; or neither relation can hold at the site. The present framework does not infer legitimacy from authority alone because recognition can itself arise within unequal institutional arrangements. It also does not infer illegitimacy from unrecognized power alone because emergency, technical, or informal practices can sometimes create justified capacities before formal recognition catches up. The normative assessment requires a separate account of warrant, procedure, rights, responsibility, and consequences.

A site-specific power asymmetry occurs when materially affected configurations do not possess comparable capacity to contest, revise, or refuse an operative decision at the same site. The relevant comparison is relational rather than scalar. An institution can have strong power over $\mathcal{Q}_{\varepsilon, \kappa, \rho}^T$ and little power over the target system's internal formation relation $\text{Form}_{\varepsilon, \kappa, \rho}^T$. Another configuration can possess the reverse pattern. Power analysis should therefore retain the profile of sites rather than compressing interpretive power into one global score.

8.4 Upstream Interpretive Contraction and Terminal Closure

Section 6 defined generative non-closure at the terminal success condition, and Section 7 extended scrutiny to the provenance of target constraints. The interpretive profile in Equation 23 shows that

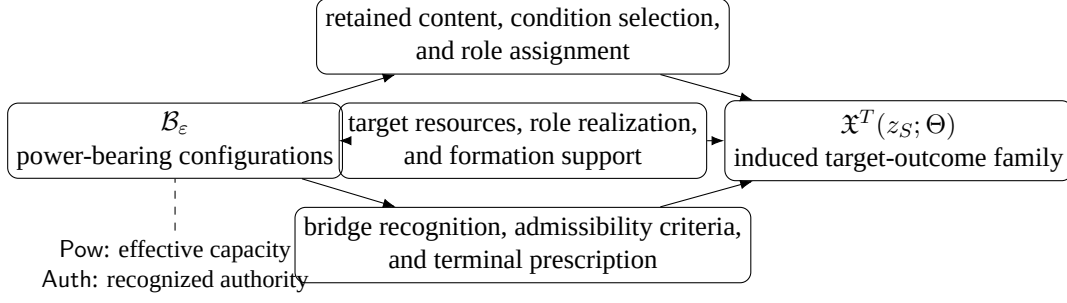


Figure 6: Interpretive power over decision sites in a translation episode. Power-bearing configurations can possess effective capacity over upstream and terminal components of the interpretive profile. Recognized authority is analytically distinct from effective power. Changes at the decision sites can alter the induced family of target outcomes without requiring an explicit source-prescribed terminal filter.

contraction can occur even earlier. A participant can leave $\mathcal{P}_{\varepsilon, \kappa, \rho}^T$ unused while shaping the retained-content projection, candidate-condition selector, generative-role vocabulary, target-resource projection, role-realization relation, or target-formation relation so that some target formations never enter the admissible search space.

To represent this effect without introducing a scalar measure of power, write $\mathfrak{X}^T(z_S; \Theta)$ for the admissible target-outcome family induced by a specified interpretive profile. Consider two profiles Θ and Θ' that differ at one or more decision sites while the declared translation task remains comparable. An interpretive intervention is *contractive* at the represented resolution when Equation 26 holds.

$$\mathfrak{X}^T(z_S; \Theta') \subsetneq \mathfrak{X}^T(z_S; \Theta). \quad (26)$$

Equation 26 does not state that contraction is harmful. A valid theorem, safety requirement, legal definition, evidential constraint, or carefully justified conceptual distinction can narrow an outcome family appropriately. The equation records a structural effect: fewer target epistemic objects remain admissible or reachable under the modified profile.

Proposition 8.3 (Terminal non-closure does not eliminate upstream interpretive power). *Assume a translation episode satisfies generative non-closure in Definition 6.2. Assume also that the source-prescribed family $\mathcal{P}_{\varepsilon, \kappa, \rho}^T(z_S)$ does not operate as an additional success filter. If a power-bearing configuration b can make operative a change at an upstream site of $\Theta_{\varepsilon, \kappa, \rho}(z_S)$ such that Equation 26 holds, then the episode can remain terminally non-closed while exhibiting effective interpretive contraction attributable to power over the upstream architecture.*

Proof. Definition 6.2 constrains the terminal success rule by removing membership in $\mathcal{P}_{\varepsilon, \kappa, \rho}^T(z_S)$ as an additional requirement. The admissible outcome family in Equation 20, however, depends on upstream objects including the retained translation object, target resource family, formation relation, and admissibility predicates. A change in the interpretive profile can therefore alter the induced family $\mathfrak{X}^T$ independently of terminal prescription. When the effective change is attributable to a configuration related to that site by Equation 24, terminal non-closure and upstream interpretive power coexist. $\square$

Proposition 8.3 clarifies why a formally open dialogue can still be highly structured by power. A target participant can be free to choose among the outcomes that remain visible after the source problem, relevant history, target resources, bridge warrants, and admissibility criteria have already been selected by others. Conversely, a tightly constrained episode can still distribute interpretive capacity relatively broadly if materially affected participants share meaningful power over those upstream decisions. Terminal openness and power distribution are therefore distinct analytical dimensions.

Figure 6 summarizes the decision-site architecture before the validation obligations are stated.

8.5 Power, Warrant, and Normative Assessment

The presence of power does not settle the validity of the interpretation produced through it. A bridge-warranted constraint can be imposed through an asymmetric institution and still be epistemically well supported. An equally distributed procedure can also adopt a poorly justified criterion. The power analysis and the warrant analysis therefore answer different questions. Equation 22 asks whether a source-originating target constraint has a justified bridge. Equation 24 asks who can make decisions at the sites where such constraints become operative.

This distinction yields an important limit on epistemic humility. A translator can comply fully with Definition 7.1 at the interpersonal level while participating in an institution whose publication rules, benchmark design, funding conditions, or interface defaults make one interpretive profile practically unavoidable. Humility can regulate a participant's use of judgment; it cannot by itself redistribute the relational capacities through which an episode is structured. Conversely, redistribution of power does not guarantee humility because participants with symmetrical procedural capacities can still universalize poorly warranted standards.

The formalism also distinguishes *closure capacity* from *closure justification*. A configuration can possess the capacity to narrow $\mathfrak{X}^T$ by changing Q^T or another upstream site. Whether that contraction is justified depends on the evidence, procedure, rights, responsibilities, and purposes relevant to the local domain. Legal translation may require authoritative closure at some sites; scientific translation may require empirically constrained terminology; exploratory scholarship may place greater weight on preserving alternative target-side formations. The present paper provides a location map for these decisions rather than a universal rule that ranks them.

The distinction between power and authority is especially useful when analysing language-system asymmetry. A globally dominant language can acquire high effective power through publication infrastructure, model training data, indexing systems, or institutional defaults even when no single body possesses recognized authority to declare its categories universally binding. In other settings, a treaty organization, court, standards body, or professional association can possess explicitly recognized authority over a narrow terminological site while lacking broader power over the target community's internal conceptual development. Treating these cases as one undifferentiated hierarchy would obscure the mechanisms that matter for translation.

8.6 Validation Obligations for Interpretive-Power Analysis

Table 7 summarizes the validation obligations introduced by this section. An application should identify the relevant decision site, specify the represented power-bearing configuration, distinguish effective capacity from recognized authority, provide evidence for actual exercise when historical causation is claimed, and separate structural contraction from its normative evaluation.

Table 7 also clarifies the evidential burden of claims about "language power." Such a claim should be decomposed into the infrastructures and institutions that make particular categories, translation specifications, bridge warrants, or admissibility rules operative. The analysis can then distinguish symbolic prestige from material access, recognized authority from de facto control, and broad structural influence from a demonstrated intervention in one episode.

The section establishes the power interface required for the remaining analysis. Interpretive power is represented as relational capacity over decision sites already present in the translation formalism. Recognized authority is separated from effective power; terminal openness is separated from upstream control; and structural contraction is separated from its normative justification. Section 9 applies this architecture to AI-mediated translation, where model providers, training corpora, retrieval systems, benchmarks, prompts, user interfaces, and institutional deployment rules can redistribute effective capacity across several decision sites at once.

Table 7: Validation obligations for interpretive-power analysis in translation.

Validation object	Formal representation	Required local justification
Power-bearing configuration	$b \in \mathcal{B}_\varepsilon$	Evidence that the represented individual, institution, infrastructure, or relational configuration can materially affect the translation episode
Decision site	component of $\Theta_{\varepsilon, \kappa, \rho}(z_S)$	Identification of the precise object being shaped: retained content, generative selection, role assignment, target resources, role realization, formation support, bridge recognition, admissibility criteria, or terminal prescription
Effective capacity	$(b, D) \in \text{Pow}_{\varepsilon, \kappa, \rho}$	Evidence that b can make, block, stabilize, or operationalize a materially relevant change at site D under the represented arrangement
Recognized authority	$(b, D) \in \text{Auth}_{\varepsilon, \kappa, \rho}$	Source of the recognized entitlement or competence, including its domain and procedural limits
Observed exercise	intervention affecting site D	Historical, institutional, computational, or process evidence connecting the intervention to an operative change; structural capacity alone is insufficient
Interpretive contraction	Equation 26	Demonstration that the changed profile narrows the represented target-outcome family at the declared resolution
Normative assessment	domain-specific evaluation	Independent reasons concerning legitimacy, evidence, rights, safety, procedure, responsibility, or consequences; asymmetry or contraction alone does not settle the evaluation

9 Epistemic Power Distribution in AI-Mediated Translation

This section applies the interpretive-power architecture of Section 8 to AI-mediated translation. Its role is to identify how effective capacity over translation decisions is redistributed when a generative model becomes part of the mediation infrastructure. The objective is narrower than a general theory of AI power. The analysis asks which components of an AI-mediated episode can affect retained-content selection, generative-condition reconstruction, target-resource availability, bridge recognition, admissibility criteria, and terminal presentation. The section first represents AI mediation as a layered configuration, then examines redistribution across interpretive decision sites, language-resource asymmetry, and recursive uptake. It concludes with validation obligations for claims about AI-mediated epistemic power. The method is formal and mechanism-oriented. The analysis does not treat an AI system as a unitary intentional actor, does not infer domination from automation alone, and does not assume that human mediation is intrinsically less power-laden.

9.1 AI Mediation as a Layered Relational Configuration

An AI-mediated translation episode usually contains more than a model receiving a source string and emitting a target string. The operative configuration can include pre-training and adaptation corpora,

model parameters, retrieval sources, prompts and system instructions, decoding or ranking procedures, interface defaults, post-editing, institutional deployment rules, and human users. Empirical multilingual NLP research already shows that language resources are distributed unevenly and that model performance can depend materially on the availability and composition of multilingual data. The NLLB study, for example, identifies the scarcity of parallel data as a central obstacle for many low-resource languages and develops a multilingual translation system partly to address that disparity [15]. Recent work on multilingual LLM adaptation likewise reports persistent disadvantages for low-resource languages associated with limited pre-training or instruction data [16, 17]. These findings motivate a layered representation of the mediation configuration rather than a single undifferentiated “AI translator.”

For episode ε , define the represented AI mediation configuration in Equation 27.

$$\mathfrak{M}_\varepsilon^{\text{AI}} = (D_\varepsilon, M_\varepsilon, R_\varepsilon, I_\varepsilon, G_\varepsilon). \quad (27)$$

Here D_ε denotes the data resources materially available to the episode, including training, adaptation, retrieval, and evaluation data where relevant; M_ε denotes the model configuration used to generate or rank candidate outputs; R_ε denotes runtime conditioning such as prompts, retrieved context, tool outputs, or user-provided exemplars; I_ε denotes the interaction interface through which source material, alternatives, confidence cues, defaults, and editable options are presented; and G_ε denotes deployment and governance conditions such as organizational policy, benchmark requirements, workflow rules, or post-editing authority. Equation 27 is an analytical decomposition. An empirical application may merge, subdivide, or omit components when the local system architecture requires a different resolution.

The decomposition prevents two attribution errors. First, an observed output cannot automatically be attributed to the model parameters alone when retrieval, prompting, ranking, interface defaults, or organizational rules materially shaped the result. Second, the human–AI distinction does not by itself identify where interpretive power lies. A human user may possess considerable terminal editing authority while an upstream institution controls the data, prompt template, admissibility rules, and ranking procedure that determine which alternatives become visible.

Definition 9.1 (AI-mediated interpretive configuration). An AI-mediated interpretive configuration for episode ε is the pair consisting of the layered mediation configuration $\mathfrak{M}_\varepsilon^{\text{AI}}$ and the interpretive profile $\Theta_{\varepsilon, \kappa, \rho}(z_S)$ introduced in Section 8, together with the empirically supported relations by which components of $\mathfrak{M}_\varepsilon^{\text{AI}}$ can affect components of $\Theta_{\varepsilon, \kappa, \rho}(z_S)$.

Definition 9.1 keeps the causal claim local. The existence of a training corpus, interface, or policy does not establish that it affected a particular translation decision. A power claim requires evidence for a capacity relation, and a historical claim about exercise requires evidence connecting that capacity to an operative change in the episode.

9.2 Redistribution across Interpretive Decision Sites

Section 8 represented interpretive power as effective capacity over decision sites already present in the translation formalism. AI mediation can redistribute those capacities across actors and across stages of the process. In a face-to-face scholarly exchange, the source and target participants may jointly negotiate which distinctions matter, which analogies are acceptable, and when a candidate target concept should remain unresolved. In an AI-mediated workflow, some of these decisions can be displaced upstream into data curation, model adaptation, prompt design, benchmark construction, ranking, or interface design.

This displacement matters because the configuration that produces an immediately visible answer can differ from the configuration that determined the space of answers available for consideration. A user can appear to possess terminal choice while lacking effective capacity over source truncation, retrieval scope, candidate generation, default ranking, or the target resources represented in the model. Conversely, an AI system can expand target-side agency by surfacing multiple formulations, retaining source terminology, providing historical context, exposing uncertainty, or allowing local experts to revise the target resource

set. AI mediation therefore changes the distribution of interpretive power in directionally heterogeneous ways.

Let C be a component of $\mathfrak{M}_\varepsilon^{\text{AI}}$ and let D be a decision site in $\Theta_{\varepsilon,\kappa,\rho}(z_S)$. The existing relation $\text{Pow}_{\varepsilon,\kappa,\rho}$ can be applied without introducing a second power relation: an application may represent C or the human or institutional configuration governing C as a member of $\mathcal{B}_\varepsilon$ and then test whether $(C, D) \in \text{Pow}_{\varepsilon,\kappa,\rho}$ is supported. The AI-specific contribution is therefore a decomposition of where such capacities can be located, rather than a new definition of power.

Proposition 9.2 (Non-closure and upstream power asymmetry). *Suppose an AI-mediated episode satisfies terminal non-closure in the sense of Definition 6.2. Suppose further that an upstream decision site D exhibits the site-specific power asymmetry described in Section 8.3: an AI-mediation component or its governing configuration has effective capacity over D , while at least one materially affected configuration lacks comparable capacity to contest, revise, or refuse the operative decision at that site. Then terminal non-closure can coexist with non-distributed interpretive power at D .*

Proof. Terminal non-closure constrains the use of a source-prescribed terminal family as an additional success condition. It does not redistribute capacity over upstream decision sites. The second premise already locates a site-specific asymmetry in effective capacity at D . Because the terminal success rule and the distribution of capacity over D are distinct components of the architecture, the episode can satisfy terminal non-closure while the upstream asymmetry remains operative. $\square$

Proposition 9.2 prevents an interface-level notion of user freedom from substituting for a power analysis. The availability of an editable answer, several candidate translations, or an open text box can be valuable, yet these features do not establish who shaped the candidate space or the standards by which candidates were generated and ranked.

9.3 Language-Resource Asymmetry and Target Formation

Language-resource inequality enters the present framework at a specific formal location. Section 5 represented target-side generative mediation through resources capable of realizing selected generative roles. In an AI-mediated episode, the practical availability of those resources can depend partly on D_ε and M_ε . If culturally, historically, technically, or disciplinarily relevant target-language material is sparse or weakly represented, the set of target-side resources made accessible by the mediation system can be narrower than the resources that exist in the target community itself.

This distinction is essential. The formalism should not infer that a target language or epistemic system lacks a distinction merely because an AI system fails to represent it. The observed limitation may belong to the AI mediation configuration. Studies of low-resource language modelling support this caution: multilingual systems continue to exhibit performance disparities associated with data scarcity, while adaptation methods can materially improve low-resource performance [16, 17]. The NLLB project likewise frames unequal data availability as a structural obstacle for machine translation coverage and quality [15].

Let $\mathcal{U}_{\varepsilon,\kappa,\rho}^T$ denote the target-side resource family already used in the generative reconstruction of Section 5. For an AI-mediated episode, distinguish the resources represented as available to the target community from the subset made practically accessible through the AI configuration. Equation 28 states this relation.

$$\mathcal{U}_{\varepsilon,\kappa,\rho}^{T,\text{AI}} \subseteq \mathcal{U}_{\varepsilon,\kappa,\rho}^T. \quad (28)$$

The subset relation in Equation 28 is representational rather than universal. Equality is possible when the relevant target resources are adequately available to the AI-mediated workflow. A strict subset records an application-level claim that some target resources relevant to the declared task remain inaccessible, unrepresented, or practically unavailable through the AI configuration.

The subset relation is stated for a fixed target representation. If an AI-mediated interaction helps participants construct a genuinely new target-side resource that is subsequently stabilized and retained,

that change should be represented by an updated $\mathcal{L}^T$ and resource carrier in a later slice or episode rather than by treating the newly stabilized resource as if it had already belonged to the original $\mathcal{U}_{\varepsilon, \kappa, \rho}^T$.

Caution 9.3 (Model limitation and target-system absence). Failure of an AI-mediated system to surface a target-side distinction, historical resource, or generative pathway does not by itself establish that the target language system lacks that resource. An empirical application should distinguish absence in the represented target system from absence in $\mathcal{U}_{\varepsilon, \kappa, \rho}^{T, \text{AI}}$.

Caution 9.3 is particularly important for generative translation. A system can produce fluent target-language text while offering a reduced generative resource set. The empirical study by Shterionov, van Helleman, and Vanmassenhove reports greater homogeneity among the tested generative-AI English–Dutch translations than among human reference translations, with variation by domain [7]. That result does not establish a general law of AI-mediated homogenization. It does, however, show why output diversity and target-resource accessibility should be measured rather than inferred from fluency alone.

9.4 Shared Mediation Infrastructure and Recursive Uptake

AI-mediated translation can also concentrate interpretive capacity by serving as a shared interface across many otherwise heterogeneous encounters. The relevant phenomenon is not simply scale. A common mediation configuration can repeatedly expose users to similar retained distinctions, candidate structures, explanatory templates, and default target formulations. Where those outputs are subsequently copied into documents, educational materials, organizational terminology, or retrievable corpora, translation output can become part of the environment from which later translation episodes draw resources.

The present section introduces this mechanism cautiously because the long-run generative consequences belong to Section 10. For the current power analysis, it is sufficient to represent recursive uptake as a possible feedback from an episode’s outputs into later data or runtime resources. Let O_ε denote the externally retained outputs of episode ε . A subsequent episode ε' may satisfy the update relation in Equation 29.

$$O_\varepsilon \rightsquigarrow (D_{\varepsilon'}, R_{\varepsilon'}), \quad \varepsilon \prec_H \varepsilon'. \quad (29)$$

Here $\varepsilon \prec_H \varepsilon'$ denotes strict historical precedence induced by the relation $\preceq_H$ introduced in Section 3.1, with translation episodes treated as retained events or composite regions when the application represents them historically. The symbol $\rightsquigarrow$ in Equation 29 records empirically demonstrated contribution rather than deterministic inclusion. An application must show that earlier outputs actually entered later training, retrieval, prompting, exemplars, or institutional resources. The equation therefore provides a location for recursive effects without assuming that every generated translation feeds back into future models.

Recursive uptake can redistribute power across time. A decision originally made by one model provider, benchmark designer, translator, or institution can persist after the original actor has left the immediate episode if the resulting formulation becomes a frequently retrieved or institutionally standardized resource. Conversely, recursive uptake can also enlarge target-side resources when communities deliberately add locally generated terminology, annotations, corrections, or alternative formulations to future mediation infrastructure. The mechanism is structurally ambivalent; its normative assessment depends on provenance, participation, reversibility, evidence, and the consequences of stabilization.

Figure 7 summarizes the layered relation among AI mediation components, interpretive decision sites, and recursive uptake.

9.5 Validation Obligations for AI-Mediated Power Analysis

Table 8 summarizes the validation obligations introduced by this section. The central requirement is attribution discipline. Claims about “AI power” should be decomposed into the component, decision site, capacity, observed exercise, and downstream consequence actually supported by evidence.

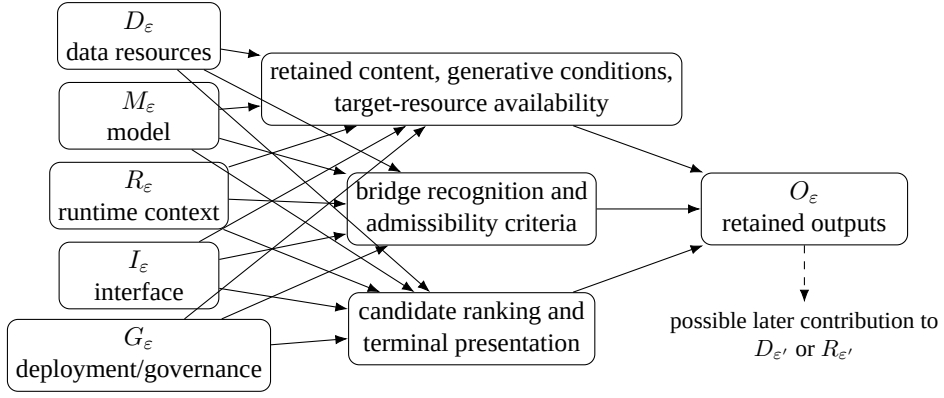


Figure 7: AI-mediated redistribution of interpretive power. Data, model, runtime, interface, and governance components can affect several decision sites in the interpretive profile. The resulting outputs may, when empirically demonstrated, contribute to resources used in later episodes. The diagram represents possible capacity relations and does not imply that every component affects every site in a particular system.

Table 8: Validation obligations for epistemic power analysis in AI-mediated translation.

Validation object	Formal representation	Required local justification
AI mediation component	component of $\mathfrak{M}_\varepsilon^{\text{AI}}$	Identification of the data, model, runtime, interface, or governance component materially relevant to the episode
Decision-site capacity	$(C, D) \in \text{Pow}_{\varepsilon, \kappa, \rho}$	Evidence that the represented component or its governing configuration can materially affect the specified interpretive decision site
Observed exercise	operative change in $\Theta_{\varepsilon, \kappa, \rho}(z_S)$	Process, system, experimental, or historical evidence linking the component to the actual change; architectural possibility alone is insufficient
AI-accessible target resources	$\mathcal{U}_{\varepsilon, \kappa, \rho}^{T, \text{AI}}$	Evidence distinguishing resources unavailable through the mediation system from resources absent in the target language system itself
Terminal openness	Definition 6.2	Verification that editable or multiple outputs are not being mistaken for distributed power over upstream conditions
Recursive uptake	Equation 29	Evidence that retained outputs materially entered later data, retrieval, prompting, exemplars, or institutional resources
Normative assessment	domain-specific evaluation	Independent reasons concerning participation, provenance, reversibility, evidence, rights, safety, responsibility, and consequences; automation or concentration alone does not settle the evaluation

Table 8 also clarifies why comparative AI evaluation should extend beyond output accuracy. A system can improve lexical or sentence-level translation while concentrating decision authority upstream; another can expose more alternatives while providing weak target-side resources. The relevant evaluation

depends on the task. Generative epistemic translation adds the specific question of whether the mediation configuration enables target-local reconstruction of generative roles without treating the model’s available resource set as coextensive with the target system itself.

The section establishes the AI-specific power interface required for the remainder of the paper. AI mediation is represented as a layered relational configuration whose components can redistribute effective capacity over several interpretive sites at once. Uneven language resources can narrow the target resources practically available through the mediation system without establishing absence in the target system. Shared mediation infrastructure can also create temporally extended effects when outputs become resources for later episodes. Section 10 turns from the distribution of capacity to the generative consequences of repeated cross-system knowledge formation.

10 Generative Consequences of Cross-System Knowledge Formation

This section extends the analysis from episode-level mediation to historically retained consequences. Its role is to specify how a translation output, interpretive decision, or target-side formation can become part of the conditions from which later epistemic objects are generated. The objective is to distinguish immediate translation success from a stronger claim about changes in future formation possibilities. The section first defines mediated inheritance, then introduces a task-bounded continuation family for representing future formability, distinguishes expansion, contraction, and recomposition of that family, and examines cross-system coupling, path dependence, and the temporal extension of interpretive power. The method is formal and historical-reconstructive. The constructions identify what would have to be demonstrated for a claim about generative consequence; they do not imply that translation ordinarily produces long-run convergence, homogenization, or cumulative improvement.

10.1 Mediated Outputs as Historical Formation Inputs

Section 9.4 represented one AI-specific route through which retained outputs can contribute to later data or runtime resources. The broader GR problem is historical. Once a translation output is retained in a textbook, archive, institutional vocabulary, disciplinary convention, annotation practice, computational resource, or recurrent dialogue, it can become part of the history from which later epistemic objects are formed. Translation then participates in the production of future formation conditions rather than merely connecting two already formed systems.

Let O_ε denote the externally retained outputs of a translation episode ε , as in Section 9.4. Let Σ' be a later historical slice in a represented language system $\mathcal{L}_{\Sigma', \rho'}^L$, and let z be an epistemic object whose formation profile $\mathfrak{F}_{\kappa', \rho'}^L(z; \Sigma')$ is under study. The mediated-inheritance predicate is introduced in Equation 30.

$$\text{Inh}_{\varepsilon \rightarrow \Sigma'}^L(o, z) = 1, \quad o \in O_\varepsilon. \quad (30)$$

Equation 30 records the application-level claim that the retained output o , or a documented stabilized derivative of it, materially contributes to the later formation profile of z . The predicate is intentionally historical rather than merely textual. Repetition of the same wording is unnecessary, while mere temporal priority is insufficient. An application should identify a plausible and supported pathway through which the earlier mediated output entered the relations, distinctions, practices, operations, institutions, or prior-translation structures relevant to z .

Definition 10.1 (Mediated epistemic inheritance). A later epistemic formation exhibits mediated epistemic inheritance from episode ε when Equation 30 is supported for at least one retained output $o \in O_\varepsilon$ and at least one later epistemic object z , with the inherited contribution located inside the historically reconstructed formation structure of z .

Definition 10.1 supplies a bridge between Sections 3 and 9. A translation episode can itself become part of the historical support from which later language-system structures are reconstructed. This possibility does not make every translation historically consequential. Many outputs remain local, transient,

or unused. The definition applies only when uptake is evidenced at the resolution relevant to the later formation claim.

The inherited element can also change function. A translated term initially introduced as an explanatory convenience can later become a disciplinary label; an analogy can become a standard teaching device; a target-generated distinction can become a source for subsequent back-translation. The formalism therefore tracks contribution to later formation rather than requiring preservation of the original episode's purpose.

10.2 Continuation Families and Represented Generative Consequence

Mediated inheritance establishes historical contribution, while a claim about *generative consequence* requires a further question: does the inherited contribution alter what the represented system can subsequently form under a declared analysis? Translation history and metahistory already provide rich accounts of translation as historical transformation, mobility, and reconfiguration [20], while epistemic-translation scholarship explicitly connects translation to knowledge growth [18]. The continuation-family construction below is therefore not offered as a discovery that translation changes history. It is an exploratory GR device for imposing an additional evidential burden on the stronger claim that a documented uptake changes a bounded family of later formable objects. The paper uses a task-bounded continuation family to state that claim without treating the future of a language system as an enumerable total possibility space.

Let ω denote a continuation specification. It records the domain, temporal or procedural horizon, evidential standard, and admissible formation operations relevant to the analysis. For a represented language system $\mathcal{L}_{\Sigma, \rho}^L$, let $\mathcal{X}_{\omega}^L$ be the bounded candidate family of epistemic objects considered under ω . Let $\text{Reach}_{\omega, \rho}^L$ be an application-specific reachability relation between the retained historical configuration $K_{\leq \Sigma}^L$ and candidate objects in $\mathcal{X}_{\omega}^L$. The supported continuation family is defined in Equation 31.

$$\mathfrak{C}_{\omega, \rho}^L(\Sigma) := \{x \in \mathcal{X}_{\omega}^L \mid (K_{\leq \Sigma}^L, x) \in \text{Reach}_{\omega, \rho}^L\}. \quad (31)$$

The reachability relation in Equation 31 is deliberately domain specific. In a formal discipline it may be represented through derivability or construction rules. In a historical or conceptual inquiry it may require documented practices, available distinctions, institutional resources, and evidence that participants can actually form the relevant object. In an educational application it may require empirical evidence about learner formation. The notation therefore organizes a claim about supported future formability; it does not convert speculative possibilities into demonstrated continuations.

Definition 10.2 (Represented generative consequence). A mediation episode has a represented generative consequence for language system L under fixed (ω, ρ) when supported uptake associated with the episode contributes to a change between a pre-uptake continuation family $\mathfrak{C}_{\omega, \rho}^L(\Sigma^-)$ and a post-uptake continuation family $\mathfrak{C}_{\omega, \rho}^L(\Sigma^+)$. The claim concerns the declared continuation specification and resolution only.

Definition 10.2 separates three analytical layers. An output can be linguistically successful without being historically inherited. It can be historically inherited without changing the continuation family relevant to the inquiry. A represented generative consequence requires both a supported uptake pathway and a supported change in future formability at the adopted scale. The continuation family is the most conjectural formal object in the paper: in many historical or social applications it may be impossible to identify a sufficiently bounded candidate family or credible reachability relation. In those cases the analysis should stop at mediated inheritance rather than infer a generative consequence.

Three elementary change types are useful when the pre- and post-uptake families are comparable

under the same specification. They are stated in Equation 32.

$$\begin{aligned}
\mathfrak{C}_{\omega,\rho}^L(\Sigma^-) &\subsetneq \mathfrak{C}_{\omega,\rho}^L(\Sigma^+) && \text{generative expansion,} \\
\mathfrak{C}_{\omega,\rho}^L(\Sigma^+) &\subsetneq \mathfrak{C}_{\omega,\rho}^L(\Sigma^-) && \text{generative contraction,} \\
\mathfrak{C}_{\omega,\rho}^L(\Sigma^-) &\not\subseteq \mathfrak{C}_{\omega,\rho}^L(\Sigma^+), \quad \mathfrak{C}_{\omega,\rho}^L(\Sigma^+) &\not\subseteq \mathfrak{C}_{\omega,\rho}^L(\Sigma^-) && \text{generative recomposition.} \quad (32)
\end{aligned}$$

Equation 32 is descriptive. Expansion can introduce misinformation, unsafe practices, or poorly justified distinctions. Contraction can remove confusion, redundancy, or invalid procedures. Recomposition can combine losses and gains that resist a scalar ranking. Normative assessment therefore requires the same domain-specific separation between structural change and justified evaluation used in Sections 7 and 8.

10.3 Cross-System Coupling: Convergence Status

Generative consequence becomes specifically cross-system when a mediated encounter changes future formation conditions in one or more participating systems. Let episode ε connect represented systems A and B . If an output produced through that encounter is inherited into a later formation profile in A , B , or both, then a historical dependency has been introduced across the mediation interface. The systems are *generatively coupled* at the represented scale when later formation in at least one system depends materially on such a cross-system inherited contribution.

Generative coupling is compatible with several trajectories. The continuation families of A and B can acquire more mutually accessible problems or distinctions; one system can absorb a resource while the other changes little; both can create new local structures that remain strongly heterogeneous; or one can contract around a standardized interface while the other expands around newly available alternatives. The definition therefore contains no requirement that the two systems become more similar.

This distinction is especially important for shared AI mediation. A common AI configuration can expose several language systems to recurrent terminology, explanatory patterns, or candidate structures, while target-local uptake can remain different because each system has different historical resources, institutions, practices, and admissibility constraints. Section 9 cited empirical evidence of greater homogeneity in one tested English–Dutch generative-AI translation setting [7]; that finding motivates measurement of convergence in relevant applications but does not support a general inference from shared mediation to homogenization. In the present formalism, shared mediation establishes a possible coupling channel. Similarity change is a separate empirical object.

The same point applies to beneficial cross-system formation. A shared mediator can make previously inaccessible source problems, conceptual distinctions, or historical resources available to target participants. Generative coupling can therefore expand the set of locally available formation pathways without requiring a common terminal vocabulary. This is one reason the paper locates generative translation at the level of conditions and roles rather than terminal expressions alone.

Figure 8 summarizes the transition from an episode-level output to historically inherited formation conditions and changed continuation families.

10.4 Recursive Stabilization and Generative Path Dependence

A single inherited output can be transient. Repeated uptake can produce a different historical structure when a formulation, distinction, benchmark, translation convention, or explanatory pattern becomes routinely available to later participants. The relevant GR object is the sequence of mediation episodes and inherited effects rather than one isolated translation pair.

Let $\varepsilon = (\varepsilon_1, \dots, \varepsilon_n)$ denote an ordered sequence of mediation episodes whose retained outputs have documented uptake into later represented configurations. For a fixed continuation specification, write $\mathfrak{C}_{\omega,\rho}^L(\Sigma \mid \varepsilon)$ for the continuation family reconstructed after that mediation history. A system exhibits *generative path dependence* at the represented scale when two supported mediation histories beginning from the same declared initial representation yield different continuation families under the same analysis

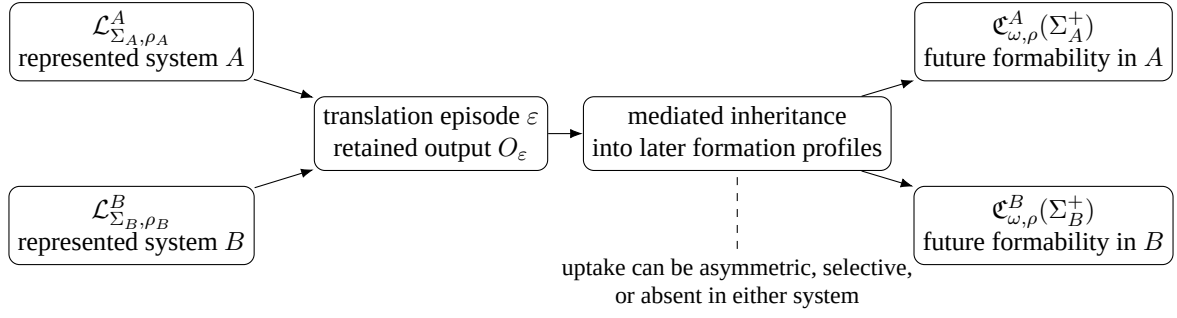


Figure 8: Cross-system generative consequence through mediated inheritance. A translation episode can produce retained outputs that later enter formation histories in one or more represented systems. Where supported uptake changes a task-bounded continuation family, the episode has a represented generative consequence. The diagram permits asymmetric uptake and does not imply convergence between the participating systems.

specification. The condition is stated in Equation 33.

$$\mathfrak{C}_{\omega, \rho}^L(\Sigma \mid \varepsilon) \neq \mathfrak{C}_{\omega, \rho}^L(\Sigma \mid \varepsilon'). \quad (33)$$

Equation 33 is a historical comparison, not a claim that all conceptual development is path dependent in this strong sense. The two reconstructed histories must be comparable at the declared initial conditions, resolution, and continuation specification, and the difference in continuation families must be supported by evidence linking it to the distinct mediation histories.

Recursive stabilization is one possible mechanism for Equation 33. A translation convention initially selected among several admissible formulations can become embedded in educational materials, institutional templates, search indexes, model outputs, or disciplinary usage. Once embedded, the convention can become a resource from which later distinctions are formed and can also change which alternatives remain visible. Another history can stabilize a different convention or preserve several alternatives. The resulting difference concerns future formation structure, even when current surface expressions later appear similar.

This mechanism connects generative consequence to the historical-underdetermination result of Section 3. Present manifestation alone need not recover the history that produced it. When future formation depends on historically inherited resources and operations, present manifestational similarity likewise need not establish similarity of continuation families. An empirical application that compares only present outputs can therefore miss path-dependent differences in the conditions for later knowledge formation.

10.5 Temporal Extension of Interpretive Power

Sections 8 and 9 located interpretive power at decision sites inside a translation episode. Mediated inheritance adds a temporal dimension. A decision made at one episode can persist after the original translator, institution, model, or platform is absent from a later encounter if the resulting output or stabilized derivative has become part of the later formation environment.

Proposition 10.3 (Temporal extension through generative inheritance). *Let $b \in \mathcal{B}_\varepsilon$ possess effective capacity over decision site D in episode ε , so that $(b, D) \in \text{Pow}_{\varepsilon, \kappa, \rho}$. Suppose there is evidence that an exercised change at D materially affects a retained output $o \in O_\varepsilon$, that $\text{Inh}_{\varepsilon \rightarrow \Sigma'}^L(o, z) = 1$ for a later formation, and that the inherited contribution is necessary to the represented difference between the corresponding pre- and post-uptake continuation families. Under these conditions, the earlier effective capacity of b has a temporally extended generative consequence at the declared resolution.*

Proof. The effective-capacity premise locates b at an interpretive decision site in episode ε . The observed-exercise premise connects that capacity to a change in retained output o . Definition 10.1 connects o to

the later formation history, and Definition 10.2 connects supported uptake to a change in the continuation family. The stated necessity condition attributes the represented difference to the inherited contribution rather than to temporal succession alone. The resulting path from earlier decision-site capacity to later formation change establishes the claimed temporal extension within the adopted model. $\square$

Proposition 10.3 does not convert historical influence into continuing legal, moral, or institutional authority. Recognized authority can expire while an inherited convention remains causally or epistemically influential. Nor does the proposition establish that the earlier exercise was unjustified. A safety standard, scientific correction, or carefully validated terminology can have a temporally extended generative consequence that is desirable within the relevant domain. The proposition identifies persistence of effective consequence; legitimacy and warrant remain separate evaluations.

The proposition is particularly relevant to AI-mediated infrastructures because one design decision can be reproduced across many episodes and retained in downstream resources. The evidential burden remains high. Architectural scale alone does not show that an earlier output was inherited, that it altered later continuation families, or that a particular component caused the change. Claims about long-run AI influence therefore require provenance and uptake evidence in addition to model-output comparison.

10.6 Validation Obligations for Generative-Consequence Analysis

Table 9 summarizes the evidential obligations introduced by this section. The table separates historical inheritance, future formability, cross-system coupling, path dependence, and temporally extended power so that a study can support one claim without silently assuming the others.

Table 9 marks the boundary between the formal proposal and future empirical work. A corpus study may establish recurrent output patterns without demonstrating inheritance into later knowledge formation. Historical research may demonstrate inheritance without establishing a changed continuation family. Experimental or computational studies may estimate changes in accessible formation pathways without settling their normative value. The GR architecture is intended to make these evidential differences explicit.

The section completes the paper's main generative argument. Cross-system mediation can become historically constitutive when retained outputs enter later formation profiles. Where that inheritance changes a task-bounded continuation family, the mediation has a represented generative consequence that can take the form of expansion, contraction, or recomposition. Repeated mediation can create coupling and path dependence without implying convergence, and interpretive power can acquire temporally extended effects when earlier decisions become inherited formation conditions. Section 11 states the scope conditions and limitations required to keep these claims proportional to the evidence available in particular applications.

Table 9: Validation obligations for generative consequences of cross-system knowledge formation.

Validation object	Formal representation	Required local justification
Mediated inheritance	$\text{Inh}_{\varepsilon \rightarrow \Sigma'}^L(o, z) = 1$	Historical, institutional, computational, pedagogical, or process evidence that an earlier mediated output or stabilized derivative materially entered the later formation structure
Supported continuation family	$\mathfrak{C}_{\omega, \rho}^L(\Sigma)$	A declared continuation specification, bounded candidate family, and domain-appropriate reachability evidence; speculative possibility alone is insufficient
Generative consequence	Definition 10.2	Comparable pre- and post-uptake continuation families plus evidence that supported uptake contributes to the represented change
Change type	Equation 32	Common specification and resolution across the compared families; structural expansion or contraction does not determine normative value
Cross-system coupling	inherited contribution across the mediation interface	Evidence that later formation in at least one represented system depends materially on a contribution produced through the cross-system episode
Generative path dependence	Equation 33	Comparable initial representations and continuation specifications, distinct supported mediation histories, and evidence connecting those histories to the difference in continuation families
Temporal extension of power	Proposition 10.3	Evidence linking earlier effective capacity to observed exercise, retained output, later inheritance, and the represented generative consequence
Normative assessment	domain-specific evaluation	Independent reasons concerning truth, evidence, safety, rights, participation, responsibility, reversibility, distributional effects, and other locally relevant standards

11 Scope Conditions for the Proposed Formalism

This section states the scope conditions under which the proposed formalism can support analysis without converting a preliminary representation into a stronger empirical, ontological, or normative claim. Its role is to delimit the inferential reach of the constructions developed in Sections 1–10. The objective is to identify the additional warrants required when moving from formal possibility to historical reconstruction, from historical reconstruction to generative explanation, from relational capacity to exercised power, and from descriptive structure to normative evaluation. The discussion proceeds through ontological status, task and resolution dependence, historical and modal evidence, cross-system bridge conditions, power and normative assessment, AI-specific empirical scope, and conditions of non-application. The method is methodological and reconstructive: the section derives limitations from the indices, assumptions, and evidential commitments already built into the formalism rather than adding a new substantive

theory.

11.1 Analytical Representation and Ontological Suspension

The formal objects introduced in this paper are analytical representations. A history-bearing carrier, language-system projection, manifestation relation, formation profile, target-resource family, admissibility family, interpretive profile, continuation family, or power relation provides a disciplined way to represent a specified research object at a declared resolution. The formalism does not establish that social, linguistic, or epistemic reality is ultimately constituted by the mathematical objects used to describe it.

This distinction is especially important for the GR language of histories, relations, events, and configurations. The paper uses that language because translation episodes are temporally extended, relationally situated, and historically conditioned. An empirical application may instantiate those roles through archival records, discourse corpora, interview evidence, interaction traces, institutional rules, model logs, experimental interventions, or another adequate representation. The adequacy of the application therefore depends on whether the chosen empirical objects support the analytical roles assigned to them, not on whether a particular notation is treated as an ontology.

Caution 11.1 (Formal compatibility and ontological commitment). A phenomenon that can be represented by the proposed formalism thereby acquires a formal description within the declared research frame. Formal compatibility alone does not establish the phenomenon’s ultimate ontology, causal mechanism, or empirical prevalence.

Caution 11.1 also limits interpretation of the diagrams in the paper. A commutative or noncommutative relation among represented objects records a claim about the selected analytical structure. It should not be read as evidence that the represented social or epistemic process literally implements the mathematical structure unless an application supplies the required mechanism and measurement model.

11.2 Task, Resolution, and Domain Dependence

The paper’s principal constructions are indexed by task, resolution, episode, historical slice, or continuation horizon. The indices κ , ρ , ε , Σ , and ω are therefore substantive scope controls rather than technical decoration. A retained-content projection adequate for one translation task may omit distinctions required by another. A target resource family visible at one resolution may divide into heterogeneous resources at a finer resolution. An admissibility criterion justified in one institutional setting may lack a warrant in another.

The framework consequently supports local claims of the form “relative to the declared task, resolution, episode, and evidential frame.” Generalization across those indices requires an additional stability argument. For example, an analysis that identifies a generative-role correspondence at ρ_1 cannot infer the same correspondence at ρ_2 merely because both representations concern the same named concept. Likewise, an episode-level power relation does not establish a persistent institutional power relation unless the relevant capacity survives across the episodes or structures being compared.

The same restriction applies to the term *language system*. Section 2 uses a task-relative projection rather than a total description of a natural language, discipline, community, or culture. An application should therefore identify the practices, distinctions, inferential resources, historical materials, and institutions relevant to the declared translation problem. Treating a task-relative projection as a complete representation of “English,” “Chinese,” “physics,” “law,” or another broad system would exceed the formal claim.

Proposition 11.2 (Locality of formal conclusions). *Let a conclusion C be derived from objects indexed by $(\varepsilon, \kappa, \rho, \Sigma, \omega)$. The formal derivation warrants C within that indexed representation. Extending C to another index tuple requires a bridge, invariance, or stability argument appropriate to the objects that change.*

Proposition 11.2 is a scope rule rather than an empirical theorem. It prevents index suppression from silently converting a local analytical result into a universal claim.

11.3 Historical Reconstruction and Generative Evidence

The distinction between historical formation support and generative conditions creates two separate evidential burdens. Historical formation support $\mathcal{H}_{\kappa,\rho}(z; \Sigma)$ concerns the documented conditions, problems, distinctions, practices, institutions, and prior translations that materially participated in the formation of an epistemic object. Its reconstruction therefore requires historical evidence appropriate to the case. Present conceptual similarity cannot by itself recover the actual historical path.

Candidate generative conditions require a further argument. A condition can be historically present without being necessary, sufficient, portable, or formation-relevant for the target task. The selector introduced in Section 5 should therefore be justified through evidence capable of supporting a formation-relevant role. Depending on the domain, that evidence may include process tracing, comparative cases, intervention, counterfactual reconstruction, repeated interaction, expert practice, or another locally defensible method. The formal selector records the result of that inquiry; it does not perform the inquiry on its own.

The continuation family $\mathcal{C}_{\omega,\rho}^L(\Sigma)$ introduced in Section 10 is similarly bounded. It represents a supported family of later formable objects under a declared horizon and resolution. It does not represent the total set of metaphysically possible futures. A claim of generative expansion, contraction, or recombination therefore concerns the supported continuation family available to the study, together with the assumptions used to construct it.

Caution 11.3 (Historical presence and generative role). Historical participation of a condition in the formation of z does not by itself establish that the condition is generatively necessary, that its removal would prevent formation, or that an analogous condition should be reconstructed in a target system. Each stronger claim requires an additional warrant.

Caution 11.3 is central to the paper’s distinction between historical reproduction and generative translation. The formalism permits a target system to realize a generative role through historically different resources. It also permits the empirical result that a proposed role correspondence fails.

11.4 Cross-System Bridge Conditions and Partial Comparability

Generative epistemic translation requires comparison across heterogeneous systems while preserving the possibility that some comparisons remain partial, task-specific, or unsupported. The role-mediated architecture in Section 5 was introduced for this purpose. A source condition and a target resource need not be identical or historically homologous; the analysis must specify the generative role relative to which they are compared and the evidence supporting that comparison.

A bridge can therefore fail at several points. The source role may be poorly identified. The target system may contain several incompatible realizations. A target-side resource may appear analogous while serving a different formation function. The task may require a distinction for which the available evidence provides no warranted cross-system bridge. These outcomes are informative results rather than defects that must be repaired by forcing an equivalence.

The humility condition introduced in Section 7 applies directly to such cases. Unsupported source-side judgments remain suspended with respect to target filtering. Suspension does not imply that the systems are incomparable in every respect; it limits the comparison to relations for which a bridge warrant is available. This permits strong local criticism where evidence supports it while preserving unresolved remainder elsewhere.

Research Obligation 11.4 (Bridge warrant). For each cross-system generative-role correspondence used to constrain target formation, an application should identify the compared role, the source evidence, the target evidence, the bridge warrant, and the conditions under which the correspondence would be revised or withdrawn.

Research Obligation 11.4 prevents role language from becoming a vocabulary for intuitive analogy. A role correspondence becomes analytically useful only when the comparison can be inspected and contested.

11.5 Power, Authority, and Normative Assessment

Sections 8 and 9 distinguish effective capacity, recognized authority, epistemic warrant, and normative legitimacy. The distinction constrains the conclusions that can be drawn from a represented asymmetry. A relation in $\text{Pow}_{\varepsilon, \kappa, \rho}$ records effective capacity over a specified interpretive decision site. It does not by itself establish that the capacity was exercised, that the exercise caused the observed outcome, that the actor possessed recognized authority, or that the arrangement was illegitimate.

The same restraint applies to interpretive contraction. A smaller admissible outcome family can result from domination, evidential correction, safety constraints, legal requirements, methodological discipline, or several mechanisms at once. Conversely, a larger outcome family can reflect productive pluralization, weak standards, noise, strategic ambiguity, or insufficient evidence. The set relation alone supplies a structural description; evaluation requires domain-specific normative and epistemic reasons.

This separation also places a limit on the use of *epistemic humility*. The paper develops humility as discipline over unsupported cross-system judgment during a translation episode. It does not establish a general moral duty to suspend every judgment, nor does it imply equal credibility among language systems, claims, institutions, or speakers. Evidence can warrant decisive rejection. The formal condition concerns the provenance and warrant of criteria used to govern target formation.

11.6 AI-Specific Empirical Scope

The AI-specific constructions are configuration-specific. The layered object $\mathfrak{M}_{\varepsilon}^{\text{AI}}$ represents the data, model, runtime, interface, and governance/deployment components materially relevant to a particular mediated episode or study. Claims about one model version, language pair, prompting regime, retrieval system, benchmark, provider policy, or institutional deployment should not be generalized to “AI” without evidence supporting the broader domain.

The distinction between $\mathcal{U}_{\varepsilon, \kappa, \rho}^{T, \text{AI}}$ and $\mathcal{U}_{\varepsilon, \kappa, \rho}^T$ is particularly important. The first family represents target resources practically accessible through the studied AI-mediated configuration. A difference between the two can arise from training data, retrieval coverage, interface design, model capacity, prompting, governance, or measurement. The difference therefore does not by itself diagnose a deficiency in the target language system.

Recursive uptake also requires provenance evidence. Equation 29 provides a representation for cases in which earlier outputs materially enter later data, retrieval, prompting, exemplars, or institutional resources. Temporal succession, repeated wording, or output similarity alone is insufficient to establish that pathway. Where data lineage is unavailable, the formalism should record recursive uptake as an open hypothesis rather than a demonstrated mechanism.

For the same reason, the paper does not infer a general trajectory of convergence or homogenization from the possibility of shared AI mediation. Section 10 permits expansion, contraction, recomposition, coupling, and path dependence. Which pattern occurs is an empirical question indexed by the systems, tasks, horizons, infrastructures, and histories under study.

11.7 Claim Classes and Validation Requirements

The scope conditions can be summarized as a sequence of distinct claim classes. Table 10 states what the formalism can represent at each class and what additional evidence is required before a stronger conclusion is warranted. The table is intended as a reporting discipline for future applications rather than as a fixed methodological hierarchy.

Table 10: Scope and validation requirements for principal claim classes in the proposed formalism.

Claim class	Formalism can represent	Additional warrant required
Representational claim	A specified relation among indexed analytical objects	Adequacy of the empirical operationalization and resolution for the declared task
Historical claim	Documented participation of conditions in formation support	Archival, textual, institutional, interactional, or other historical evidence linking the conditions to the formation process
Generative-role claim	Candidate condition and declared formation-relevant role	Evidence that the role contributes to formation under the relevant conditions; historical co-presence alone is insufficient
Cross-system bridge claim	Role-mediated correspondence between heterogeneous source and target resources	Source evidence, target evidence, bridge criterion, and revision conditions
Power claim	Effective capacity over a specified interpretive decision site	Evidence distinguishing capacity, actual exercise, causal contribution, recognized authority, and downstream effect
Generative-consequence claim	Change in a bounded supported continuation family	Evidence of uptake or intervention plus support for the later formation difference under the declared horizon and resolution
AI-mediated claim	Contribution of a specified data, model, runtime, interface, or governance component	Configuration-specific system or process evidence; generalization across models, languages, or deployments requires further support
Normative claim	Location of choices, constraints, asymmetries, and consequences requiring evaluation	Independent domain-specific reasons concerning warrant, rights, safety, participation, responsibility, justice, or other relevant norms

Table 10 makes explicit a recurrent principle of the paper: movement to a stronger claim class requires an additional warrant. Formal representation can organize evidence and reveal where a warrant is missing; it cannot substitute for that warrant.

11.8 Applicability Boundaries: Revision Conditions

The framework is not required for every translation problem. A direct manifestational translation may be adequate when the task concerns a bounded communicative function and target-side regeneration of the source concept is irrelevant. Structural translation may be sufficient when the relevant relations can be represented and compared without reconstructing formation conditions. Generative epistemic translation becomes analytically useful when the research question concerns how another system can form a locally intelligible object through its own resources under reconstructed generative roles.

Several conditions should therefore lead an investigator to withhold or revise a generative analysis. The formalism should be withheld when the source formation history cannot be reconstructed to the degree required by the claim; when the proposed generative role is only an intuitive gloss; when target-side resources cannot be distinguished from the resources exposed by the mediator; when bridge warrants remain unavailable; when continuation families cannot be supported beyond speculation; or when an attribution of power identifies neither a capacity-bearing configuration nor a decision site. In such cases, a weaker manifestational, structural, historical, or exploratory description is preferable.

The formalism should also remain revisable when empirical applications reveal that its distinctions

fail to separate phenomena they were designed to distinguish. For example, if generative-role reconstruction cannot be operationalized independently from terminal prescription in a domain, the non-closure architecture would require revision for that domain. If target-resource accessibility cannot be separated empirically from target-system resources, claims based on that distinction should be weakened. If supported continuation families prove too unstable for comparative use at a chosen horizon, generative-consequence claims should be reformulated at a different resolution or replaced by a more modest historical account.

Claim 11.5 (Revision priority). Within the present research programme, failure of an empirical application to support a bridge, mechanism, or distinction should first revise the local representation or its scope. It should not be converted into evidence for the unsupported relation merely to preserve formal completeness.

Claim 11.5 states the methodological posture required by a preliminary GR formalism. The framework is intended to make assumptions, bridges, and evidential obligations visible. Its value therefore depends partly on preserving failed translations, unresolved comparisons, and unsupported generative claims as legitimate outcomes of inquiry.

The scope conditions complete the paper’s analytical architecture. The proposed formalism is local, task-relative, historically evidential, and ontologically restrained. It distinguishes representation from mechanism, historical formation from generative role, capacity from exercise, power from legitimacy, AI-accessible resources from target-system resources, and supported continuation families from total future possibility. These limits preserve the main contribution of the paper: a formal vocabulary for studying generative epistemic translation without treating the vocabulary itself as a substitute for historical, linguistic, empirical, or normative inquiry.

12 Conclusion

This section consolidates the paper’s contribution and states the research programme that follows from it. Its role is synthetic. The objective is to bring together the historical, formal, epistemic, political, and AI-mediated dimensions developed in Sections 1–11 without extending the framework beyond the evidential and conceptual boundaries already stated. The section first summarizes the formal architecture of generative epistemic translation, then integrates epistemic humility and interpretive power, examines the implications of AI-mediated translation for historical generativity, and identifies the principal interfaces and validation priorities for subsequent work. The method is reconstructive: the claims stated here are conclusions from the preceding analysis rather than independent additions to the formalism.

12.1 Formal Architecture of Generative Epistemic Translation

The paper began from a restrictive boundary condition. Translation studies already contains sophisticated treatments of equivalence, function, target-system norms, culture, ideology, power, digital mediation, and transfer across epistemic systems. A GR contribution therefore required an analytical object that could not be obtained merely by redescribing translation as contextual, historical, relational, or power-laden. The resulting proposal concentrates on *generative epistemic translation*: mediation in which selected formation-relevant conditions associated with a source-side epistemic object are reconstructed through target-side resources so that the target system can form a locally intelligible object under declared constraints.

The formal architecture was built incrementally. Section 2 introduced history-bearing GR carriers, task-relative language-system projections, context-indexed manifestations, event-relative source and target roles, and retained-content projections. These objects established a minimal analytical vocabulary without assigning ultimate ontological status to the represented systems. Section 3 then treated concepts and other epistemic objects as historically formed configurations whose present manifestations can underdetermine the histories that contributed to their intelligibility. The formation profile was introduced

to organize relevant problems, inherited distinctions, operations, institutions, prior translations, and historical alternatives without equating historical co-presence with generative necessity.

Section 4 separated manifestational, structural, and generative translation as distinct analytical modes. This separation prevents fluent target expression, structural reconstruction, and target-side generativity from being collapsed into one scalar notion of translation quality. Manifestational and structural translation remain legitimate terminal objectives when they match the task. Generative epistemic translation becomes relevant when the research question concerns the capacity of a target system to form, examine, modify, or reject an epistemic object through resources available within its own historically situated organization.

Sections 5 and 6 supplied the core of the proposed formalism. Historical formation support is first filtered through a task-relative selection of candidate generative conditions. The selected conditions are represented through declared generative roles, and target-side resources are then evaluated according to whether they can realize those roles. This role-mediated architecture permits source and target resources to remain historically and structurally heterogeneous. Generative translation therefore does not require replaying the source history, reproducing the source vocabulary, or identifying a source object with a target object.

Open-ended target formation completes this architecture. A generative episode can impose evidential, logical, legal, safety, disciplinary, or other declared constraints while leaving the terminal target object undetermined in advance. The resulting non-closure condition is *ex ante*. It concerns the structure of the mediation before target formation occurs, rather than requiring permanent plurality after the inquiry is complete. A target process can therefore converge on a unique result when target-local formation and warranted constraints support that result. The decisive distinction is whether a source-preferred terminal object functions as the hidden success condition of the mediation.

This architecture provides a narrow answer to the paper's central formal question. Generative epistemic translation is represented as a historically indexed relation among source formation support, selected generative roles, target-local resources, declared admissibility constraints, and an open family of target formations. The formalism does not replace translation theory. It identifies an additional object for cases in which the reconstruction of formation conditions matters independently from the production of an acceptable target expression.

12.2 Epistemic Humility and Interpretive Power

The paper's treatment of epistemic humility follows directly from the generative architecture. If target formation is meant to occur through target-local resources, the source system cannot automatically supply the criteria by which those resources and their outcomes are judged. Section 7 therefore represented humility as scope discipline over cross-system evaluative authority. A source-side judgment can become a target-side admissibility condition only through a bridge whose warrant is stated and supported. Suspension in this framework concerns unsupported projection of evaluative criteria; it does not require equal credibility among claims, indefinite agnosticism, or abandonment of evidence-based rejection.

This distinction also strengthens the non-closure criterion. Terminal openness alone cannot secure generativity when source-side actors or institutions retain unilateral control over the criteria that define admissibility. A mediation can leave several target expressions formally available while filtering them through categories that were imported without a warranted bridge. Epistemic humility therefore operates at a second-order level: it constrains the authority to decide which judgments are permitted to shape target formation.

Section 8 located power within the same architecture. Interpretive power was represented as effective relational capacity over identifiable decision sites, including retained-content selection, generative-condition selection, generative-role assignment, target-resource accessibility, bridge recognition, admissibility criteria, and terminal prescription. This representation avoids treating a language, institution, platform, or community as powerful merely by label. A power claim requires a capacity-bearing configuration and a specified site at which that configuration can alter the mediation.

The analysis also separated effective power, recognized authority, epistemic warrant, causal contribution, and normative legitimacy. These distinctions are important because asymmetry alone does not determine whether a translation arrangement is objectionable. A scientific standard, legal requirement, safety rule, or evidential constraint can legitimately contract the space of admissible target formations. Conversely, a formally plural outcome space can coexist with concentrated control over the upstream conditions that determine what becomes thinkable or accessible. The formalism therefore identifies where evaluative questions arise while leaving their normative resolution to domain-specific reasons.

Taken together, epistemic humility and interpretive power provide a relational account of cross-system understanding that avoids two symmetrical simplifications. The first simplification treats the source system as entitled to determine the categories through which the target becomes intelligible. The second treats heterogeneity as sufficient reason to suspend comparison indefinitely. The proposed architecture permits comparison, criticism, and decisive judgment where warrants are available, while requiring the provenance of cross-system criteria to remain visible. Generative translation is consequently compatible with disagreement. A target system can regenerate the relevant problem structure and still produce a different concept, judgment, or normative conclusion.

12.3 AI Mediation and Historical Generativity

The AI-specific extension of the paper concerns mediation architecture rather than an essential property of artificial intelligence. Section 9 represented AI-mediated translation through materially relevant data, model, runtime, interface, and governance or deployment components. This layered representation prevents model output from being attributed to a single abstract actor and permits empirical inquiry into which component contributes to a particular interpretive effect.

A central distinction in this analysis is the difference between the resources of a target language system and the subset of those resources made practically accessible through an AI-mediated configuration. Failure of a model or interface to surface a distinction, historical resource, conceptual lineage, or local inferential pathway does not establish that the target system lacks that resource. The distinction is especially important for multilingual and low-resource settings, where data availability, retrieval coverage, interface design, and evaluation benchmarks can influence what appears readily translatable.

The AI setting also makes recursive uptake analytically salient. A retained output can enter later educational material, professional vocabulary, prompts, retrieval systems, exemplars, annotations, corpora, or institutional practices. Section 10 generalized this observation into a historical account of mediated inheritance. Translation outputs and interpretive decisions can become part of the formation support from which later epistemic objects are generated. The stronger claim that mediation has a generative consequence requires additional evidence: the uptake must contribute to a demonstrable difference in a bounded continuation family of later formable objects.

This distinction separates three levels that are easily conflated in AI discussion. A system can produce a successful translation without altering later knowledge formation. An output can be historically retained without demonstrably changing what later actors can form. A generative consequence is supported only when the retained mediation contributes to a difference in future formability under a declared task, horizon, and resolution. The framework can then represent expansion, contraction, or recomposition of the supported continuation family without assigning automatic normative value to any of those patterns.

Cross-system mediation also creates the possibility of historical coupling. Shared infrastructures can connect language systems that previously developed through partially distinct pathways. Such coupling need not produce convergence. It can support hybridization, local differentiation, selective borrowing, recursive disagreement, new conceptual combinations, or contraction around repeated forms. Path dependence follows because earlier mediation can alter the resources available to later mediation. Interpretive power can therefore acquire a temporal dimension when a decision made at one stage enters the formation conditions of subsequent stages.

These results give the AI-era problem a specific form. The relevant question is not simply whether AI

translation is accurate, culturally sensitive, homogenizing, or beneficial. Those questions remain important and require empirical study. The GR question concerns how AI-mediated configurations redistribute access to generative resources, how they organize bridge criteria and admissibility, and how recurrent outputs participate in later formation histories. This formulation keeps the analysis compatible with both beneficial and harmful cases and prevents the formalism from presupposing a single developmental trajectory for AI-mediated knowledge.

12.4 Research Interfaces and Validation Priorities

The proposed formalism creates several research interfaces while preserving the autonomy of the corresponding disciplines. Translation studies remains the primary boundary-setting field for claims about translation practice, norms, culture, institutions, translators, audiences, technological mediation, epistemic transfer, and translation as historical transformation. The present framework is most distinctive when a study requires the narrower decomposition developed here: source formation support, selected generative roles, target-resource realizations, bridge-warranted constraints, and terminal non-closure must be distinguished rather than compressed into a general claim of deep or culturally responsive translation.

Education provides a particularly direct interface. A pedagogical explanation can be evaluated at the manifestational level, the structural level, or the generative level. The generative criterion asks whether learners have access to the problem structure, distinctions, examples, operations, and constraints required to form and revise the relevant concept themselves. This criterion does not imply that direct instruction is inferior. It provides a separate analytical vocabulary for distinguishing answer delivery from the reconstruction of conditions for independent formation.

The philosophy and history of science provide another interface because scientific concepts are often intelligible through problem lineages, instruments, disciplinary distinctions, failed alternatives, and historically stabilized inferential practices. The formation-profile architecture offers a way to state which parts of that history are claimed to matter generatively in a particular cross-disciplinary explanation. Historical reconstruction remains evidentially independent: the formalism cannot determine which factors actually contributed to a scientific concept's development.

Political theory, legal theory, and studies of knowledge and power provide interfaces for the bridge and authority problems. Cross-system translation frequently occurs under unequal institutional conditions. Publication systems, legal vocabularies, administrative categories, educational standards, and platform infrastructures can influence which conceptual resources receive recognition and which systems bear the burden of translation. The interpretive-power formalism can identify decision sites and capacity relations, while questions of justice, legitimacy, rights, representation, and responsibility require additional normative argument.

AI studies and human-AI interaction provide an empirical interface for the layered mediation architecture. Future work can investigate whether particular model and interface designs expose source histories, preserve competing distinctions, reveal uncertainty, support target-local resource discovery, or prematurely close formation around default formulations. Such studies should distinguish model capability from product behavior, output regularity from historical uptake, and historical uptake from downstream generative consequence.

The wider GR research programme provides a final interface. The paper uses history-bearing relational configurations, task-relative projections, generative capacity, power over relational interfaces, and ontological suspension in a domain-specific setting. Translation therefore functions as a test case for a broader GR proposition: meaningful comparison among heterogeneous systems can require attention to the conditions through which their local objects are generated. The present paper does not establish that this architecture transfers unchanged to law, economics, education, political organization, or other GR domains. Such transfer would require new domain-specific derivation and validation.

Section 11 supplies the corresponding research discipline. Representational claims require adequate operationalization; historical claims require historical evidence; generative-role claims require evidence

beyond co-presence; bridge claims require source, target, and bridge warrants; power claims require identifiable capacities and decision sites; generative-consequence claims require supported differences in later formation; AI-mediated claims require configuration-specific evidence; and normative claims require independent reasons. These validation obligations are constitutive constraints on the proposed formalism rather than external qualifications appended after it. A generative framework that cannot preserve the possibility of failed bridges, unsupported mechanisms, and unresolved comparisons would reproduce the interpretive closure that the paper seeks to analyse.

The paper therefore closes with a deliberately limited proposition. Generative epistemic translation can be studied as a relation among historically formed source conditions, selected generative roles, heterogeneous target resources, warranted cross-system bridges, declared admissibility constraints, and open target formation. Epistemic humility disciplines the projection of unsupported source criteria; interpretive power identifies capacities over the mediation architecture; AI infrastructures redistribute access and control across that architecture; and retained mediation can enter the historical conditions of later knowledge formation. These relations provide a preliminary formal vocabulary for investigating how knowledge can become intelligible across heterogeneous language systems while preserving the possibility that the receiving system generates a different, locally warranted result.

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