Chapter 7

Methodologies of Relational Inquiry

This chapter develops the methodological architecture of relational inquiry within Generative Relational Theory (GR) and Generative Relational Economics (GRE). Its role within Part III is to translate the ontological, epistemological, and praxis-level commitments developed in Chapters 4–6 into concrete disciplines for specifying, observing, reconstructing, comparing, measuring, validating, and reporting relations. Chapter 6 treated research as historically situated praxis involving judgment, institutional position, methodological plurality, contingent encounter, revision, and responsibility. The present chapter moves one level closer to research design. It asks what a researcher has to specify before a relational claim can become methodologically accountable, what different forms of evidence can support, how heterogeneous methodological traditions can correct one another, and where the evidential burden increases as inquiry moves from the presence of a relation toward claims about what relations generate.

The chapter therefore treats methodology as a revisable architecture of epistemic access rather than as a menu of techniques. The ontological distinctions of Chapter 4 remain operative throughout. Analytical entities, relations, fields, institutions, network nodes, latent positions, spatial regions, and higher-order structures can be useful research objects without being elevated into final ontological commitments. The epistemology of Chapter 5 remains equally active: manifestations and representations provide mediated access to relational reality; similar manifestations can remain compatible with different relational configurations; observation is partial and positioned; boundaries and scales affect what becomes visible; and stronger claims require explicit inferential bridges. Chapter 6 adds the praxis constraint that method selection, interpretation, data production, preservation, AI assistance, and reporting occur within historically and institutionally situated relations. In condensed form, ontology constrains reification, epistemology constrains over-inference, and research praxis constrains decontextualized technique.

These constraints support a methodologically plural chapter. Historical, interpretive, qualitative, quantitative, empirical, formal, computational, network, spatial, temporal, legal, institutional, and field-based approaches can each provide distinctive forms of access to relational phenomena. Their differences are analytically conse-

quential. Documentary evidence can preserve institutional traces while inheriting administrative categories; ethnography can disclose tacit practice while remaining bounded by field access; interviews can reconstruct experience and meaning while being shaped by memory and elicitation; legal analysis can establish formal positions while leaving practical enactment open; network analysis can reveal structural organization while depending on node and edge construction; statistical models can quantify dependence while leaving substantive meaning underdetermined. The chapter therefore evaluates methods by the epistemic work they perform in relation to a specified research question rather than by a general hierarchy among traditions.

The first methodological commitment is question-prior design. A research method becomes adequate relative to an object, claim, boundary, scale, temporal horizon, evidential environment, and intended inference. This ordering matters because method-first inquiry can silently reshape the research object around what the preferred technique can observe. A relational question can require several forms of evidence whose translations remain partial. Methodological combination therefore concerns complementarity and mutual correction as much as synthesis. Where representations remain only partially translatable, the unresolved remainder should remain visible rather than being erased through forced integration.

The chapter's second commitment concerns explicit construction of the research object. Relational inquiry often begins before the relata, boundaries, scales, or relation types are fully settled. Entities can be provisional; relations can be observed, inferred, latent, institutional, historical, symbolized, negative, or uncertain; relational identity can persist through some transformations while dissolving under others; and configurations can contain dyadic, triadic, higher-order, nested, or second-order structures. Research design therefore requires versionable object specification. Revision can increase complexity when evidence reveals omitted structure, and it can simplify an initially elaborate object when the additional structure proves unnecessary for the target claim.

The third commitment concerns the distinction between manifestation and relation. A transfer, message, contract, administrative code, spatial co-presence, interview statement, institutional role, or statistical association can provide evidence about a relation without exhausting its meaning or structure. This distinction motivates the chapter's repeated use of profiles, provenance chains, uncertainty records, and inferential bridges. The purpose of these devices is not bureaucratic completeness. They make visible which transformations connect encountered evidence to a relational claim, which assumptions enter that transformation, and where later researchers could revise the inference. This discipline becomes increasingly important when AI systems participate in retrieval, classification, entity resolution, translation, coding, summarization, modeling, or relation extraction, because computational abundance can otherwise hide the historical and representational conditions under which evidence became legible.

A further commitment concerns contingency and judgment. Relational inquiry remains partly open at the design stage because research designs encounter anomalies, unexpected documents, unanticipated actors, new relation types, field discontinuities, measurement failures, and changing institutional conditions. Contingent encounter can therefore redirect object specification, boundary construction, scale

selection, or evidential strategy. Aesthetic judgment can make an unexpected pattern salient before its epistemic significance is established. The methodological task is to preserve this generative role of encounter while requiring subsequent verification, alternative explanation, provenance, and claim calibration. In the AI era, where candidate models, classifications, explanations, and formalizations can be produced at comparatively low marginal cost, this capacity to recognize which encounter deserves sustained inquiry becomes more consequential.

The internal structure of the chapter follows six movements. The first movement, Sections 7.1–7.2, establishes the transition from research praxis to relational methodology and maps the major traditions of social-science inquiry. Section 7.1 translates the commitments of Chapters 4–6 into methodological constraints: research questions precede method preference; relational objects remain provisional; adequacy is target-relative; methods can be combined while preserving translation remainders; and method selection remains revisable. Section 7.2 then compares historical-interpretive and qualitative, quantitative-empirical, formal-computational, and mixed or multi-method traditions according to their forms of epistemic access. The section rejects a simple qualitative–quantitative binary as too coarse for the range of relational questions developed later in the chapter.

The second movement, Sections 7.3–7.9, constructs the relational research object. Section 7.3 develops provisional entities, candidate relations, higher-order relations, configurations, fields, institutions, symbolic objects, historical objects, and revisable object specifications. Section 7.4 treats analytical boundaries as explicit hypotheses about relevance and tractability and introduces permeability, sensitivity, revision, and boundary remainders. Section 7.5 distinguishes boundary from scale and develops individual, dyadic, organizational, community, institutional, field, cross-scale, and multiscale inquiry while preserving scale remainders. Sections 7.6 and 7.7 separate relation identification from relation characterization: the former asks what warrants a claim that a relation is present, absent, latent, institutional, historical, or otherwise identifiable; the latter examines direction, intensity, duration, reciprocity, dependence, constraint, enablement, asymmetry, multiplexity, and meaning. Section 7.8 adds temporal identity and persistence, and Section 7.9 extends inquiry from individual relations toward configurations, higher-order structures, relations among relations, motifs, and topology.

The third movement, Sections 7.10–7.16, examines major modes of evidential access and situated reconstruction. Documentary inquiry distinguishes records from the institutions and infrastructures that produce them and treats provenance and documentary silence as part of the evidential problem. Archival inquiry examines selection, custody, arrangement, preservation, access, archival power, and the difference between a historical configuration and the archival configuration through which its traces survive. Ethnographic inquiry develops situated observation, tacit practice, field position, and reflexive field notes. Interview-based inquiry distinguishes narrative, experiential, mnemonic, contradictory, and relational accounts while preserving the conditions under which testimony is elicited. Legal inquiry separates legal status, institutional interpretation, and enacted practice; institutional inquiry reconstructs rules, roles, authority, coordination, memory, boundaries, and transformation across formal and informal layers. Comparative relational inquiry

then develops claim-relative and graded comparability, distinguishing relational equivalence from functional equivalence and preserving comparative remainders where cases remain only partially commensurable.

The fourth movement, Sections 7.17–7.25, develops broader methodological families and relational representations. Section 7.17 maps mainstream historical-interpretive social-science methods through their epistemic functions, including case study, comparative history, historical institutionalism, process tracing, archival and documentary research, interviews, ethnography, discourse analysis, legal and institutional interpretation, conceptual history, genealogy, and thick description. Section 7.18 provides the quantitative-empirical counterpart through sampling, measurement, regression, panels, time series, multilevel models, experiments, quasi-experiments, missing data, robustness, and sensitivity analysis while making the relational content of identification assumptions explicit. Sections 7.19 and 7.20 develop network and higher-order relational analysis, separating nodes and edges from the objects they represent and distinguishing pairwise structure from jointly constituted or second-order relations. Sections 7.21 and 7.22 address statistical and causal relational inference, including dependence, latent structure, interference, spillover, network confounding, relational counterfactuals, and the distinction between an empirical relational graph and a causal graph. Sections 7.23–7.25 then develop spatial, temporal, and field-based relational analysis, treating geographical proximity, relational distance, mobility, accessibility, territory, formation, persistence, rhythm, temporal gaps, field position, gradients, overlapping fields, and distributed conditions as distinct analytical objects.

The fifth movement, Sections 7.26–7.31, turns from reconstruction toward the quality, governance, and recoverability of relational claims. Section 7.26 treats measurement as a transformation from relational manifestations into indicators, proxies, composites, and other representations, with explicit attention to validity, error, standpoint, and invariance. Section 7.27 examines missing actors, missing relations, hidden relations, strategic concealment, unequal observability, archival loss, and digital omission while preserving the distinction between missingness and substantive absence. Section 7.28 develops triangulation through convergence, complementarity, tension, contradiction, shared dependence, and preservation of irreducible disagreement. Section 7.29 then organizes validation around construct, historical, relational, boundary, scale, representation, cross-method, and external dimensions, while preserving a validation remainder for unresolved alternatives and transfer limits. Section 7.30 extends research ethics from isolated participants toward relational privacy, third-party exposure, vulnerable relations, representational and classification harm, data governance, reciprocity, and responsibility. Section 7.31 closes this movement by making reporting itself part of methodological accountability through explicit boundary, scale, representation, assumptions, uncertainty, alternative models, provenance, reproducibility, and reinterpretability.

The sixth movement, Section 7.32, marks the transition from relational inquiry to generative relational inquiry. The section distinguishes relation existence, relational consequence, generative effect, mechanism, trajectory, structural transformation, and transformation of the generative rule. These distinctions prevent a documented relation from being treated as sufficient evidence for what that relation pro-

duces through time. They also establish the increasing evidential burden associated with stronger generative claims. Chapter 8 begins where this chapter ends: once the relation and its evidential architecture have been reconstructed with sufficient discipline, inquiry can turn toward mechanisms, trajectories, feedback, path dependence, criticality, multiscale generation, dynamical and stochastic systems, structural transformation, option spaces, and other methods required to study how later relational possibilities are produced.

Across these movements, the chapter follows a common principle of scoped methodological accountability. Relational inquiry can remain ambitious without requiring exhaustive representation of the relational world. A study can construct bounded objects, choose a defensible scale, use partial evidence, adopt formal representations, and reach strong local conclusions when the transformations connecting evidence to claim remain sufficiently explicit and when materially relevant uncertainty and counterevidence remain visible. Methodological rigor therefore lies partly in knowing what the selected method makes available, what it transforms, what it leaves outside the immediate representation, and what kinds of later revision the preserved research record permits. This architecture prepares the transition from knowing relations to investigating generation while keeping stronger claims proportionate to the evidence that supports them.

7.1 From Research Praxis to Relational Methodology

Chapter 6 approached research methodology through the prior category of praxis. That ordering established that method selection occurs within a configuration of questions, relations, judgments, institutional conditions, evidential access, historical location, responsibilities, and limits. The present section begins Chapter 7 by carrying that result into relational methodology. Its role is to specify how the ontological and epistemological commitments developed in Chapters 4 and 5 constrain the methodological architecture of relational inquiry, and how the praxis analysis of Chapter 6 turns those constraints into practical design requirements. The section proceeds through research praxis as methodological constraint, the priority of research questions, the provisional construction of relational objects, methodological adequacy, method combination, revisability, and the limits of method transfer. The objective is not to select a preferred technique. It is to establish the conditions under which a technique can become adequate to a relational research problem.

The transition is important because relational vocabulary by itself underdetermines methodology. Chapter 4 distinguished ontological reality, relational reality, and manifestational reality while retaining ontological suspension. Chapter 5 then treated knowledge as mediated through manifestation, traces, representations, observation, boundaries, scale, history, and unequal epistemic access. Chapter 6 placed these epistemic conditions inside research praxis, where researchers encounter, judge, select, translate, revise, preserve, and sometimes intervene in the fields they study. Relational methodology therefore inherits constraints from three directions: the reality under study may exceed its manifestations; access to that reality is partial and mediated; and research operations themselves occur within consequential relations.

This inheritance gives methodology a limited but demanding function. It should organize inquiry so that the relation between research question, object specification, manifestation, evidence, representation, inference, and revision remains sufficiently visible for the resulting claim to be examined. A method can contribute to that task without settling the ultimate ontology of the object or exhausting the possible ways in which the object can later be known.

Proposition 7.1 (Ontological–epistemic–methodological continuity)**.** *Within the present framework, relational methodology is stronger when its design choices remain traceable to the ontological restraint, epistemic access conditions, and praxis-level responsibilities that motivate those choices.*

Proposition 7.1 expresses continuity rather than derivation. Ontology does not mechanically determine a method, and epistemology does not supply a unique procedure. The same ontological and epistemic conditions can support several methodological configurations. Their adequacy depends on the question, target, evidence, scale, history, and consequences of inquiry. This underdetermination is a reason for methodological judgment rather than a defect to be concealed.

7.1.1 Research Praxis as Methodological Constraint

Research praxis constrains methodology because methods operate within relations that precede and exceed their technical procedures. The researcher occupies positions with respect to participants, institutions, archives, infrastructures, computational systems, disciplinary communities, funding structures, and publics. These positions shape access, categories, recording practices, feasible interventions, and the practical consequences of representation. A technically well-executed procedure can therefore remain methodologically weak if it ignores conditions that materially affect what the procedure is able to observe or support.

The ontology developed in Chapter 4 provides a first constraint. Ontological suspension discourages the conversion of an analytical representation into a final claim about what reality ultimately is. A network representation, for example, can be useful when ties and positions make an explanatory difference, yet the graph does not thereby become the ontology of the field. A legal category can be indispensable for studying institutional authority without exhausting the relational reality of the persons and practices classified through it. A statistical variable can capture a regularity while remaining one manifestational representation among several possible access routes. Relational methodology should therefore distinguish the reality being investigated from the representation through which the inquiry currently renders it tractable.

The three-register architecture creates a second constraint. Ontological, relational, and manifestational questions can intersect, but they are not interchangeable. A manifestation can provide evidence of a relation without being identical to the relation. A stable institutional representation can participate in sustaining a relational reality while still omitting other relations that matter to the inquiry. An observed change in manifestation can reflect a change in relational reality, a change in the manifestation process, a change in recording practice, or some combination of these. Methodological design should remain sensitive to these possibilities when moving from observed

traces toward relational claims.

Chapter 5 adds the inverse problem of manifestation. Similar manifestations can sometimes be compatible with different underlying relational configurations, while similar relations can become manifest differently across institutional, historical, cultural, or technological contexts. This limits simple reverse inference from record to relation. Administrative categories, platform data, interview statements, archival traces, legal classifications, behavioral observations, and machine-generated indicators can each be informative, but their evidential meaning depends partly on the processes through which they became available.

Research praxis adds a third constraint by situating these epistemic problems inside activity. A researcher chooses where to look, which archive to enter, whom to interview, what to formalize, which anomaly deserves attention, when to stop collecting evidence, and when a provisional interpretation is sufficiently warranted for the current purpose. These choices are shaped by finite time and attention. They can also be redirected by contingent encounter. Methodology should consequently provide structure while preserving routes through which unexpected evidence can alter the design.

Definition 7.2 (Praxis-constrained methodology)**.** A *praxis-constrained methodology* is a methodological configuration whose research object, evidence strategy, inferential operations, ethical conditions, and revision procedures are specified in relation to the situated constraints and responsibilities of the inquiry in which they operate.

Definition 7.2 does not require researchers to produce an exhaustive sociology of their own project before investigation begins. The relevant requirement is proportionality. Conditions that materially shape access, representation, interpretation, or consequence should enter methodological reasoning at a level appropriate to the claim. Other background relations can remain outside the immediate design until evidence gives reason to reconsider them.

This formulation also preserves the distinction between research-dominant and application-dominant praxis developed in Chapter 6. A method used primarily to understand a field can tolerate forms of provisionality that become less acceptable when the same method is used to allocate resources, classify persons, prioritize cases, or trigger institutional action. The technical operation may remain similar while the praxis configuration changes. Methodological adequacy therefore benefits from renewed assessment when the relation between inquiry and consequence changes.

7.1.2 Research Questions before Method Selection

Relational methodology begins more coherently from the research question than from allegiance to a method. The question specifies what difference the inquiry seeks to understand and what kind of claim would count as an informative response. Method selection can then be evaluated by asking whether a procedure provides appropriate access to the evidence needed for that claim.

This ordering helps avoid a recurrent methodological inversion. Researchers can possess expertise in a technique and then search for objects that fit the technique's available representation. Network analysis can encourage the world to appear as

nodes and edges; regression can encourage the world to appear as variables and conditional associations; ethnography can privilege enacted meaning and situated practice; archival research can privilege preserved traces; formal modeling can privilege structures that can be explicitly parameterized. Each orientation can be productive. Difficulty arises when the representational affordances of the method silently become criteria for what counts as an important research object.

The epistemology of Chapter 5 suggests a different sequence. A question should first identify the epistemic target with sufficient precision to guide access. Is the inquiry asking whether a relation exists, how it is experienced, how it is institutionally represented, whether it persists across time, how it differs across scale, or how it becomes visible through particular manifestations? These questions can concern the same empirical setting while requiring different evidential relations.

The distinction between relational and generative questions is especially important. Chapter 5 treated evidence for relational claims separately from evidence for generative claims because identifying a relation does not by itself establish what that relation contributes to later change. Chapter 8 will develop the additional methodological burden of generative inference. Chapter 7 therefore concentrates first on the methodological work required to identify, characterize, reconstruct, compare, measure, interpret, and validate relations.

Research questions can also remain layered. A project may begin with a descriptive question about the existence of a relation, encounter evidence suggesting a historical transformation, and later develop a generative question about how that transformation altered capacities or future possibilities. Such development need not indicate poor initial design. It can represent learning. The methodological requirement is to make the shift in question visible because the evidential burden changes with it.

Proposition 7.3 (Question-prior method selection)**.** *Method selection is better grounded when the intended claim and its evidential target are specified before the authority, availability, novelty, or technical sophistication of a particular method is allowed to organize the research problem.*

The proposition remains compatible with exploratory inquiry. A researcher can enter a field without a sharply stabilized hypothesis and can allow observation, archives, dialogue, or computational exploration to generate candidate questions. The relevant priority is logical rather than strictly chronological. When a method is used to support a substantive claim, the researcher should be able to state what question the method is serving and why its operations are informative for that question.

This is also where contingent encounter and aesthetic judgment enter methodology. A research question can arise because an unexpected pattern, phrase, institutional inconsistency, visual structure, failed model, or cross-disciplinary analogy appears unusually salient. Such recognition can precede evidential justification. The methodological task begins when the initial attraction is converted into a researchable question whose object, evidence, alternatives, and uncertainty can be examined. Aesthetic judgment can orient attention without becoming a substitute for epistemic warrant.

7.1.3 Relational Objects of Inquiry

A relational object of inquiry is constructed provisionally from a reality that may exceed the analytical object. This statement follows directly from the ontological restraint of Chapter 4. Research needs objects sufficiently stable to be investigated, yet the construction of such objects should not be confused with proof that reality itself is partitioned in exactly the same way.

Objects can take several forms. The inquiry may focus on an entity and the relations through which its capacities are produced; a dyadic or multilateral relation; a network or higher-order configuration; an institution; a field; a symbolic object; a historical trajectory; or a relation between manifestations and the realities they help disclose or sustain. The methodological question is whether the chosen object specification makes consequential relations sufficiently visible for the research purpose.

This requires attention to provisional entityhood. A person, firm, household, organization, state, platform, legal category, or dataset can be treated as an analytical entity when doing so supports the inquiry. Relational analysis may then decompose some of the relations that make the entity effective without requiring the entity to disappear analytically. The relevant resolution depends on the question. A firm can be a useful unit for one analysis and a heterogeneous configuration of labor, ownership, contracts, technologies, routines, and infrastructures for another.

Relational objects also inherit the problem of manifestation. A recorded relation is not automatically equivalent to a relation as lived, enacted, institutionalized, or historically constituted. A friendship edge extracted from a platform, an administrative household category, a contractual relation, a citation link, a financial transfer, and an interview account of trust are different forms of evidence. They can refer to relations with different degrees of overlap. Methodological design should therefore state the operation by which a manifestation is being treated as evidence for a relational object.

Definition 7.4 (Provisional relational object)**.** A *provisional relational object* is an analytically specified entity, relation, configuration, field, institution, symbolic form, or historical object whose boundaries and relevant properties are stabilized sufficiently for inquiry while remaining open to revision when evidence indicates that the specification omits, conflates, or misrepresents consequential relations.

The word *provisional* carries epistemic rather than merely stylistic force. Boundary choice can change the object. Scale can reveal relations invisible at another resolution. Historical change can make a previously adequate category misleading. Machine-mediated observation can create new relational indicators while increasing distance between the analyst and the process through which those indicators were produced. Participant interpretation can reveal that a formally identical relation carries heterogeneous meanings. A relational object should therefore preserve a revision path.

The three-register architecture further suggests that some projects may need multiple linked objects. One object can concern a relational reality, another its manifestational forms, and another the institutional or symbolic representation through which those manifestations are recorded. Their relation can itself become part of the inquiry. This is especially important where classifications are performative. A legal,

administrative, statistical, or algorithmic representation can begin as a manifestation of a relation and later participate in reorganizing the relation it represents.

Chapter 7 will develop these issues in detail through object specification, boundary construction, scale selection, relation identification, persistence, and configuration reconstruction. The present subsection establishes the general discipline: relational objects are analytical achievements whose adequacy depends on what they allow the inquiry to see, compare, and revise.

7.1.4 Methodological Adequacy

Chapter 6 defined methodological adequacy as the fit between a method's operations, assumptions, evidential access, limitations, research object, and intended claims. Relational inquiry adds several dimensions to that criterion because relations are often accessed indirectly and because their identity can depend on boundary, scale, history, and representation.

A method can be adequate along one dimension and limited along another. Administrative records can support broad temporal coverage while inheriting institutional categories whose meaning changed. Interviews can recover experiential and interpretive relations while remaining selective with respect to memory, participation, and retrospective reconstruction. Ethnography can reveal tacit practice and situated meaning while covering a comparatively bounded field. Network data can expose patterns of connectivity while reducing heterogeneous relations to edge structures. Formal models can clarify implications of relational assumptions while depending on the adequacy of the chosen abstraction. Statistical methods can characterize uncertainty and conditional patterns while remaining sensitive to measurement and identification assumptions. These differences invite target-relative evaluation rather than a general hierarchy.

Ontology and epistemology add further adequacy questions. Does the method distinguish manifestation from the relation inferred from it? Does it preserve uncertainty where the inverse problem remains underdetermined? Are boundaries, scales, and temporal intervals explicit enough to understand the scope of the claim? Can the representation accommodate multiple realization or historical transformation? Does the evidence-production process systematically privilege relations that are institutionally legible while making other relations difficult to observe? Can the inferential path be reconstructed and contested?

Definition 7.5 (Relational methodological adequacy)**.** *Relational methodological adequacy* is the degree to which a methodological configuration provides warranted access to the specified relational object while making its principal representational choices, boundary and scale conditions, evidential limitations, uncertainties, and revision pathways commensurate with the intended claim.

This definition includes ethical and justice-sensitive dimensions where they are epistemically material. Unequal capacity to create records can generate biased relational maps. Exclusion from institutional categories can produce apparent absence. Strategic concealment can alter observed network structure. A research design that treats these patterns simply as missing data can lose substantive information about the field. Methodological adequacy may therefore require examining how observ-

ability itself is relationally distributed.

Adequacy is also historical. A method can work well under one manifestation regime and become weaker after institutional or technological change. A stable survey item can cease to measure the same relation after the meaning of a category changes. A platform interface can alter interaction while preserving the same database field. An archival series can contain a discontinuity created by a change in administrative procedure. Historical sensitivity therefore belongs inside methodological validation rather than being added only as contextual narrative.

Epistemic humility provides the final discipline. Methodological sophistication should not be treated as evidence of comprehensive access. A powerful model, large dataset, rich archive, long ethnography, or advanced AI system can expand what can be investigated while leaving important relations outside the current representation. Adequacy concerns fitness for a stated claim, not epistemic mastery of the field.

7.1.5 Method Combination

Method combination follows from partial access rather than from a general preference for methodological multiplicity. Several methods can be useful when the research question contains components that become visible through different evidential interfaces. Combination is most informative when each method has a defined role and when their translations and disagreements remain inspectable.

The epistemology of manifestation explains why combination can matter. A relation may leave documentary, behavioral, testimonial, institutional, spatial, temporal, or computational traces that are related without being equivalent. Documentary inquiry can reveal formal decisions; interviews can reveal how those decisions were interpreted; ethnography can show how they are enacted; quantitative data can characterize distribution; historical inquiry can reconstruct change; formal analysis can expose structural implications. The combined design can therefore approach different aspects of the same relational problem.

Combination should preserve methodological difference. Translating narrative into variables, contracts into network edges, field observations into coded categories, or historical episodes into model states can enable comparison while producing remainders. The relation between methods is epistemically stronger when these remainders remain visible. Apparent convergence can otherwise be manufactured by forcing heterogeneous evidence into a common representation.

Disagreement can also be informative. If archival evidence and contemporary interviews produce different relational histories, the discrepancy can indicate memory transformation, archive selection, category change, institutional power, or genuine historical discontinuity. If a network model identifies a central actor while ethnographic observation finds little practical authority, the difference can reveal a gap between connectivity and influence. Method combination should therefore support mutual correction as well as confirmation.

Proposition 7.6 (Complementarity with preserved remainder)**.** *A multi-method relational design is strengthened when each method has an explicit evidential role, translations between representations are documented, and residual disagreement is preserved*

when the available evidence does not warrant synthesis.

The proposition also limits methodological accumulation for its own sake. Adding methods can increase cost, interpretive complexity, and opportunities for inconsistency. A single method can be sufficient when its access and assumptions are adequate to a narrowly specified question. Combination becomes useful when it improves access, tests representational dependence, exposes boundary sensitivity, or provides genuinely complementary evidence.

AI-assisted research creates a new form of combination because computational systems can mediate search, coding, translation, formalization, synthesis, and interpretation across methods. Their contribution can accelerate comparison while obscuring provenance if intermediate transformations are not retained. A relational methodology using AI should therefore treat machine-mediated transformations as part of the methodological chain, especially where they affect inclusion, classification, inference, or interpretation.

7.1.6 Revisability of Method Selection

Method selection should remain revisable because inquiry can change what is known about the object and about the adequacy of the method itself. Chapter 5 treated relational knowledge as revisable; Chapter 6 extended that principle to theories, research designs, collective knowledge production, failure, and cumulative research memory. Methodology inherits the same architecture.

Revision can be triggered by several kinds of encounter. New evidence can show that an assumed relation is absent. A participant can identify a category mismatch. Archival material can reveal that a supposedly stable variable changed meaning. A formal model can expose an inconsistency in the conceptualization. An unexpected empirical pattern can reveal an omitted scale. A machine-generated classification can perform poorly for a subgroup because the training representation omitted relevant relations. A contingent encounter can make a previously peripheral phenomenon appear generatively important enough to justify a redesign.

The possibility of revision does not imply continuous methodological instability. Research requires periods of stabilization so that evidence can be compared and claims can be evaluated. The practical issue is whether the design has procedures for distinguishing ordinary noise from evidence that places meaningful pressure on the current object, boundary, scale, or method.

Definition 7.7 (Method revision trigger)**.** A *method revision trigger* is an observation, contradiction, failure, historical discontinuity, representational mismatch, ethical constraint, or other evidentially relevant development that gives reason to reassess one or more elements of the current methodological configuration.

Revision should be localized where possible. A measurement failure can require a new indicator without requiring abandonment of the research question. A boundary failure can require a wider field without invalidating the underlying evidence. A historical discontinuity can require periodization rather than a new method. A persistent contradiction across methods can eventually require revision of the object itself. This proportionality preserves cumulative knowledge while remaining responsive to

failure.

Contingent encounter and aesthetic judgment are especially significant at this point. A method leaves some possible significance outside its initial anticipation because research value can become visible only after an unexpected juxtaposition, anomaly, or pattern appears. Aesthetic judgment can make such an encounter salient by registering elegance, strangeness, tension, symmetry, discontinuity, or generative possibility. Methodological revision begins when that salience is converted into a question that can be investigated. In AI-rich research environments, this human or collective capacity can become more consequential because internally generated candidate explanations are abundant while encounters with poorly represented realities remain comparatively scarce.

Revisability also supports future re-epistemization. Preserving earlier versions of a method, object specification, coding scheme, model, dataset, and interpretive rationale allows later researchers to reconstruct why a design once appeared adequate and why it changed. Methodological history then becomes part of the evidence available to future inquiry.

7.1.7 Limits of Method Transfer

Methods travel across disciplines, populations, institutions, historical periods, technologies, scales, and praxis configurations. Such transfer can be productive because a method developed in one domain can reveal structures that another domain has not yet represented clearly. The transfer also creates a risk of carrying hidden assumptions into a field where their original justification is weaker.

Ontology provides one reason for caution. Similar representations can correspond to differently constituted relational objects. An edge in a citation network, a kinship network, a financial network, and a command network shares a graph-theoretic form while representing relations with different meanings, persistence conditions, asymmetries, and consequences. Formal similarity can support comparison without establishing ontological equivalence.

Epistemology provides a second reason. Manifestation relations vary. Administrative records produced in one jurisdiction may have only partial counterparts in another. A survey category can travel linguistically while changing relational meaning. Digital traces can appear standardized across platforms while being generated through different interfaces and incentives. A measure validated in one historical period can become unstable after institutional change. Transfer therefore requires renewed examination of the relation between manifestation, evidence, and target.

Praxis provides a third reason. A method can move from research-dominant inquiry into application-dominant use, where errors affect allocation, access, classification, treatment, or institutional response. The consequences of false positives, false negatives, exclusion, delay, opacity, or category mismatch can then change the adequacy threshold. Practical transfer can also make a representation performative: once a classification is used administratively, actors may adapt to it and institutions may reorganize around it.

Caution 7.8 (Method transfer across relational settings). Methodological performance

established in one relational setting provides evidence for possible transfer, while adequacy in the receiving setting requires renewed attention to object constitution, manifestation processes, boundary and scale conditions, historical context, affected relations, and consequences of error.

Caution 7.8 supports disciplined borrowing rather than methodological isolation. A transferred method can remain highly useful when its assumptions are examined and its representation is adapted to the new target. Comparative work can even use transfer failure as evidence: the point at which a measure, category, model, or procedure ceases to travel can reveal a consequential difference in relational organization.

The same principle applies to GRE itself. Relational vocabulary should not be imposed uniformly across domains simply because the framework is designed to travel. A relation that matters in economics may be weakly informative in another domain; a generative mechanism identified in education may not transfer to humanitarian practice; a representation useful for institutional analysis may obscure interpersonal meaning. The broader GR framework gains from domain transfer when it preserves the possibility that neighboring disciplines and empirical fields can revise its categories.

Section 7.1 therefore establishes the methodological starting point of the chapter. Research praxis constrains the design; ontological suspension limits reification; the three-register architecture separates reality from its manifestations without severing their relations; epistemology specifies mediated access, uncertainty, boundary, scale, history, justice, and revisability; and methodological judgment organizes these conditions around a research question. The sections that follow can now examine concrete traditions and procedures while retaining this architecture. Section 168 turns first to major traditions of social science inquiry, with the aim of clarifying their different evidential capacities and possibilities for mutual correction before the chapter moves into object specification, relational identification, reconstruction, measurement, validation, and reporting.

7.2 Major Traditions of Social Science Inquiry

Section 7.1 established that relational methodology inherits constraints from ontology, epistemology, and research praxis. The present section places that framework in dialogue with several major traditions of social science inquiry. Its role is comparative and reconstructive: it identifies the characteristic forms of access offered by historical-interpretive and qualitative inquiry, quantitative-empirical inquiry, formal and computational work, and mixed or multi-method research. The objective is to clarify how these traditions can contribute to relational inquiry, where their characteristic remainders arise, and how methodological disagreement can become a source of correction. The discussion proceeds from the major traditions to their dialectical relation, mutual correction, question-prior method selection, and the limits of a binary qualitative–quantitative division. The method of comparison follows the ontology and epistemology of Chapters 4 and 5: each tradition is considered through the manifestations it can access, the relations it can render visible, the inferential operations it supports, and the forms of uncertainty that remain after those operations.

Table 7.1: Methodological traditions as partially distinct modes of epistemic access

Tradition	Characteristic access	Relational contribution	Characteristic remainder
Historical-interpretive and qualitative	Meaning, sequence, practice, experience, documents, situated categories	Relational meaning, process, institutional formation, context, contingency	Transfer, archive or access asymmetry, interpretive dependence
Quantitative-empirical	Distributions, contrasts, associations, interventions, repeated observations	Pattern, magnitude, uncertainty, conditional relation, causal identification under assumptions	Measurement validity, omitted relations, transport, model dependence
Formal and computational	Explicit assumptions, logical structure, simulation, network or agent configurations	Mechanism possibility, structural consequence, counterfactual exploration, complex configuration	Stylization, parameter dependence, representation–world gap
Mixed and multi-method	Coordinated access through several evidential and inferential modes	Triangulation, complementarity, contradiction diagnosis, translation across representations	Integration loss, commensuration pressure, unresolved translation remainder

A methodological tradition is more than a list of techniques. It is a historically organized cluster of research questions, evidential habits, representations, standards of warrant, institutional practices, and judgments about what counts as an informative result. Traditions can overlap, borrow from one another, and change internally. Researchers can also combine practices that originated in different lineages. The category therefore functions as a map of recurrent orientations while leaving researcher identities and combinations of practice open.

Definition 7.9 (Methodological tradition)**.** A *methodological tradition* is a historically developed configuration of research questions, evidential practices, representational forms, inferential standards, and evaluative habits that organizes recurrent ways of gaining access to a field of inquiry.

Definition 7.9 keeps the focus on access and inquiry. A tradition can make some relations comparatively visible while leaving others weakly represented. Historical reconstruction can disclose sequence and category formation while providing limited leverage on population-level prevalence. Statistical designs can estimate distributions or conditional contrasts while leaving the meaning of a category dependent on prior conceptual and measurement work. Formal models can expose logical consequences and mechanism possibilities while remaining sensitive to their assumptions and target specification. Qualitative inquiry can reconstruct situated meaning and practice while requiring disciplined attention to transfer beyond the studied setting. These are characteristic tendencies whose expression depends on the local research configuration.

Table 7.1 summarizes the comparative structure used throughout the section.

The table presents a plural architecture with several forms of epistemic access. Re-

lational inquiry can draw from each tradition when the research question and object make that access informative. The relevant standard is methodological adequacy as developed in Section 7.1: the fit among question, object, manifestation, evidence, inference, scale, history, and consequence.

7.2.1 Historical-Interpretive and Qualitative Traditions

Historical-interpretive and qualitative traditions provide access to dimensions of social reality that are often expressed through sequence, meaning, practice, narrative, classification, experience, institutional memory, and context. Their evidential materials can include archives, correspondence, legal and administrative records, interviews, field observation, material artifacts, texts, images, organizational routines, and traces of everyday interaction. Their contribution to relational inquiry lies especially in reconstructing how relations are understood, enacted, contested, institutionalized, remembered, and transformed through time.

Interpretive work has a long methodological association with attention to meaning in context. Geertz's account of interpretive anthropology gave influential form to the idea that cultural analysis requires dense contextual interpretation and resists treating observed conduct as self-explanatory data (Geertz 1973). GRE need not inherit that framework wholesale to recognize the methodological point. A manifestation acquires evidential significance through a field of relations. The same gesture, category, document, payment, or institutional procedure can carry different meanings under different histories and symbolic arrangements. Qualitative inquiry can therefore contribute to the inverse problem of manifestation by examining the processes through which an observed trace becomes intelligible.

Historical inquiry adds sequence and temporal dependence. The relation visible at one moment may have been generated through earlier classifications, institutional reforms, conflicts, settlements, exclusions, or technological changes. Hacking's historical ontology is one precedent for examining how categories and objects become possible within historically specific practices of classification and reasoning (Hacking 2002). Abbott similarly emphasizes temporality, events, cases, and the theoretical assumptions embedded in social-science methods (Abbott 2001). For relational inquiry, these perspectives support attention to relation formation, persistence, path dependence, turning points, and historical changes in the meaning of apparently stable variables.

Qualitative evidence also permits close examination of relational heterogeneity. Two persons assigned the same institutional category can occupy markedly different relational positions. An organizational rule can be experienced as protection in one relation and constraint in another. A formal partnership can coexist with distrust, asymmetric dependency, or symbolic exclusion. Interviews and ethnographic observation can reveal these differences when the research design preserves the distinction between participant interpretation, researcher interpretation, and the wider institutional conditions in which both are situated.

This interpretive capacity carries characteristic limits. Access can be selective. Archives preserve some actors and episodes more densely than others. Interview accounts are situated in time, relation, memory, and interaction. Field access can

depend on trust, institutional permission, language, status, and researcher position. Interpretation also involves judgment. These conditions call for provenance, reflexivity, comparison, negative cases, and explicit reasoning about alternative interpretations. Their methodological significance lies in specifying where warrant is generated and where uncertainty remains, while still permitting disciplined interpretation.

Within the three-register architecture, historical-interpretive and qualitative methods often move closely among manifestation and relational reconstruction. A document, narrative, or observed practice is a manifestation. The researcher asks what relational reality it supports, how that relation was historically generated, and which alternative reconstructions remain compatible with the evidence. Ontological suspension remains useful here because an interpretive category can organize evidence without becoming a final assertion about the ultimate nature of the social object.

Proposition 7.10 (Contextual access)**.** *Historical-interpretive and qualitative inquiry can strengthen relational analysis when contextual reconstruction changes the evidential meaning of observed manifestations, candidate relations, or their historical boundaries.*

Proposition 7.10 gives these traditions a precise methodological role. Context matters where it changes what a record, action, category, or relation warrants. The proposition also guards against decorative contextualization. Additional description contributes methodologically when it alters identification, interpretation, comparison, or inference.

7.2.2 Quantitative-Empirical Traditions

Quantitative-empirical traditions organize inquiry through systematic measurement, repeated observations, explicit comparison, statistical representation, experiments, quasi-experiments, surveys, administrative records, and related forms of structured evidence. Their characteristic strength lies in making patterns, distributions, magnitudes, uncertainty, conditional associations, and some forms of causal contrast examinable across observations.

For relational inquiry, quantitative methods can answer several distinct questions. They can estimate how frequently a relation appears under a specified operationalization, how relational characteristics vary across populations or institutions, whether outcomes differ under contrasting relational exposures, how uncertainty changes across models, or whether a proposed relation remains visible after adjusting for specified alternatives. Network statistics and repeated relational data can additionally characterize position, clustering, reachability, assortativity, temporal persistence, and other features that are difficult to infer reliably from a small number of observations.

Causal inference provides a particularly important quantitative-empirical interface. Counterfactual and intervention-oriented approaches clarify that causal claims require stronger identification conditions than descriptive association. Gangl surveys experimental, quasi-experimental, and statistical approaches to causal identification in sociological research (Gangl 2010), while Woodward develops an interventionist framework for reasoning about causal explanation and invariance (Woodward 2003). Within GRE, these traditions can contribute to relational causal

questions when the intervention, comparison, treatment, outcome, and relevant relational pathways are specified with sufficient care.

The epistemological constraints from Chapter 5 remain active. Measurement is a transformation from a manifestational field into a research representation. A numerical variable can stabilize comparison while also compressing distinctions. An administrative indicator may reflect legal eligibility, recording practice, institutional incentives, and missingness together with the phenomenon that the researcher seeks to study. Statistical precision therefore differs from ontological or conceptual adequacy. A narrow confidence interval around a weakly specified variable can still leave the central relational object uncertain.

Quantitative research also makes assumptions visible in productive ways. Sampling rules, model specifications, error structures, identification assumptions, inclusion criteria, and sensitivity analyses can expose points at which a conclusion depends on design choices. This explicitness supports revision and replication. It also permits disagreement to become more localized: researchers can ask whether the main difference concerns measurement, functional form, population, identification, boundary, or interpretation.

The characteristic remainder often concerns what the operationalization leaves outside the model. A survey variable for trust may compress several relational histories. A dyadic measure may omit institutional mediation. A population estimate can conceal subgroups whose relations differ structurally. A treatment effect can be informative within the studied design while transport to another historical or institutional setting remains uncertain. These remainders invite further inquiry and help specify where quantitative results require additional relational reconstruction.

Caution 7.11 (Precision and relational specification). Increasing numerical precision can leave unresolved uncertainty about the relational object, its boundary, its measurement process, and the historical conditions under which the estimate is intended to travel.

Caution 7.11 preserves the distinction between uncertainty internal to a statistical representation and uncertainty about the adequacy of the representation itself. Both can matter, and they may require different methodological responses.

7.2.3 Formal and Computational Extensions

Formal and computational approaches extend social inquiry by making assumptions, structures, mechanisms, and dynamic consequences explicit enough to analyze systematically. Formal models can clarify the implications of a proposed mechanism or set of constraints. Computational models can explore configurations whose interactions become difficult to track analytically. Network analysis can represent patterned relations among entities, and agent-based models can examine how local interactions among heterogeneous agents can generate aggregate patterns. Newman provides a broad account of network structure and dynamics (Newman 2003), while Epstein and Axtell demonstrate a constructive agent-based approach to social simulation (Epstein and Axtell 1996).

These approaches can make several contributions to relational inquiry. First, they

can expose hidden assumptions. A verbal explanation can rely on an implicit sequencing rule, information structure, or interaction topology that becomes visible once the model is formalized. Second, they can test internal coherence. A proposed set of relations may fail to generate the outcome attributed to it under the stated assumptions. Third, they can support counterfactual exploration by varying parameters, structures, or initial conditions. Fourth, computational representations can reveal emergent patterns that arise from repeated interaction without requiring those aggregate patterns to be inserted directly into the model.

Formalization also provides a disciplined language for relational architecture. Graphs, matrices, state variables, transition rules, spatial structures, and dynamical systems can represent different aspects of a field. Yet Chapter 4's ontological restraint remains especially important here. A graph is a representation of selected relations under specified semantics. An agent is a modeled entity with defined capacities. A field variable is an analytical construction. Their mathematical exactness supplies precision within the representation while leaving the ontology of the social world an additional question.

The representation–world gap therefore becomes a central methodological object. A computational model can be internally elegant while its mapping to empirical relations remains weak. A simulation can generate a target macro-pattern through several incompatible micro-mechanisms. A network can reproduce observed degree distributions while omitting relation meaning, institutional authority, or historical sequence. Formal and computational inquiry gains epistemic strength when the pathway between model elements, empirical manifestations, and the target relation is documented and tested.

This is also where contingent encounter matters. Formal systems tend to explore possibility within a specified representational space. Empirical anomalies, field encounters, archival surprises, or interpretive contradictions can reveal that the relevant space was poorly specified. Aesthetic judgment may initially draw attention to an unexpected pattern or structural elegance, while later empirical work determines whether that attraction tracks a significant relation. The productive relation between formalization and encounter is therefore iterative.

Definition 7.12 (Formal-computational remainder)**.** A *formal-computational remainder* is a materially relevant aspect of the research object, evidence relation, meaning structure, historical condition, or uncertainty that is left outside a formal or computational representation used in the inquiry.

Definition 7.12 permits purposeful simplification; a model can bracket potentially relevant features when their omission is explicit and proportionate to the research task. The methodological task is to identify remainders whose omission could alter the interpretation or transfer of the result. This keeps simplification analytically useful while preserving recoverability of what the simplification brackets.

7.2.4 Mixed and Multi-Method Research

Mixed and multi-method research coordinates several forms of evidence or inference within one research programme. Mixed-methods scholarship has developed explicit designs for integrating qualitative and quantitative components across data collec-

tion, analysis, and interpretation (Creswell and Plano Clark 2018). Relational inquiry can extend this logic beyond a simple pairing of qualitative and quantitative techniques by treating method combination as a problem of coordinated epistemic access.

A multi-method design can serve several functions. One method can establish a pattern while another reconstructs its meaning. Historical inquiry can identify institutional changes that define the temporal boundary of a statistical comparison. Interviews can expose measurement categories that require revision. Network analysis can identify structurally unusual cases for qualitative follow-up. Formal modeling can clarify a candidate mechanism that later empirical work tests. Documentary analysis can reveal that a variable's administrative meaning changed during the observation period. These combinations become methodologically valuable when each contribution is linked to a distinct inferential task.

Integration also creates translation problems. A qualitative category may need to become a coding scheme. A historical sequence may be summarized as a periodization variable. An interview-based relational distinction may become an edge type in a network. A formal mechanism may be translated into observable implications. Each transformation can preserve some properties and lose others. Chapter 6 described this problem as translation with remainder. Multi-method research therefore benefits from recording what is preserved, transformed, or left unresolved at each interface.

Method combination can also produce contradiction. An estimated association may coexist with interview evidence that challenges the proposed mechanism. Archival reconstruction may reveal that the comparison groups were generated by different institutional processes. A simulation may require behavioral assumptions inconsistent with field observation. Such contradictions can become diagnostically useful. They may reveal differences in scale, boundary, time, measurement, or meaning and thereby redirect attention toward the research configuration.

Definition 7.13 (Methodological complementarity)**.** *Methodological complementarity* is a relation among methods in which distinct forms of access contribute nonidentical evidence or inference to a shared research problem while the translations and remainders among those contributions remain visible.

Complementarity differs from accumulation by volume. Adding a second method strengthens the design when it changes what can be known, checked, or revised. Repeating the same assumption through two differently formatted procedures can create an appearance of triangulation without materially expanding epistemic access.

7.2.5 Dialectical Relation among Methodological Traditions

The relation among methodological traditions can be understood dialectically when their differences generate pressures that alter the research object, assumptions, or design. The relevant dialectic occurs through concrete contradictions in inquiry. A statistical regularity can conflict with an historical reconstruction. A participant interpretation can conflict with an institutional classification. A formal mechanism can fail to produce an empirically observed transition. A close case study can reveal a variable that a large-sample design had treated as homogeneous. These tensions can motivate reconstruction at a higher level of methodological specificity.

This dialectical view differs from a search for final synthesis. Some disagreements can be resolved by better evidence or improved specification. Others arise because methods answer different questions or preserve different aspects of the object. A historical explanation of how an institution formed and a quantitative estimate of one institutional effect can both be warranted without collapsing into one representation. Their relation becomes productive when each can expose assumptions or blind spots in the other.

Methodological contradiction can therefore have several outcomes. It can reveal measurement error, boundary mismatch, scale mismatch, historical change, divergent semantics, model misspecification, selection effects, or an inadequately differentiated research question. It can also remain unresolved after careful inquiry. Preserving that unresolved remainder can be epistemically preferable to forcing agreement through premature commensuration.

Proposition 7.14 (Dialectical methodological revision)**.** *When competent methods generate materially different accounts of a shared research object, the disagreement can justify revision of the object's specification, evidential boundaries, scale, temporal framing, or inferential assumptions before it justifies a general ranking of the methods themselves.*

Proposition 7.14 turns disagreement into a research prompt. It asks which part of the configuration is under pressure and what additional evidence could discriminate among the competing reconstructions.

7.2.6 Mutual Methodological Correction

Methodological pluralism becomes substantive when traditions can correct one another. Historical inquiry can identify temporal breaks that weaken pooled statistical estimates. Quantitative analysis can show that an interpretation based on a salient case has limited prevalence in a larger population. Qualitative work can reveal that a survey category conflates distinct meanings. Formal modeling can expose an inconsistency in a verbal mechanism. Empirical observation can show that a formally coherent mechanism lacks the conditions required for operation. Computational analysis can identify relational patterns whose meaning then requires contextual inquiry.

Mutual correction relies on standards appropriate to the claim under examination. A statistical estimate receives corrective pressure from an interview when the interview reveals a problem in measurement, mechanism, boundary, interpretation, or transport. A formal model contributes corrective pressure when it exposes a logical implication, hidden assumption, or mechanism constraint that changes the historical claim.

The concept of mutual correction therefore preserves asymmetry where the evidential situation warrants it. Some methods may be more informative for a particular question. Some evidence may place stronger pressure on a claim. Methodological pluralism permits differential weight across techniques when that weighting is connected to the research object and inferential task. The justification should arise from local evidential relevance and inferential adequacy.

Definition 7.15 (Mutual methodological correction)**.** *Mutual methodological correc-*

tion occurs when evidence or inference generated through one methodological configuration identifies a materially relevant weakness, omission, boundary condition, or alternative interpretation in another configuration, leading to a more adequate specification of the shared research problem.

This definition also clarifies why methodological communities benefit from heterogeneous expertise. Correction often requires someone capable of recognizing what a representation suppresses. A historian, statistician, ethnographer, legal scholar, network scientist, or computational modeler may detect different weaknesses because their traditions train attention toward different manifestations and inferential risks. Collective research praxis can therefore become more generative when disagreement is institutionally organized as a resource for revision.

7.2.7 Research Object and Question before Methodological Camp

The comparative analysis returns to the principle established in Section 7.1: the research object and question should guide method selection. Methodological identity can be intellectually productive because traditions accumulate expertise, standards, and communities of criticism. Difficulty arises when allegiance to a camp determines in advance what the object is allowed to become.

An inquiry into trust illustrates the problem. If trust is specified only as a survey score, the research may gain population-level comparability while losing the historical and relational processes through which trust formed. If trust is approached only through interview narratives, the inquiry may recover meaning and trajectory while leaving prevalence and distribution weakly specified. If trust is represented only as a network property, structural embedding becomes visible while symbolic or experiential dimensions may recede. A formal model can clarify self-reinforcing mechanisms while depending on assumptions about updating, memory, and interaction. The object therefore changes with the access relation established by the method.

A question-prior design asks which aspects of trust matter for the present inquiry. Is the aim to identify a relation, reconstruct its historical formation, estimate its distribution, compare institutions, study its symbolic manifestation, test a causal mechanism, or examine its self-reinforcing dynamics? Several questions may require several methods. The methodological configuration can then be justified by the epistemic work each component performs.

This principle also matters for AI-assisted research. AI systems can make methodological templates, code, statistical routines, formal models, and literature syntheses rapidly available. Ease of execution can tempt research toward methods that are computationally convenient or well represented in training data. Question-prior methodology places orientation earlier in the sequence. Contingent encounters, aesthetic judgment, disciplinary knowledge, and ethical consideration can shape the question before technical abundance determines the design.

Caution 7.16 (Methodological camp capture). A research programme can become methodologically narrow when the representational affordances of a preferred tradition repeatedly determine which objects and questions receive attention, especially where alternative forms of access could materially change the claim.

The caution concerns repeated selection effects that can accompany specialized expertise. Deep specialization remains valuable. The methodological issue arises when specialization becomes an unexamined filter on research orientation.

7.2.8 Limits of a Binary Methodological Division

The familiar qualitative–quantitative distinction captures a real historical and institutional division in social science. King, Keohane, and Verba offered an influential attempt to bridge that divide through a common logic of descriptive and causal inference (King et al. 1994). Mixed-methods research subsequently developed explicit designs for coordinating qualitative and quantitative components (Creswell and Plano Clark 2018). These developments remain important, yet a binary division can obscure several forms of methodological heterogeneity that matter for relational inquiry.

First, historical-interpretive inquiry and qualitative field research overlap without being identical. Archival sequence reconstruction, hermeneutic interpretation, ethnography, interviewing, documentary analysis, and comparative historical work can involve different evidence relations and standards of warrant. Second, quantitative inquiry contains heterogeneous logics, including description, prediction, measurement, causal identification, spatial analysis, temporal analysis, and network statistics. Third, formal and computational research can use numerical procedures while answering questions different from those of conventional statistical estimation. A simulation may explore mechanism possibility while a statistical design estimates a population parameter. A theorem may clarify structural implication without using empirical data directly.

The binary also becomes unstable inside particular projects. Qualitative coding can produce counts. Quantitative variables require interpretive decisions. Historical databases can combine archival judgment with statistical analysis. Network data can be numerically represented while edge semantics depend on qualitative reconstruction. Machine-learning systems can process textual or visual materials while producing outputs whose interpretation remains context dependent. The material format of data therefore provides only part of the information needed to classify the epistemic mode of inquiry.

For GRE, a more useful map begins from epistemic functions. Researchers may need methods for discovering relations, reconstructing meaning, identifying historical sequence, measuring magnitude, estimating uncertainty, testing causal contrasts, representing topology, simulating mechanisms, comparing cases, interpreting institutions, or validating claims across manifestations. The same project can move among several functions as the research object becomes more precise.

Proposition 7.17 (Function-prior methodological classification)**.** *For relational inquiry, methodological classification is often more informative when it identifies the epistemic function performed by a method in a specific research configuration than when it assigns the method exclusively to a qualitative or quantitative camp.*

Proposition 7.17 provides the bridge to the remainder of Chapter 7. The next sections move from traditions toward the concrete construction of relational inquiry: specification of the research object, boundary, scale, relation identification, characterization, persistence, configuration reconstruction, and the evidential practices

through which those tasks are pursued. The methodological traditions surveyed here remain available as resources. Their contribution will be assessed locally through the relations they help disclose, the manifestations they make usable as evidence, and the remainders their representations leave for further inquiry.

7.3 Specification of the Research Object

Sections 7.1 and 7.2 established two conditions for relational methodology. Method selection should remain answerable to the research question and to the ontological, epistemological, and practical conditions of inquiry; methodological traditions provide partially distinct modes of access whose adequacy depends on the object and claim under examination. The present section develops the first concrete operation that follows from those conditions: specification of the research object. Its role is to clarify how an inquiry provisionally individuates entities, candidate relations, higher-order relations, configurations, fields, institutions, symbolic objects, and historical objects before later sections develop boundary construction, scale selection, relation identification, and validation in greater detail. The objective is methodological rather than metaphysical. Object specification provides a disciplined and revisable analytical interface through which inquiry can proceed while preserving the ontological suspension of Chapter 4 and the mediated, partial, historically situated epistemology of Chapter 5.

Research commonly begins with nouns that appear already available: a person, organization, market, institution, platform, policy, community, class, network, field, or historical period. Relational inquiry treats such terms as starting points whose analytical content may require reconstruction. A familiar name can conceal uncertainty about individuation, membership, constitutive relations, temporal persistence, scale, and manifestation. A "firm," for example, can be specified as a legal entity, an ownership structure, a contractual nexus, an organizational hierarchy, a technological infrastructure, a set of routines, or a historically changing configuration combining several of these features. Each specification can support useful inquiry while foregrounding different relations and leaving different remainders.

The three-register architecture developed in Section 91 gives this problem a precise form. An analytical research object can refer to a relational reality, to one or more manifestational forms, or to a representation through which those manifestations are recorded and interpreted. The object used by a method therefore need not coincide with the ultimate ontology of what is being studied. Section 92 permits inquiry to proceed under ontological suspension, while Sections 113–116 show why movement from manifestation to relational knowledge can remain non-invertible and representation-dependent. Research-object specification sits at this interface: it stabilizes a target sufficiently for investigation while recording the inferential and representational choices through which that stability was achieved.

Definition 7.18 (Research-object specification)**.** A *research-object specification* is a provisional and explicit account of what an inquiry treats as its analytical object, including the criteria of individuation relevant to the question, the candidate relations or structures through which the object is characterized, the manifestations through

which it can be accessed, the temporal and scalar conditions relevant to its identity, and the conditions under which the specification would be revised.

Definition 7.18 gives object specification epistemic content. The specification is more than a naming convention. It affects what evidence is collected, which contrasts become meaningful, which relations appear internal or external, how persistence is judged, and which alternative explanations remain visible. It can also change during inquiry. An object initially approached as an organization can later require analysis as an institutional field; a dyadic relation can become intelligible only inside a higher-order configuration; a seemingly stable category can become a historical object whose changing meaning is part of the explanation.

Table 7.2 summarizes the principal object forms developed in this section. The categories are analytical resources whose boundaries can overlap. A single project may use several linked specifications when the research question spans different registers or levels of organization.

The table also anticipates a recurrent principle of Chapter 7: a research object is specified through a relation among question, manifestation, representation, and inferential purpose. The sections that follow will refine boundary, scale, and identification procedures. The present section establishes the object forms on which those procedures operate.

7.3.1 Provisional Entities

Relational inquiry often requires entities. Persons, households, firms, agencies, schools, platforms, states, datasets, documents, and technologies can provide analytically useful units. Relational analysis therefore does not require dissolution of entityhood. It asks how an entity is being individuated for the research purpose and which relations are relevant to that individuation.

An entity can be provisionally specified through several criteria. Legal recognition can establish one form of continuity. Organizational membership can establish another. Bodily continuity, control over resources, account identity, spatial location, functional role, or shared institutional treatment can each support entity specification under different questions. The choice influences the inquiry. A household defined administratively can differ from a household reconstructed through care, coresidence, financial transfer, or self-identification. A platform account can represent a person, organization, automated agent, shared role, or strategically managed interface. A state can be treated as a legal actor in one inquiry and as a heterogeneous configuration of agencies, offices, infrastructures, and authority relations in another.

Definition 7.19 (Provisional entity)**.** A *provisional entity* is an analytically individuated unit whose identity and continuity are specified sufficiently for the research question while remaining open to decomposition, aggregation, or reclassification when consequential internal or external relations become visible.

This definition preserves a practical middle position. Entity categories can support measurement, comparison, interviewing, archival organization, or formal modeling. Their use gains methodological strength when the criteria of individuation are visible. A researcher studying organizational inequality, for example, may initially treat

Table 7.2: Research-object forms and characteristic specification questions

Object form	Provisional specification	Characteristic evidential interface	Possible revision trigger
Entity	Criteria of individuation, continuity, membership, and relevant internal relations	Legal, administrative, observational, testimonial, material, or computational traces	Internal heterogeneity becomes consequential to the claim
Relation	Relata, relation semantics, directionality, temporality, and mode of realization	Interaction, record, testimony, rule, transfer, co-presence, or inferred pattern	Manifestations support competing relational interpretations
Higher-order relation	Relations or configurations functioning as relata or conditioning structures	Multi-source relational records, nested observation, comparative or formal reconstruction	Relation types or levels are conflated by the initial representation
Configuration	Patterned arrangement among multiple entities and relations	Network, institutional, ethnographic, documentary, statistical, or formal representation	Local relations fail to explain configuration-level regularities
Field	Distributed conditions, positions, gradients, or constraints across a relational domain	Recurrent cross-case patterns, positional differences, institutional traces, spatial or temporal distributions	Pairwise or organizational explanation proves sufficient, or field attribution lacks distinctive support
Institution	Stabilized rules, roles, practices, authority, infrastructures, and expectations	Legal texts, administrative records, routines, testimony, observation, enforcement and resource flows	Formal rules and enacted relations diverge materially
Symbolic object	Category, representation, narrative, model, sign, or classificatory form with relational effects	Textual, legal, administrative, statistical, media, or computational representation	Meaning, uptake, or performative effects change across settings or time
Historical object	Event, trajectory, period, category, or process individuated through temporal relations	Archives, longitudinal traces, oral history, material records, retrospective reconstruction	Periodization, category meaning, or continuity criteria become unstable

a university as one entity for comparison across institutions. Inquiry into internal allocation may later require decomposition into departments, laboratories, administrative offices, funding streams, and employment categories. The earlier specification can remain useful for one claim while becoming too coarse for another.

The epistemology of manifestation also matters here. Administrative entities can acquire apparent solidity because records are organized around them. A database may provide one row per household or organization, encouraging the analyst to treat that unit as naturally given. Section 116 showed that representation can organize what becomes epistemically available, while Section 117 showed that classifications

can become performative. Entity specification should therefore record whether the unit originates from the research question, from institutional practice, from a data system, from participant self-understanding, or from a later analytical reconstruction.

A provisional entity can also have porous membership. Collaborative teams, communities, informal organizations, migratory households, online collectives, and research networks may have participants with different degrees or durations of inclusion. Binary membership can then obscure the relation through which membership is enacted. Later sections on boundary construction and scale selection will provide more detailed procedures for these cases. At the present stage, the object specification should make uncertainty about membership visible rather than converting it prematurely into a fixed boundary.

Caution 7.20 (Entity reification)*.* An entity specification can become misleading when the analytical unit is treated as internally homogeneous or historically continuous beyond the evidence required for the claim. Relational inquiry should preserve a route for decomposing or reclassifying the entity when internal differentiation becomes consequential.

Caution 7.20 connects directly to ontological restraint. Analytical convenience can justify a provisional unit without establishing that the unit is fundamental, homogeneous, or invariant.

7.3.2 Candidate Relations

Once provisional entities or other relata have been identified, relational inquiry specifies candidate relations. A candidate relation is a proposed form of connection, dependence, differentiation, coordination, constraint, recognition, transfer, obligation, influence, exchange, co-constitution, or other structured linkage whose evidential status remains to be investigated. The adjective *candidate* is important because the relation should not enter the analysis as established merely because a dataset contains an edge, an institution uses a category, or participants employ a familiar term.

Candidate-relation specification begins with semantics. The researcher should state what kind of relation is being proposed. “Connected to,” “associated with,” “works with,” “depends on,” “trusts,” “governs,” and “exchanges with” carry different relational meanings. A formal representation that reduces them to a common edge type can be useful for a limited purpose, yet the reduction should remain visible. The same pair of entities can participate simultaneously in contractual, affective, legal, informational, financial, spatial, and hierarchical relations whose interaction matters to the research question.

The specification can also record directionality, reciprocity, sign or valence where meaningful, intensity, temporality, and conditions of activation. An obligation can exist before enforcement. A trust relation can persist through intervals with little observable interaction. A contractual relation can be formally symmetrical while operating through asymmetric dependence. A transfer relation can be directional even when the wider relationship contains reciprocal exchange. These features need not be quantified at the specification stage; they should be conceptually available so later methods can determine which features require evidence.

The inverse problem of manifestation is especially consequential for candidate relations. A recorded interaction can support several relational interpretations. Repeated messages can indicate collaboration, supervision, conflict, dependency, or routine administration. Co-location can support opportunity for interaction without establishing a meaningful relation. A legal contract can establish formal obligations while leaving enacted practice partly unresolved. Testimony can directly reveal experienced meaning while remaining situated in a relational and historical context. Candidate-relation specification therefore benefits from stating the evidential pathway through which manifestations are expected to bear on the relation.

Definition 7.21 (Candidate relation)**.** A *candidate relation* is a provisionally specified relational form whose relata, semantic content, relevant temporal conditions, and expected evidential manifestations are stated sufficiently to permit identification, comparison, or attempted falsification in later inquiry.

The definition treats candidate relations as objects of investigation. Section 172 will address identification standards in detail. At the specification stage, the researcher is preparing those standards by making the relation explicit enough that evidence can count for or against it.

Contingent encounter can enter at this point. A candidate relation may originate from an unexpected phrase in an interview, an archival juxtaposition, a spatial pattern, a surprising residual, an institutional inconsistency, or an aesthetic recognition of structural similarity across domains. Such origins can be epistemically productive without settling the relation's validity. The move from encounter to specification converts an initial salience judgment into an inspectable proposal whose evidence, alternatives, and boundaries can later be examined.

7.3.3 Higher-Order Relations

Some research questions concern relations whose relata are themselves relations, configurations, roles, or structured interactions. Section 121 developed the epistemology of higher-order relational knowledge; the methodological problem here is how to specify such objects before choosing techniques for reconstructing them.

A higher-order relation can appear when one relation conditions another. A funding relation can alter the relation between a laboratory and its research agenda. A legal relation can structure the bargaining relation between employer and worker. A kinship relation can affect the meaning of a financial transfer. A platform's moderation relation with users can reshape relations among users. In each case, the object of inquiry may exceed a collection of pairwise ties because the relation among relations is substantively consequential.

Higher-order specification requires care with levels. A researcher can distinguish a relation among relations from a relation among entities represented in several layers. A multilayer network may contain friendship, advice, authority, and resource-transfer ties among the same actors. A higher-order claim goes further when the inquiry proposes that the configuration or state of one relation changes the operation, meaning, or possibility of another. The methodological burden therefore includes stating the conditioning relation rather than relying solely on visual or formal complexity.

Definition 7.22 (Higher-order relational object)**.** A *higher-order relational object* is a provisionally specified relation or configuration in which one or more relata are themselves relations, relational positions, or relational configurations, or in which the interaction among relation types is part of the substantive claim.

Evidence for such an object can be distributed across sources. Legal documents may establish one relation, interviews another, transaction records a third, and temporal comparison the conditioning pathway among them. This makes provenance particularly important. The researcher should be able to reconstruct which evidence supports each lower-order relation and which additional evidence supports the higher-order linkage.

The specification should also preserve inherited uncertainty. If the existence or meaning of a lower-order relation remains uncertain, confidence in the higher-order object can be affected. A mathematically elegant representation does not remove that dependence. Formalization can clarify how relations combine; empirical and interpretive work determines whether the represented relations and conditioning pathways have adequate support in the target field.

7.3.4 Relational Configurations

Relational configurations become relevant when the arrangement among several entities and relations carries analytical significance beyond isolated dyads. A configuration can include clusters, chains, hierarchies, cycles, nested structures, brokerage positions, overlapping memberships, institutional arrangements, or other patterned organizations of relation. The configuration is specified as an object when the research question concerns how these relations coexist, constrain one another, or produce a recognizable structure.

The distinction between configuration and relation is one of analytical resolution. An employment relation can be studied dyadically. The organization in which employment occurs may also be represented as a configuration involving authority, ownership, division of labor, information, evaluation, technology, and resource allocation. A household transfer can be examined as one directional relation, while the wider configuration may include care, inheritance, co-residence, obligation, migration, and recognition. Configuration specification becomes informative when the arrangement changes what individual relations mean or what possibilities they support.

Definition 7.23 (Relational configuration)**.** A *relational configuration* is a provisionally bounded arrangement of multiple entities, relations, positions, or higher-order relations whose organization is analytically relevant to the research question.

Configuration specification should identify the organizing features that matter. A network representation can emphasize topology. An institutional analysis can emphasize roles and rules. Ethnographic reconstruction can emphasize enacted practice and meaning. A formal model can emphasize interaction rules or state transitions. Several representations can refer to the same empirical setting while specifying different configuration objects. Section 7.2 therefore matters directly: methodological traditions provide distinct access relations to configurations and can correct one another where representations diverge.

A configuration should also retain historical indexation. Apparent structural similarity across two moments can conceal changes in relation semantics, membership, technology, or institutional context. Conversely, visible changes in membership can coexist with persistent organizational relations. Section 120 distinguished relational identity from immobility; configuration specification carries that distinction forward by making the criteria of continuity available for later analysis.

Proposition 7.24 (Configuration-sensitive specification)**.** *Where the meaning, persistence, or consequence of a candidate relation depends materially on surrounding relations, the research object gains adequacy from specifying the relevant configuration rather than treating the focal relation as context-free.*

The proposition is conditional. Some questions can be answered with a focused relation. Configuration-level specification becomes valuable when surrounding relations alter the claim or evidential interpretation.

7.3.5 Fields

A field specification is useful when the inquiry concerns distributed conditions that organize possibilities across a relational domain without being adequately represented as a finite set of directly observed pairwise relations. Section 122 distinguished field reconstruction from dense-network description. The methodological task is to state what kind of distributed condition is being proposed and what observations could make that proposal informative.

Fields can be specified through positions, gradients, constraints, opportunities, symbolic valuations, resource distributions, institutional pressures, or recurrent directional tendencies across a domain. The field concept can therefore help describe cases in which similarly positioned actors encounter comparable pressures despite lacking direct ties, or in which local interactions repeatedly display patterned orientation toward a wider structure.

The term should remain analytically disciplined. A field label can become a placeholder for unexplained context if the distributed condition is not specified. Calling an environment a “political field,” “economic field,” “cultural field,” or “epistemic field” provides limited methodological leverage until the inquiry identifies the positions, resources, rules, gradients, evaluative structures, or other relations through which field effects are expected to appear.

Definition 7.25 (Provisional field object)**.** A *provisional field object* is a specified relational domain in which distributed positions, constraints, gradients, resources, or evaluative conditions are hypothesized to organize local possibilities or interactions across more than one directly observed relation.

Field specification therefore includes a distinctive evidential question: what pattern would be difficult to account for through the observed local relations alone and would become more intelligible under the proposed distributed condition? The answer can involve recurrent positional differences, parallel adaptations across disconnected actors, spatial gradients, institutional convergence, symbolic hierarchies, or other patterned manifestations. Later field-based relational analysis in Section 191 will develop the relevant methods.

Ontological suspension remains especially useful here. A field representation can organize evidence without requiring the researcher to claim that the social world literally possesses a field in the same ontological sense as a physical field. The methodological value rests on explanatory and evidential adequacy within the specified domain, together with explicit limits on the analogy.

7.3.6 Institutions

Institutions often appear as ready-made research objects because legal systems, administrative classifications, organizational charts, and public discourse already name them. Relational specification asks what configuration of rules, roles, practices, expectations, authority, infrastructures, resources, and symbolic recognition makes the institution effective in the research setting.

The distinction between formal institution and enacted institution is methodologically significant. A rule can exist in law or policy while being weakly enforced, unevenly interpreted, or displaced by informal practice. Conversely, stable practices can acquire institutional force before complete formal codification. An institution can therefore be studied through several linked objects: its formal representation, the relations through which it is enacted, the actors and infrastructures that sustain it, and the manifestations through which participants encounter it.

Definition 7.26 (Institutional research object)**.** An *institutional research object* is a provisionally specified configuration of rules, roles, practices, authority relations, expectations, infrastructures, and symbolic or material supports through which a recurrent pattern of coordinated or constrained action is stabilized over a relevant domain and interval.

This specification does not require each listed component to be present with equal strength. Its purpose is to prevent the institutional label from substituting for relational reconstruction. A court, market, university, ministry, welfare regime, research field, or platform-governance arrangement can each involve distinct combinations whose empirical realization should be specified locally.

Institutional objects also illustrate performative representation. Legal classifications, rankings, administrative categories, eligibility rules, and algorithmic classifications can describe institutional relations while also contributing to their reproduction or transformation. Sections 117 and 131 showed why representation and reflexive observation can enter the object itself. A research design that studies such institutions may therefore need to distinguish the institution before a representation, the representation as manifestation, and the later institution partly reorganized through that representation.

Institutional specification also creates a bridge to later ethical analysis. Which relations count as institutional can affect responsibility, visibility, and the allocation of causal or normative attention. A narrow specification may place responsibility on individual actors while leaving infrastructural or rule-based constraints outside the frame. A broader specification may illuminate those constraints while reducing detail about local agency. Boundary and scale choices therefore remain explicit rather than being settled by the institutional name alone.

7.3.7 Symbolic Objects

Relational inquiry frequently encounters objects whose efficacy depends partly on symbolization: categories, narratives, classifications, legal concepts, models, metrics, rankings, images, identities, doctrines, currencies, reputational signs, and other represented forms. Chapter 4 distinguished manifestational reality from relational reality, and Sections 116–117 examined symbolization and performative representation. Methodologically, symbolic objects require specification at the junction of meaning, representation, uptake, and relational consequence.

A symbolic object can be studied as a representation with semantic content. It can also be studied as a relationally real object when repeated uptake gives it persistence and efficacy within a system. A credit rating, credential, legal status, organizational label, or monetary denomination can affect access, expectations, authority, or resource flows because actors and institutions orient their conduct around the symbolized form. The relevant research object may therefore include both the symbolic representation and the relations through which that representation becomes consequential.

Definition 7.27 (Symbolic research object)**.** A *symbolic research object* is a provisionally specified sign, category, representation, narrative, model, or classificatory form whose meaning, circulation, uptake, or relational effects are relevant to the research question.

Symbolic specification should distinguish several questions. What does the object mean in the relevant setting? Who can produce, authorize, interpret, contest, or modify it? Through which media and institutions does it circulate? Which manifestations indicate uptake? Which relations does it describe, stabilize, obscure, or transform? These questions prevent the analysis from equating symbolic presence with shared meaning or causal efficacy.

Machine-mediated inquiry adds further complexity. A computational category can operate symbolically for human participants while also functioning operationally inside an automated system. A risk score, recommendation category, similarity metric, or model-generated label may affect later decisions even when its internal meaning is opaque to those classified. Section 130 treated such cases as machine-mediated relational knowledge. Object specification should preserve the relation among training or source data, model representation, operational classification, institutional uptake, and experienced consequence when those layers matter to the inquiry.

Symbolic objects also illustrate why aesthetic judgment and epistemic judgment should remain distinct. A researcher can be drawn to a metaphor, category, image, or formal pattern because it appears unusually elegant or generative. That salience can open a productive research trajectory. The symbolic object's analytical role still requires evidence concerning meaning, circulation, relation, and effect. Aesthetic recognition can orient the encounter while methodological specification prepares the object for epistemic examination.

7.3.8 Historical Objects

Historical inquiry requires objects whose identity unfolds through time. Events, periods, institutional formations, categories, trajectories, crises, reforms, movements, technological transitions, and long-run relational configurations can function as historical objects. Their specification differs from a static snapshot because temporal boundary, sequence, continuity, transformation, and retrospective reconstruction become constitutive parts of the research problem.

Section 125 developed trajectories and historical knowledge, while Section 120 addressed relational identity and persistence. Those epistemic commitments imply that a historical object should state the criterion under which temporally separated manifestations are being treated as parts of the same trajectory or formation. A category whose name persists can change in meaning. An institution can retain legal continuity while its enacted relations transform. A movement can change membership and organization while preserving a recognizable problem orientation. A crisis can be bounded narrowly around a visible rupture or more broadly around the relations that prepared and prolonged it.

Definition 7.28 (Historical research object)**.** A *historical research object* is a provisionally individuated event, trajectory, period, category, institution, or relational configuration whose identity depends materially on temporal sequence, continuity, transformation, or historically situated interpretation.

Historical specification should therefore record periodization and category semantics. The beginning and end of an object can depend on the research question. A policy reform may begin with legislation, with implementation, with anticipatory behavior, or with earlier institutional preparation. Its effects can persist after formal repeal. Several periodizations can remain analytically useful if their purposes are explicit. The same discipline applies to historical categories. Researchers can preserve the language of historical actors while also constructing analytical categories for comparison; the relation between these two vocabularies should remain visible.

Historical objects also depend on archives and preserved traces whose survival is uneven. The available record can overrepresent institutions with durable documentation and underrepresent relations expressed through oral practice, informal exchange, marginalized communities, destroyed records, or transient digital infrastructures. The specification should therefore include the conditions under which the historical object becomes knowable. Absence from the record can reflect disappearance of the relation, weak manifestation, archival loss, exclusion, or inaccessible evidence. These possibilities carry different implications.

Contingent encounter can be especially productive in historical specification. A previously ignored document, marginal notation, visual artifact, dataset, testimony, or juxtaposition between periods can make a latent relation salient. The initial encounter can change the proposed object: a seemingly bounded event becomes a longer trajectory; a familiar institution becomes a history of category change; a peripheral actor becomes central to the relational reconstruction. Such revisions illustrate why historical object specification benefits from preserving provenance and alternative periodizations rather than converging too early on one canonical narrative.

7.3.9 Revisable Object Specification

The preceding subsections treat research objects as provisional achievements of inquiry. Revisability brings those forms together into a methodological discipline. Object specification should be stable enough to support evidence collection, comparison, modeling, interpretation, and communication while remaining responsive to evidence that the initial individuation obscures consequential relations.

Several kinds of evidence can trigger revision. New data can reveal hidden internal heterogeneity. Participant testimony can challenge the meaning assigned to an institutional category. Historical evidence can show that a supposedly stable entity changed its criteria of membership. Formal analysis can reveal that a dyadic representation omits a higher-order dependency required by the mechanism. Cross-scale comparison can show that the relation changes under aggregation. Computational inference can identify a pattern that requires qualitative interpretation before it can support a relational claim. An intervention can also change the object itself, especially where measurement, classification, or publication becomes performative.

Definition 7.29 (Object-specification revision)**.** An *object-specification revision* is a documented change in the individuation, type, constituents, relational semantics, temporal identity, or representational mapping of a research object in response to evidence that the earlier specification materially limits the inquiry's intended claim.

Revision can take several forms. An entity can be decomposed into a configuration. A relation can be differentiated into several relation types. A configuration can be reframed as a field when distributed conditions matter. A formal institution can be linked to enacted practice. A symbolic object can be treated as performative after evidence of uptake. A snapshot can become a historical object when temporal dependence becomes explanatory. The reverse movements can also occur. Detailed relational reconstruction may show that a simpler entity-level object is adequate for a particular comparison. Field language can be set aside when local relations account sufficiently for the observed pattern. Revisability therefore supports both greater complexity and justified simplification.

A revision record should preserve the earlier specification, the evidence motivating change, the new specification, and the consequences for earlier findings. This follows the revisability architecture of Section 131 and the cumulative research practice developed in Section 164. Preserving versions allows later readers to determine whether a change in results arose from new evidence, altered object definition, boundary revision, scale change, or transformation in the field itself.

Proposition 7.30 (Object-specification discipline)**.** *Relational inquiry gains methodological clarity when the research object is treated as an explicit, question-relative, evidence-sensitive, and versionable specification whose criteria of individuation can be examined separately from claims about the object's ultimate ontology.*

Proposition 7.30 summarizes the section's bridge from ontology and epistemology into method. Ontological suspension permits the analyst to work with provisional objects without converting analytical individuation into metaphysical closure. Relational and manifestational distinctions require the researcher to state how evidence provides access to the proposed object. Historical and scale sensitivity keep object identity open to transformation. Research praxis adds responsibility for how cate-

gories and representations affect participants, institutions, and later inquiry.

The same discipline also clarifies the role of contingent encounter and aesthetic judgment. An inquiry may begin because a relation, category, configuration, or historical juxtaposition appears unexpectedly significant before the researcher possesses a complete evidential account. Object specification gives that recognition a researchable form. It records what has become salient, how the proposed object is being individuated, which manifestations could bear on it, and what evidence could require its revision. In an environment where AI can rapidly generate candidate concepts, classifications, models, and relational interpretations, this conversion from salience to accountable specification may become increasingly consequential.

Research-object specification therefore prepares the next methodological problem. Once an object has been provisionally individuated, the inquiry needs to determine what lies within the analytical domain, which relations cross or constitute its edge, and how permeability or uncertainty at that edge should be represented. Section 170 develops this problem through boundary construction.

7.4 Boundary Construction

Section 7.3 treated the research object as a provisional and revisable epistemic specification. The present section develops the next methodological operation: construction of the boundary within which that object is investigated. Its role is to make inclusion, exclusion, interface, and cross-boundary relations explicit parts of research design. The objective is to specify how analytical, spatial, temporal, institutional, and relational boundaries can delimit a tractable domain without converting that delimitation into an unwarranted claim that relational reality itself terminates at the same edge. The section therefore examines analytical boundaries, spatial and temporal delimitation, institutional edges, relational neighborhoods, permeability, sensitivity to alternative boundaries, and procedures for revision.

The epistemological foundation for this operation was established in Section 119, which defined an epistemic boundary as a stated rule of inclusion and exclusion and argued that the warrant of relational knowledge can depend on the boundary under which evidence has been assembled. Chapter 7 translates that conclusion into research practice. Boundary construction determines which entities, relations, events, traces, intervals, and environments enter the immediate analysis; which are provisionally treated as external conditions; and which interfaces remain visible because they may transmit effects across the analytical edge. In this sense, a boundary forms part of the inferential architecture of a study; its role exceeds that of a neutral container placed around an already completed object.

Several intellectual traditions already provide resources for this problem. Simon's account of near-decomposable organization shows why relatively bounded subsystems can sometimes support useful analysis while remaining connected to wider structures (Simon 1962). Network analysis similarly directs attention to clusters, positions, ties, and relational neighborhoods whose analytical boundaries need not coincide with conventional group categories (Wellman 1983). Multiscale analysis emphasizes that organization visible at one scale can differ from organization visible at

another (Bar-Yam 2004), while social–ecological systems research provides a practical example of boundary construction across linked resource, governance, user, and interaction domains (Ostrom 2009). The methodological lesson drawn here is limited: useful boundaries can correspond to durable structures in the world, to institutional classifications, or to question-specific analytical decisions, and their adequacy should be evaluated through the claims they are intended to support.

Definition 7.31 (Methodological boundary construction)**.** *Methodological boundary construction* is the explicit, question-relative specification of the entities, relations, events, traces, intervals, environments, and interfaces included within the immediate analytical domain of an inquiry, together with the criteria of exclusion, the treatment of cross-boundary relations, and the conditions under which the boundary would be revised.

Definition 7.31 emphasizes construction without implying arbitrariness. Some boundaries are legally instituted, physically consequential, organizationally enforced, ecologically structured, or historically stabilized. Others are introduced by the researcher to make observation or representation manageable. In either case, the methodological task is to state what the boundary does for the inquiry and which consequences follow from treating particular relations as internal, external, or boundary-crossing.

Table 7.3 summarizes the boundary dimensions developed below. The dimensions can overlap. A single project may use a territorial boundary for sampling, an institutional boundary for authority, a temporal boundary for exposure, and a relational neighborhood for tracing effects. Their combination should remain inspectable because different combinations can generate different research objects and different inferential reach.

The table also anticipates a central discipline of this section. Boundary construction should preserve the difference between delimiting an inquiry and declaring an ontological edge. A legally incorporated firm can have a clear juridical boundary while its productive capacities depend on suppliers, households, infrastructures, financial institutions, software platforms, and regulatory systems. A school can have a formal membership boundary while learning relations extend through families, online communities, examinations, and labor markets. The methodological question concerns which of these relations need to remain inside the immediate explanatory frame for a specified claim.

7.4.1 Analytical Boundaries

An analytical boundary specifies the immediate domain within which a research claim is constructed. It identifies which parts of a relational configuration are treated as focal, which are represented as contextual conditions, and which remain outside the present inquiry. The boundary therefore operationalizes a theory of relevance. It helps make inquiry tractable while also shaping what can appear as cause, context, mechanism, consequence, or remainder.

Analytical boundaries often arise before data collection. A project can delimit itself to employees within one organization, transactions within a platform, policies within a jurisdiction, or relations among organizations participating in a programme.

Table 7.3: Boundary dimensions and characteristic methodological questions

Boundary dimension	**Primary delimitation**	**Characteristic boundary-crossing issue**	**Possible revision trigger**
Analytical	Question-relative inclusion of relevant entities, relations, and conditions	Omitted relation materially alters the intended claim	Residual pattern, alternative explanation, or participant evidence reveals consequential exclusion
Spatial	Territory, distance, ecological region, infrastructure, or location	Mobility, remote interaction, resource flow, or jurisdiction crosses the perimeter	Effects cluster outside the selected area or depend on spatially distant relations
Temporal	Observation window, episode, period, lag, or historical interval	Antecedent conditions, anticipation, delayed effects, or persistence exceed the window	Changing results under plausible start, end, or lag specifications
Institutional	Membership, jurisdiction, authority, ownership, rule system, or organizational responsibility	Outsourcing, inter-organizational dependence, informal practice, or overlapping authority	Formal and enacted boundaries diverge materially
Relational neighborhood	Relation type, path length, interaction frequency, dependency, or functional connection	Relevant actors or relations lie beyond the initial relational horizon	Expanding the neighborhood changes interpretation or mechanism
Permeability and interface	Conditions governing passage across an analytical or instituted edge	Selective flows of persons, resources, information, value, symbols, or authority	Boundary-crossing processes become constitutive of the object or outcome

Such decisions determine sampling frames, documentary searches, interview recruitment, measurement, model structure, and later generalization. They can also arise during inquiry. A study that begins with a bounded organization may discover that a procurement rule, financing relation, family arrangement, or external platform materially structures the relations observed inside the organization. The boundary then becomes an empirical question whose adequacy can be investigated directly.

The distinction between internal and external relations is consequently boundary-relative. A relation classified as external for one purpose can become internal for another. Credit relations may remain external to a narrow study of workplace communication while becoming internal to an inquiry into organizational survival. A household transfer can remain outside a firm-level productivity model while becoming central to a study of labor reproduction. The classification carries methodological meaning only when the research question and boundary are stated together.

Claim 7.32 (Boundary-relative inferential reach)**.** *When relations excluded by an analytical boundary plausibly contribute to the formation, persistence, interpretation, or transformation of the target object, the inferential reach of the study depends partly on how those relations are represented, tested, or acknowledged.*

Claim 7.32 supports deliberately scoped inquiry with conclusions calibrated to that scope. A study can remain deliberately narrow when its conclusion is correspondingly narrow. The practical problem arises when the analytical reach of the con-

clusion exceeds the relational reach of the evidence. A localized study may support strong claims about a specified process while leaving broader institutional, ecological, or historical implications open.

Boundary provenance helps maintain this alignment. A research record can state whether a boundary follows law, administrative data, physical access, institutional membership, a theoretical mechanism, sampling feasibility, ethical constraint, or a preliminary relational reconstruction. These origins matter because a boundary inherited from a dataset can appear more natural than it is. Administrative records frequently define the universe of visible entities in advance; platform data can privilege interactions that leave machine-readable traces; legal categories can determine which organizations or persons appear as formally recognized actors. Methodological transparency requires the researcher to distinguish convenience of access from evidence that the same boundary is analytically adequate.

Analytical boundaries also have an ethical dimension. Exclusion from the immediate analytical frame can reduce visibility of actors or consequences that are already weakly represented in the available evidence. A bounded study can remain appropriate while some affected relations lie outside its scope. Boundary decisions deserve greater scrutiny when they systematically remove groups, forms of labor, informal practice, ecological dependence, or downstream consequences that are relevant to the claim. Epistemic humility therefore begins partly with stating what the analysis has left outside.

7.4.2 Spatial Boundaries

Spatial boundaries delimit inquiry through location, territory, distance, ecological region, built environment, administrative geography, or infrastructural reach. They can be highly consequential because many forms of social and economic organization are spatially structured. Residence, transport, property, jurisdiction, resource access, environmental exposure, and face-to-face interaction can depend on spatial position. At the same time, spatial proximity and relational inclusion need not coincide.

A city boundary, district, watershed, campus, workplace, market area, or service region can provide a useful sampling or analytical frame. Its adequacy depends on the process under study. A municipal boundary may be appropriate for a question about local administrative authority while proving too narrow for commuting, housing finance, food supply, air pollution, digital communication, or care networks. A workplace perimeter can capture co-presence while omitting remote coordination and household conditions. A national border can have major legal force while transnational finance, supply chains, migration, media, and knowledge flows remain analytically consequential.

Spatial boundary construction should therefore distinguish at least three relations: location of the focal object, spatial reach of the relevant mechanism, and spatial organization of the evidence. These can differ. Researchers may observe participants in one location, reconstruct a mechanism extending across several locations, and rely on data aggregated according to a third geography. Making these mappings explicit reduces the risk that the geometry of the dataset becomes the assumed geometry of the process.

Boundary zones can also deserve attention. Effects may be concentrated near an edge because institutions, prices, regulations, infrastructures, or ecological conditions change across it. In such cases, the boundary is part of the phenomenon. Comparisons across jurisdictional borders, service catchments, school districts, ecological transition zones, or platform access regimes can use boundary discontinuity as evidence, although the interpretation still depends on whether other relations change at the same edge.

Spatial boundaries can move. Administrative borders are redrawn, organizations relocate, infrastructures expand, ecosystems shift, and digital systems alter the relevance of physical distance. A longitudinal inquiry should therefore avoid assuming that a geographic unit retains identical relational meaning throughout the study period. The persistence of a name on a map may conceal transformation in mobility, connectivity, jurisdiction, or material dependence.

A useful spatial boundary record can consequently include the selected geography, the reason for its use, relevant cross-boundary flows, known edge effects, and plausible alternative delimitations. The practical objective is to preserve enough information to determine whether the claim depends on a spatial perimeter that the underlying relational process regularly exceeds.

7.4.3 Temporal Boundaries

Temporal boundaries specify when the analytical object is observed and which prior or subsequent relations enter the explanatory frame. Section 7.3.8 showed that historical objects require explicit periodization. Boundary construction extends this discipline to research that may not present itself as historical. Cross-sectional, experimental, organizational, computational, and policy studies also rely on temporal windows whose placement can influence the relations that become visible.

A temporal boundary can follow a calendar interval, policy period, organizational lifecycle, event sequence, exposure window, cohort, technological regime, or period of relatively stable institutional conditions. Each choice can foreground different mechanisms. A study beginning on the date a policy is formally implemented may miss anticipatory behavior. An inquiry ending when a programme formally closes may miss persistence, displacement, or delayed effects. A crisis bounded by its most visible rupture may omit the slower relational changes that prepared it or the institutional adaptations that followed it.

Temporal delimitation also affects relation identity. A tie observed once can represent a transient interaction, an episode within a durable relation, or the first manifestation of a newly forming relation. Repeated observations can reveal persistence, rhythm, intermittency, or transformation. The evidential meaning of absence can likewise depend on the window: a relation can be inactive during the observation period while remaining institutionally available or historically consequential.

Temporal boundaries should therefore be aligned with the characteristic timescale of the research question where that timescale can be estimated. Rapid interactions, organizational routines, policy adaptation, institutional change, ecological transformation, and intergenerational processes can unfold at different rates. A single observation window may capture some dynamics while compressing others into appar-

ently stable background conditions. Section 171 will treat scale selection directly; the present point is that temporal boundaries already encode a provisional view of which durations matter.

Sensitivity to start and end points can be informative. If a conclusion changes materially when the observation window is extended modestly, the result may indicate anticipation, lag, seasonality, path dependence, structural break, or unstable object specification. Such variation does not automatically invalidate the original analysis. It identifies a temporal condition of the claim that should remain visible.

Temporal boundaries also interact with archival survival. Earlier periods may be represented by sparse institutional records, while recent periods produce dense digital traces. Apparent historical increases in interaction, reporting, or category prevalence can therefore reflect changing manifestation and record production. A boundary-conscious analysis asks whether the temporal change belongs to the relation, the evidential interface, or some combination of both.

7.4.4 Institutional Boundaries

Institutional boundaries are produced through membership rules, jurisdiction, ownership, authority, legal status, administrative responsibility, professional competence, organizational role, and stabilized expectations. They are often especially visible because institutions generate documents that name their own edges: charters, statutes, organizational charts, contracts, eligibility rules, territorial jurisdictions, account permissions, and reporting structures. These manifestations can provide strong evidence while still leaving a distinction between formal and enacted boundaries.

A formal institutional boundary identifies who or what is recognized as belonging to an organization, programme, jurisdiction, or rule system. An enacted boundary concerns where authority, coordination, responsibility, dependence, or expectation operates in practice. The two can coincide closely. They can also diverge. Contractors may perform core organizational functions while remaining formally external. A platform can shape transactions among nominally independent firms. Informal actors can influence decisions without holding recognized office. Standards issued by one institution can structure behavior far beyond its formal jurisdiction.

Relational methodology therefore benefits from preserving both representations when the distinction matters. A study of legal responsibility may appropriately privilege formal jurisdiction. A study of operational dependence may need to include outsourced or infrastructural relations. A study of institutional legitimacy may require both formal authority and experienced recognition. Treating one boundary as universally decisive would obscure these different research purposes.

Institutional boundaries can also overlap. A person can simultaneously participate in household, workplace, professional, legal, educational, financial, and digital institutions whose demands interact. Organizations can belong to regulatory regimes, markets, supply networks, professional associations, funding systems, and technical standards. Research focused on one institutional domain can therefore encounter cross-institutional relations that alter the meaning of behavior observed within it.

Boundary construction can become part of the object itself when institutional membership is contested. Disputes over jurisdiction, eligibility, citizenship, employment status, authorship, professional recognition, organizational responsibility, or platform participation often concern where an institution's edge should be drawn. In such cases, the researcher should avoid resolving the dispute merely by adopting one administrative representation as the analytical truth. Competing boundary claims can themselves be evidence about power, recognition, responsibility, and institutional transformation.

This issue has direct epistemic-justice implications. Institutional records can make formally recognized actors highly visible while rendering informal, excluded, precarious, or externally classified participants less visible. A boundary-aware methodology can preserve the official institutional boundary while also documenting relationally consequential actors who remain outside it. The aim is analytical transparency concerning the difference between institutional recognition and relational participation.

7.4.5 Relational Neighborhoods

A relational neighborhood delimits inquiry primarily through connection, allowing territory or formal membership to remain secondary where the research question requires it. The neighborhood can be organized around a focal entity, relation, event, institution, or configuration and can include other objects connected through specified relation types, path lengths, intensities, dependencies, temporal recencies, or functional roles. Network analysis offers a familiar representation of such neighborhoods, although relational methodology need not reduce them to graph distance alone (Wellman 1983).

Definition 7.33 (Relational neighborhood)**.** A *relational neighborhood* is a question-relative set of entities, relations, configurations, or conditions included because they satisfy a stated criterion of relational proximity, dependence, interaction, transmission, similarity of position, or functional connection to a focal research object.

The definition permits several constructions. A first-order neighborhood can include direct contractual partners. A wider neighborhood can include suppliers of suppliers, linked institutions, or actors connected through repeated interaction. A functional neighborhood can include relations needed for a process to operate even when graph distance is large. A multiplex neighborhood can include several relation types whose combination matters to the question. A temporal neighborhood can privilege recent or recurrent relations over historically remote ones.

The selected neighborhood determines what appears local. A person's immediate communication network can differ from the network through which employment opportunities, care, political information, or financial support are obtained. An organization's contractual neighborhood can differ from its technological dependency neighborhood. A research community's citation neighborhood can differ from its collaboration, training, or institutional-funding neighborhood. The relation semantics established in Section 7.3.2 therefore need to precede or accompany neighborhood construction.

Relational neighborhoods can also reveal why conventional group boundaries are

inadequate. Actors classified into different organizations, regions, sectors, or demographic categories can occupy closely connected positions in a process. Conversely, members of the same formal group can have weak or highly asymmetric relations. A relational neighborhood can therefore supplement, refine, or occasionally replace a categorical boundary when the research question concerns transmission, dependency, influence, coordination, support, or exposure.

Cutoffs should remain inspectable. Path length, interaction frequency, tie intensity, similarity threshold, or inclusion of particular relation types can change the neighborhood substantially. The methodological task is to state why the selected cutoff is relevant and to examine plausible alternatives when the conclusion depends on it. A neighborhood that expands until it includes the entire field loses its discriminating purpose; a neighborhood drawn too tightly can remove the relations through which the focal process is sustained.

Relational neighborhoods can change during inquiry. New evidence may show that a seemingly peripheral actor occupies a bridging position, that an indirect dependency is stronger than a direct tie, or that the focal relation is embedded in a higher-order configuration. Such findings provide a natural bridge to boundary revision and later to the relation-identification procedures of Section 172.

7.4.6 Permeable Boundaries

Many analytically useful boundaries are permeable. Persons, resources, information, authority, technologies, norms, environmental effects, symbols, and value can cross them selectively. Permeability can be symmetric or asymmetric, routine or exceptional, legally regulated or informal, stable or historically changing. Treating a boundary as permeable makes cross-boundary relations part of the research design without requiring the immediate domain to expand indefinitely.

Definition 7.34 (Boundary permeability)**.** *Boundary permeability* is the specified capacity of a methodological or instituted boundary to permit, channel, transform, restrict, or differentially expose cross-boundary relations relevant to the research object and claim.

This definition emphasizes interfaces. A boundary may operate as a selective filter as well as a separation. A border can permit some forms of movement while restricting others. An organization can receive capital, data, standards, and technologies while limiting membership or decision authority. A household can exchange care, labor, money, information, and obligations through different interfaces. A scientific field can admit methods or concepts from neighboring disciplines while maintaining distinct standards of evidence or professional identity.

Permeability can itself be structured by power. Access conditions, fees, credentials, legal status, language, technical standards, platform permissions, infrastructure, or social recognition can determine who crosses a boundary and under what terms. An analysis concerned with distribution, vulnerability, or generative capacity may therefore need to treat the interface as part of the research object and examine its operation directly. The same boundary can be open for one actor and restrictive for another.

Cross-boundary relations can also be constitutive. A firm whose production depends on external suppliers, credit, software infrastructure, and household labor reproduction may remain legally bounded while its operational persistence is generated through recurrent exchange across that boundary. A social–ecological system can depend on interactions among resource, governance, and user components that do not share one simple perimeter (Ostrom 2009). Simon's near-decomposability provides one formal intuition: relative autonomy can coexist with non-negligible coupling across subsystem boundaries (Simon 1962). These examples support a methodological distinction between boundary existence and boundary closure.

Permeability also has an epistemic dimension. Evidence can cross the boundary differently from the relation itself. Researchers may observe internal records while lacking access to external negotiations; they may possess transaction data without information about informal coordination; they may observe outcomes inside a jurisdiction while the decision process occurred elsewhere. The boundary of observation can therefore differ from the boundary of the process. This difference should be recorded when it bears on inference.

Digital and AI-mediated research makes the issue especially visible. A dataset may appear bounded because an API, archive, platform, or model exposes only a defined universe of records. The computational interface can then become an unnoticed epistemic boundary. Expanding technical access can enlarge the record while still leaving unrecorded relations, private infrastructures, or missing historical contexts outside the representation. Computational abundance reduces some access costs, but it does not by itself settle where the relevant relational boundary lies.

7.4.7 Boundary Sensitivity

Boundary sensitivity asks whether a result, interpretation, or inferred mechanism changes under plausible alternative delimitations. The procedure is analogous to sensitivity analysis in other methodological settings, but its object is the construction of the analytical domain. It can involve expanding or contracting a spatial region, moving a temporal start or end point, changing a relational cutoff, comparing formal and enacted institutional membership, including or excluding a cross-boundary interface, or testing nested versions of the research object.

Definition 7.35 (Boundary sensitivity analysis)**.** A *boundary sensitivity analysis* is a structured comparison of an inquiry's conclusions under substantively plausible alternative boundary specifications, undertaken to identify which claims remain stable, which depend on a particular delimitation, and which omitted relations require further investigation.

Boundary sensitivity does not require exhaustive enumeration of possible boundaries. The space of conceivable delimitations can be very large. The researcher can prioritize alternatives supported by theory, participant knowledge, institutional structure, historical evidence, model diagnostics, prior findings, or observed cross-boundary flows. The purpose is to test materially plausible alternatives and avoid artificial robustness produced by arbitrary perturbation.

Several outcomes are informative. A claim can remain relatively stable across tested boundaries, increasing confidence that the result persists beyond one narrow

delimitation. A claim can weaken gradually as the boundary expands, suggesting a localized process. It can reverse under a different institutional or temporal frame, indicating substantial boundary dependence. A mechanism can remain stable while effect magnitude changes. Different boundary choices can also reveal distinct processes that coexist within the same broader field.

Stability under tested boundaries should be interpreted with care. Boundary robustness supports a limited conclusion about the alternatives examined; it does not establish universal invariance. Likewise, boundary sensitivity need not be treated as a defect. If a process is genuinely jurisdiction-dependent, spatially localized, historically bounded, or conditional on a relational neighborhood, sensitivity can be an accurate description of the phenomenon. The methodological contribution lies in identifying the dependency and making its conditions visible.

Boundary sensitivity can also operate qualitatively. Interviewees may identify actors or institutions the formal design omitted. Archival evidence can show that a jurisdictional line had different practical meaning in an earlier period. Ethnographic observation can reveal routine crossings of a boundary that administrative records present as firm. Formal modeling can show that a conclusion requires treating an external parameter as fixed. These forms of evidence can motivate targeted boundary alternatives even when the study does not employ numerical robustness analysis.

Remark 7.36 (Boundary remainder). A *boundary remainder* is a relation, condition, actor, or consequence placed outside the immediate analytical domain whose exclusion remains potentially relevant to interpretation. Recording such remainders helps later inquiry distinguish deliberate scope limitation from unnoticed omission.

The remark gives a practical form to epistemic humility. A research design can acknowledge a relevant remainder while leaving its resolution to later inquiry. This is especially useful in cumulative research, because later work can revisit the omitted relation with new evidence, methods, or scales while retaining a clear record of the original boundary decision.

7.4.8 Boundary Revision

Boundary revision occurs when evidence indicates that the existing analytical edge has become insufficient for the intended claim. Revision can expand, contract, relocate, split, nest, or change the permeability assigned to a boundary. It can also alter the relation between several boundaries: a spatial frame can remain fixed while an institutional boundary expands; a temporal window can widen while a relational neighborhood becomes more selective; a formal jurisdiction can remain one analytic layer while an enacted authority network is added as another.

Several forms of evidence can motivate revision. Unexpected residual patterns can cluster outside the original region. Participants can identify external actors who shape an apparently internal process. Archival evidence can show that a relevant relation began earlier than the selected period. A formal model can require an external dependency that the initial specification treated as exogenous. Cross-scale analysis can show that aggregation conceals a boundary-crossing mechanism. An intervention can change the permeability of the boundary itself. A newly available dataset can reveal relations that earlier evidence could not represent.

Contingent encounter can also play a role. A researcher may encounter an unexpected document, conversation, spatial pattern, institutional inconsistency, or model residual that makes a cross-boundary relation suddenly salient. Aesthetic judgment can contribute to the initial recognition that the anomaly is worth following. Methodological revision begins when that recognition is translated into a testable question about the boundary: whether the newly noticed relation is recurrent, causally consequential, interpretively necessary, or structurally constitutive of the object. The encounter can therefore open the boundary without by itself establishing the revised account.

Definition 7.37 (Boundary revision)**.** A *boundary revision* is a documented alteration of the inclusion, exclusion, interface, or permeability rules of a research design in response to evidence that the earlier boundary materially constrains the adequacy of the intended claim.

A revision record should preserve the prior boundary, the evidence motivating change, the revised specification, and the consequences for earlier findings. This mirrors the versioning discipline developed for research objects in Section 7.3.9. It also supports cumulative inquiry: later researchers can determine whether disagreement arose from new evidence, changed relation semantics, different scale, or a different boundary around the same nominal object.

Boundary revision can also justify simplification. An expanded exploratory design may reveal that several external relations have little bearing on the target claim, allowing a more compact boundary to be defended. A highly porous institutional representation can be narrowed when evidence shows that only one interface materially conditions the outcome. Revisability therefore supports both expansion and disciplined contraction.

Proposition 7.38 (Boundary-construction discipline)**.** *Relational inquiry gains methodological clarity when boundaries are treated as explicit, question-relative, evidence-sensitive, and versionable specifications whose analytical usefulness can be distinguished from claims about the ultimate extent of the relational reality under study.*

Proposition 7.38 completes the movement from object specification to domain construction. The research object of Section 7.3 gives the inquiry a provisional target. Boundary construction specifies the immediate relational domain through which that target will be examined. The two operations remain distinct: an object can retain its analytical identity while the boundary around its relevant environment expands, contracts, or becomes more permeable.

The distinction also prepares the next methodological problem. Boundary answers which relations, entities, intervals, and environments are included in the immediate domain. Scale addresses the level and resolution at which organization within and across that domain is described. A boundary can therefore remain fixed while the analysis moves from individual to dyadic, organizational, institutional, field, or multiscale representation. Section 171 develops this problem through scale selection, cross-scale relations, and scale-induced distortion.

7.5 Scale Selection

Section 7.4 distinguished the analytical boundary of an inquiry from the wider relational reality in which the research object is situated. The present section develops a second and distinct design choice: the scale at which organization within and across that boundary is represented. Its role is to make analytical resolution explicit before the identification and characterization of particular relations. The objective is to show how individual, dyadic, organizational, community, institutional, and field scales disclose different relational structures; how relations can connect processes across scales; how aggregation or excessive decomposition can distort inference; and how multiscale inquiry can coordinate several resolutions without assuming that one scale provides a privileged description of the whole.

This methodological problem follows directly from the ontology and epistemology developed earlier in the book. Section 106 treated entityhood and relationality as scale-relative: a firm can operate as a contracting entity at one resolution while appearing as a heterogeneous configuration of governance, labor, assets, technologies, routines, and expectations at another. Section 119 then treated scale as an epistemic condition of relational knowledge, because changing resolution can alter which entities, relations, regularities, and discontinuities become visible. Chapter 7 translates those commitments into research design. Scale selection therefore concerns the resolution at which a question is asked, evidence is assembled, relations are distinguished, and claims are stated. It does not imply that the analyst creates the relevant reality by choosing a scale, and it does not imply that finer-grained descriptions are inherently more adequate. The selected scale remains answerable to the organization and causal differences that the inquiry seeks to reconstruct.

Several established approaches provide useful resources for this problem. Simon's analysis of complex organization emphasizes nested and near-decomposable structures whose internal and cross-component interactions can differ in strength and frequency (Simon 1962). Multiscale analysis similarly emphasizes that patterns visible at one resolution can differ from those visible at another (Bar-Yam 2004). Network analysis shows how individual attributes, dyadic ties, neighborhoods, positions, and larger relational configurations can support different descriptions of the same empirical domain (Wellman 1983). Work on social–ecological systems provides another example in which users, governance arrangements, resource systems, and interactions are studied through several connected levels rather than through one scale alone (Ostrom 2009). These traditions support a limited methodological conclusion: scale can be treated as a substantive feature of representation whose adequacy depends on the research question, the evidential interface, and the organization of the phenomenon.

Definition 7.39 (Methodological scale selection)**.** *Methodological scale selection* is the explicit specification of the analytical resolution at which entities, relations, processes, constraints, and differences are treated as distinguishable for a stated research question, together with the treatment of relations that connect or transform organization across other relevant scales.

Definition 7.39 distinguishes scale from boundary. Boundary specifies which entities, relations, intervals, and environments enter the immediate analytical domain. Scale specifies the resolution at which organization inside and across that domain is

Table 7.4: Analytical scales and characteristic methodological concerns

Scale	Primary analytical focus	Relations made especially visible	Characteristic distortion risk
Individual	Situated actor, subject, or unit	Capacity, interpretation, exposure, trajectory, agency	Relational and institutional conditions appear as background attributes
Dyadic	Relation between two specified relata	Reciprocity, asymmetry, dependence, exchange, recognition, conflict	Third-party, network, and institutional mediation is suppressed
Organizational	Coordinated configuration with roles and routines	Governance, division of labor, internal authority, resource coordination	Internal heterogeneity is compressed into organizational averages or decisions
Community	Shared practice, membership, memory, or locality	Informal norms, belonging, mutual support, collective interpretation	Porous membership and internal differentiation are underrepresented
Institutional	Rule, category, authority, and expectation structures	Authorization, classification, obligation, legitimacy, patterned constraint	Institutions are treated as unitary actors or reduced to formal rules
Field	Distributed relational environment	Position, differential access, competition, constraint, symbolic and material conditions	Local mechanisms and actor-level heterogeneity become difficult to recover
Multiscale	Relations among several resolutions	Mediation, emergence, feedback, translation, cross-scale constraint	Correspondence across scales is mistaken for a demonstrated pathway

described. A study can therefore hold its boundary fixed while moving between individual, dyadic, organizational, institutional, and field representations. Conversely, two studies can work at a similar scale while drawing different boundaries around the domain of inquiry.

Scale is also multidimensional. Spatial extent, temporal resolution, organizational level, institutional position, functional granularity, informational resolution, and relational distance can vary separately. A national dataset can contain individual-level observations. A short ethnographic encounter can reveal a long-standing institutional relation. A field-level constraint can operate through dyadic interactions. A household can be treated as an organizational unit in one inquiry and as a configuration of interpersonal relations in another. The methodological task is therefore to specify which dimension of scale is being varied and which differences are intended to remain visible.

Table 7.4 summarizes the principal scales developed in this section. The rows should be read as analytical orientations rather than mutually exclusive ontological levels. A single research object can support several of them, and the relations among these orientations become part of multiscale inquiry.

7.5.1 Individual Scale

The individual scale treats a person, household member, worker, student, decision maker, organization member, or other specified subject as the principal unit at which relevant differences are observed. This scale is often indispensable when the inquiry concerns heterogeneous capacities, interpretations, exposures, preferences, trajectories, or forms of agency. It can preserve variation that disappears when observations are aggregated into groups, organizations, or institutions.

An individual-scale design can reconstruct how a person encounters a relation rather than merely whether a relation is formally present. Two workers occupying the same nominal occupational category can experience different supervisory relations, different access to information, different dependence on income, and different capacities to contest decisions. Two students enrolled in the same institution can occupy distinct relational positions through language, prior knowledge, disability, family resources, peer networks, or interactions with teachers. Individual-scale evidence can therefore reveal heterogeneity that a higher-level average compresses.

Relational methodology, however, treats the individual as a provisional analytical object rather than an isolated explanatory origin. Attributes recorded at the individual scale can themselves summarize relational histories. Educational attainment can reflect family, institutional, peer, and policy relations. Income can reflect labor-market position, ownership, bargaining relations, legal status, and household arrangements. A reported preference can be shaped through prior encounters, norms, expectations, and available alternatives. The individual scale therefore supports detailed analysis of situated subjects while retaining the possibility that some apparently individual variables are manifestations of wider relational processes.

The epistemological implication is that individual-level evidence does not automatically identify the scale at which a mechanism operates. A repeated association among individuals can arise from dyadic interaction, organizational sorting, institutional classification, neighborhood structure, or field-level conditions. Likewise, a subjective account can provide important access to meaning and experience while leaving parts of the surrounding configuration weakly observed. Individual-scale inquiry gains strength when the relation between the individual's evidence and the broader relational environment is stated explicitly.

Remark 7.40 (Individual-scale remainder). An individual-scale description can preserve actor-level heterogeneity while leaving relational, organizational, institutional, or field conditions as a remainder. Recording that remainder helps prevent individual variation from being interpreted automatically as individually generated variation.

This remark is particularly important for GRE because later economic analysis will often examine capacities and opportunities. A person's capacity may be individually manifested while being relationally produced, maintained, constrained, or depleted. The scale of manifestation and the scale of generation can therefore differ.

7.5.2 Dyadic Scale

The dyadic scale treats a relation between two specified relata as the focal analytical unit. This scale is especially useful when the research question concerns reciprocity, dependence, exchange, recognition, authority, conflict, trust, communication, contractual relation, or another process whose meaning is difficult to reconstruct from actor attributes alone. The dyad makes the relation itself visible as an object of inquiry.

Dyadic analysis can examine direction and asymmetry. A resource transfer from A to B need not have the same meaning as a transfer from B to A. Advice can be sought in one direction and authority exercised in another. Trust can be mutual, asymmetric, domain-specific, or temporally unstable. A contractual tie can combine reciprocal obligations with unequal exit options. Treating the dyad explicitly therefore helps distinguish relational characteristics from properties attributed separately to the participants.

The dyadic scale also allows relational history to enter analysis. The meaning of an interaction at time t can depend on prior cooperation, conflict, promises, breaches, or accumulated expectations between the same participants. A short exchange can carry a long relational history. Conversely, repeated contact does not necessarily imply a stable relation if the underlying meaning or institutional basis changes substantially. Dyadic inquiry therefore benefits from temporal indexing and from the persistence criteria developed later in this chapter.

A dyad can nevertheless be analytically incomplete. Relations are frequently mediated by third parties, shared infrastructures, organizations, legal rules, norms, markets, and network positions. A lender–borrower relation depends on monetary, contractual, regulatory, and informational structures. A teacher–student relation is shaped by curriculum, institutional authority, assessment systems, peer environments, and family expectations. A buyer–seller relation can be mediated by a platform whose ranking, payment, data, and dispute systems alter both parties' options. Dyadic analysis should therefore preserve relevant mediating relations rather than treating the pair as a closed world.

Definition 7.41 (Dyadic analytical scale)**.** A *dyadic analytical scale* treats a specified relation between two relata as the focal unit of description while retaining the possibility that the relation is conditioned by third parties, institutions, infrastructures, histories, or wider relational configurations.

This definition keeps the dyad analytically central without making it ontologically self-sufficient. Section 172 will later distinguish directly observed, inferred, latent, symbolized, institutional, historical, negative, and absent relations. The present task is prior: to establish when the relation itself, rather than either participant separately, is the resolution at which the research question becomes most intelligible.

7.5.3 Organizational Scale

The organizational scale treats a coordinated configuration—such as a firm, public agency, university, laboratory, association, hospital, platform operator, or project—as a relatively persistent analytical unit. This scale becomes useful when roles, rou-

tines, governance procedures, resource allocations, internal divisions of labor, and collective outputs possess enough stability to influence outcomes beyond the momentary actions of particular members. Simon's analysis of complex organization provides one influential account of how relatively stable subsystems can support higher-level analysis without eliminating lower-level heterogeneity (Simon 1962).

Organizational analysis can therefore ask questions that are poorly represented at the individual or dyadic scale. How is authority distributed across roles? Which routines coordinate dispersed tasks? How are decisions transformed as they pass through units? Which resources are pooled? How are errors detected and corrected? Which internal interfaces create bottlenecks? How does membership turnover coexist with organizational continuity? These questions concern a relational configuration whose persistence can exceed that of many individual participants.

The scale-relative ontology developed in Section 106 is particularly important here. A firm can be treated as an entity when it contracts, owns assets, incurs liabilities, or enters a market. The same firm can be decomposed into teams, governance structures, technologies, documents, routines, labor relations, and external dependencies when those differences matter to the question. The methodological choice between these resolutions should therefore follow the intended inference. Treating the organization as a single actor can be adequate for one claim and seriously distort another.

Organizational aggregation can hide unequal internal positions. An average wage, average productivity measure, institutional decision, or organizational preference can suppress disagreement, hierarchy, informal work, subcontracting, or differential exposure to risk. A formal organizational boundary can also conceal cross-boundary relations with suppliers, households, contractors, funders, regulators, and infrastructures. Section 7.4 therefore remains active: organizational scale does not settle organizational boundary.

A useful design strategy is to identify which properties are being attributed to the organization and which lower-level relations are required to warrant those attributions. If the claim concerns an organization's formal commitment, documentary evidence and authorized decisions may be central. If it concerns organizational practice, repeated behavior across units and roles may be more informative. If it concerns learning or adaptation, the inquiry may need relations among individuals, routines, memory systems, and external feedback. Scale selection thus affects the evidence required for an organizational claim.

7.5.4 Community Scale

The community scale concerns configurations organized through shared locality, practice, identity, memory, mutual recognition, common resources, recurrent interaction, or some combination of these relations. Communities can overlap formal organizations but need not coincide with them. Their boundaries can be porous, contested, or historically changing, and their coordination can depend more strongly on informal norms and repeated interaction than on centralized authority.

Community-scale inquiry is useful when the research question concerns collective interpretation, mutual support, informal sanction, belonging, shared knowledge, customary practice, local stewardship, or collective memory. A community can sustain

expectations that remain weakly visible in individual questionnaires or formal institutional records. It can also preserve historical knowledge through practices, stories, routines, spatial arrangements, and relationships whose significance becomes visible only when the collective configuration is examined.

The community scale should not imply homogeneity. Internal differences in status, wealth, gender, expertise, age, legal standing, or access to decision making can be substantial. A community-level statement can therefore become misleading when it converts a dominant position into a collective position or when it treats participation as evenly distributed. The methodological task is to specify which shared relations warrant the community-scale object and which internal differences remain consequential for the claim.

Community analysis also interacts closely with boundary construction. Membership may be formal in one setting and relationally inferred in another. People can participate intermittently, occupy peripheral positions, belong to several communities, or be affected by community decisions without being recognized as members. Cross-boundary relations can provide resources, information, political leverage, or external constraints. The community scale therefore often benefits from layered membership and neighborhood representations rather than a single binary inclusion rule.

A community can also operate at several temporal scales. Short-lived communities can form around emergencies, campaigns, collaborative projects, or online events, while other communities reproduce relations across generations. The relevant scale should therefore be indexed to the persistence and causal interval of the process under study. Community-scale reality is compatible with substantial turnover when enough relational organization, memory, or practice persists to sustain the focal phenomenon.

7.5.5 Institutional Scale

The institutional scale focuses on relatively durable systems of rules, categories, authority, obligation, legitimacy, expectation, and patterned practice. An institution can be realized through organizations while remaining analytically distinct from them. A legal rule can organize many organizations; a market convention can coordinate actors without a single governing body; a professional standard can operate across workplaces; a citizenship category can structure rights and obligations across multiple administrative sites. Scale selection should therefore avoid treating “institution” and “organization” as interchangeable units.

Institutional-scale inquiry asks how categories and rules organize relations across cases. It can examine who is authorized to decide, which classifications create access or exclusion, how obligations are assigned, how sanctions operate, how norms become expected, and how formal rules relate to enacted practice. The relevant evidence can include legal texts, administrative procedures, organizational routines, records of enforcement, participant interpretation, and historical change. Institutional analysis often requires several evidential interfaces because the formal representation of an institution may differ from its practical realization.

This scale is especially important for generative-relational inquiry because insti-

tutions can condition the space of possible relations before a particular interaction occurs. Property rules affect the relations through which assets can be controlled or transferred. Educational institutions classify credentials and pathways. Financial rules condition access to credit and settlement. Research institutions distribute authority, recognition, resources, and standards of evidence. These effects can be manifested through individual or dyadic events while depending on a wider institutional architecture.

Institutional-scale claims should preserve variation in implementation. A rule can be formally common while being enacted differently across offices, organizations, regions, or historical periods. An aggregate institutional description can therefore conceal local discretion, informal workaround, selective enforcement, or unequal access. A multiscale design may be needed when the question concerns how institutional rules are translated into organizational procedures and individual experiences.

Remark 7.42 (Institutional manifestation across scales)*.* An institutional relation can be manifested at individual, dyadic, organizational, and field scales without being exhausted by one manifestation. Evidence gathered at one scale can therefore support only the component of the institutional claim that its access relation can warrant.

The remark extends the epistemological distinction between manifestation and relational object. A denial recorded in one administrative encounter can be evidence about institutional enactment without by itself establishing the distribution of institutional practice across the wider system. Conversely, a formal rule can establish an authorized institutional relation while leaving its practical realization uncertain.

7.5.6 Field Scale

The field scale treats the focal phenomenon as situated within a distributed relational environment in which positions, opportunities, constraints, resources, norms, expectations, and symbolic classifications are patterned across a wider configuration. Field analysis becomes useful when local interactions appear to depend on conditions that are not adequately represented as properties of one actor, one dyad, or one organization.

A field can be represented in several ways depending on the research question. It can emphasize network position, institutional location, distributions of resources, symbolic classifications, competitive structures, technological infrastructures, legal conditions, or recurrent patterns of dependence. Network analysis provides one family of representations for distributed relational position (Wellman 1983); other field representations can be qualitative, historical, spatial, institutional, or formal. The methodological commitment is therefore to distributed conditioning rather than to one specific mathematical form.

Field-scale inquiry can reveal why similar local relations produce different outcomes in different environments. The same contractual form can operate differently under distinct labor-market conditions. The same educational intervention can have different consequences when institutional access, peer structures, family resources, and credential regimes differ. A local innovation can diffuse in one technological field and remain isolated in another. These differences can be difficult to explain if field conditions are treated merely as background variables.

The field scale also poses a risk of abstraction. A broad relational environment can be represented so generally that the mechanisms connecting field conditions to local manifestations become obscure. A field-level pattern can correspond to several distinct local processes. Section 119 therefore required bridge evidence for cross-scale claims, and the same discipline applies here. The researcher should identify how field conditions become operative through institutions, organizations, dyads, or situated actors rather than infer local mechanism from field-level correspondence alone.

Field analysis is also sensitive to boundary choice. A professional field, market field, policy field, cultural field, or technological field may extend beyond one jurisdiction or organization. Its edges can be porous and relation-specific. The boundary remainder introduced in Section 7.4 can therefore be useful when potentially relevant field relations are known but remain outside the tractable scope of a study.

7.5.7 Cross-Scale Relations

Cross-scale inquiry begins when the research question concerns how organization at one resolution conditions, emerges from, translates, or transforms organization at another. The language of "micro," "meso," and "macro" can be convenient, but it is too coarse for many relational problems because scale is not defined only by physical size or population count. Individual, dyadic, organizational, institutional, temporal, spatial, and informational resolutions can cross one another in different ways.

A cross-scale relation therefore requires a specified pathway. Individual actions can accumulate into an organizational routine, but the pathway can depend on authority, repetition, documentation, incentives, or technological embedding. An institutional rule can condition individual behavior, but its effect can be mediated by organizational interpretation, enforcement, social meaning, and available alternatives. A community norm can shape dyadic trust through repeated observation and sanction. A field-level technological change can alter organizational possibilities by changing cost structures, standards, or infrastructures. These are cross-scale hypotheses because the explanatory pathway connects organization represented at different resolutions.

The epistemological requirement is stronger than simple pattern correspondence. If an aggregate outcome changes after many individual changes, the co-occurrence does not by itself establish how the levels are connected. If a national policy is followed by a local outcome, temporal sequence does not by itself identify the mediating relation. If an institutional classification correlates with individual behavior, the classification can operate through several pathways. Section 119 therefore introduced a cross-scale bridge requirement: evidence should concern the pathway that links scale-specific processes. Chapter 7 turns that requirement into design practice.

Definition 7.43 (Cross-scale bridge)**.** A *cross-scale bridge* is an empirically or theoretically specified pathway through which a relation, constraint, resource, representation, or transformation at one analytical scale becomes consequential for organization represented at another scale.

A cross-scale bridge can be material, informational, institutional, symbolic, organizational, spatial, or temporal. Examples include an administrative rule implemented

through caseworker decisions, household resources translated into educational opportunities through school access, organizational routines sedimented from repeated local practices, or market-wide price changes transmitted through contracts and budgets. The bridge need not imply one-directional causation. Feedback can connect the scales recursively.

Cross-scale divergence can itself be informative. Aggregate access can increase while access for a subgroup decreases. An organization can remain formally stable while local practices change rapidly. A network can become more connected globally while some neighborhoods become more isolated. A policy can improve an average outcome while increasing variance. Such divergences suggest that scale is part of the phenomenon rather than a technical nuisance to be averaged away.

7.5.8 Scale-Induced Distortion

Scale-induced distortion occurs when the selected resolution suppresses, merges, separates, or reclassifies differences in ways that materially alter the intended inference. Distortion can arise from aggregation, excessive decomposition, inappropriate temporal resolution, or treating a scale-specific manifestation as though it represented the same object across scales.

Aggregation is one familiar source. Group averages can hide bimodal distributions, subgroup reversals, unequal exposure, or distinct relational positions. Organizational indicators can conceal internal hierarchy. National indicators can suppress regional differences. Network summaries can conceal local bottlenecks or brokerage. Historical periodization can smooth over rapid transitions. Aggregation is methodologically defensible when the differences it suppresses are irrelevant to the target claim; it becomes problematic when those differences are part of the mechanism or normative question.

Excessive decomposition produces a complementary distortion. A highly granular description can dissolve organizational routines, institutional authority, community memory, or field structure into local observations without preserving the higher-level organization through which those observations become coordinated. Finer resolution can therefore reduce explanatory adequacy when persistence, constraint, or causal efficacy appears only at a coarser scale. The scale-relative ontology of Section 106 was introduced partly to avoid this assumption that decomposition automatically approaches a more fundamental social explanation.

Temporal scale can generate similar problems. A short window can make a slowly evolving institution appear fixed. A long window can blur a critical transition. High-frequency observations can create an impression of volatility while missing stable long-run relations; low-frequency observations can miss rapid feedback and temporary but consequential states. The relevant temporal resolution should correspond to the causal and interpretive timescales of the research question.

Definition 7.44 (Scale-induced distortion)**.** *Scale-induced distortion* is a material alteration of a relational inference produced when the analytical resolution suppresses, merges, separates, or reclassifies differences that are consequential for the research question.

Scale-induced distortion can be investigated through sensitivity across plausible resolutions. The researcher can disaggregate a group, aggregate a network neighborhood, compare organizational units, change temporal windows, or reconstruct a field-level condition. A change in conclusion does not automatically indicate methodological failure. It can reveal that the phenomenon is genuinely scale-dependent. The task is to report which components of the claim remain stable and which depend on resolution.

A useful companion to the boundary remainder is a *scale remainder*: organization known or plausibly expected to exist at another scale but not represented in the focal analysis. Recording such a remainder helps preserve the difference between deliberate resolution and unnoticed omission. It can also guide later inquiry when evidence becomes available at another scale.

Remark 7.45 (Scale remainder). A *scale remainder* is a relation, process, heterogeneity, or organized condition that lies outside the resolution of the focal representation but remains potentially consequential for interpretation, mechanism, or transfer of the resulting claim.

The remark supports epistemic humility. A study can make a strong claim at one scale while preserving explicit uncertainty about organization outside that resolution. It also supports cumulative research because later work can target the recorded remainder rather than reconstruct the original omission from scratch.

7.5.9 Multiscale Inquiry

Multiscale inquiry coordinates two or more analytical resolutions when the research question depends on relations that are difficult to reconstruct adequately at one scale alone. Its purpose is not to maximize the number of levels represented. Additional scales introduce data requirements, translation problems, computational burden, interpretive complexity, and new opportunities for mismatch. A multiscale design is warranted when the relation among scales contributes materially to the claim.

Multiscale analysis can proceed through nested, parallel, sequential, or bridge-centered designs. A nested design examines individuals within organizations and organizations within institutions. A parallel design analyzes the same phenomenon separately at several scales and compares the resulting structures. A sequential design begins at one scale and shifts resolution when anomalies or unanswered questions emerge. A bridge-centered design starts from a hypothesized cross-scale pathway and gathers evidence at the scales required to evaluate each part of the pathway. Social–ecological systems research provides a familiar example of analysis that links users, governance arrangements, resources, and interactions across several connected components (Ostrom 2009); multiscale complex-systems approaches similarly emphasize that patterns and constraints can vary with resolution (Bar-Yam 2004).

Translation between scales should remain visible. Aggregating individual observations into an organizational indicator is a transformation. Inferring a community norm from interviews is a transformation. Treating local decisions as evidence of institutional enactment is a transformation. Mapping field conditions into actor-level exposures is a transformation. Each operation preserves some information and suppresses other information. The translation-remainder principle developed earlier in

the book therefore applies to scale changes as well as to changes of method or representation.

Multiscale inquiry also benefits from versioned scale selection. A project can begin at the individual and dyadic scales because those are the most accessible manifestations, then add organizational or institutional analysis when repeated patterns indicate shared conditioning. Conversely, a field-level project can move toward local scales when broad regularities conceal heterogeneous mechanisms. Contingent encounter can motivate such movement: an archival document, interview statement, model residual, spatial pattern, or organizational inconsistency can make another scale suddenly salient. Aesthetic judgment can contribute to recognizing that the pattern is worth following, while later inquiry determines whether the additional scale materially improves explanation.

AI-assisted research can lower some costs of multiscale exploration by linking documents, extracting entities, reconstructing networks, comparing representations, or simulating systems across resolutions. These capacities do not settle which scale is substantively appropriate. Abundant automatically generated representations can increase the importance of scale judgment: the researcher still has to determine which distinctions correspond to the question, which transformations preserve relevant meaning, and which apparent cross-scale regularities survive independent evidential scrutiny.

Proposition 7.46 (Scale-selection discipline)**.** *Relational inquiry gains methodological clarity when analytical scale is stated explicitly, justified by the organization relevant to the research question, tested against plausible alternative resolutions where material, and accompanied by evidence for pathways invoked in cross-scale claims.*

Proposition 7.46 completes the movement from object specification and boundary construction to analytical resolution. Section 7.3 specified what kind of object the inquiry provisionally studies. Section 7.4 specified the domain within which relevant relations are sought. The present section specifies the resolution at which those relations and objects are distinguished. These three operations are separable but recursive: changing the scale can reveal that an object should be respecified or that a boundary should be revised, while a new boundary can expose organization that requires a different scale.

The next methodological problem concerns identification. Once object, boundary, and scale are explicit, the researcher can ask what evidence warrants the claim that a relation is present, inferred, latent, symbolized, institutional, historical, negative, or absent. Section 172 therefore turns from the resolution of relational inquiry to the identification of relations under mediated and incomplete epistemic access.

7.6 Identification of Relations

Sections 7.3–7.5 specified the provisional research object, the analytical boundary, and the scale at which relational differences are represented. The present section addresses the next methodological problem: what warrants the claim that a relation is present, absent, latent, symbolically mediated, institutionally sustained, historically reconstructed, or negatively structured within that specification. Its role is to trans-

late the ontology and epistemology of Chapters 4–5 into criteria for relational identification before the later tasks of characterization, persistence analysis, and configuration reconstruction. The section distinguishes several modes of identification, examines the evidential relations appropriate to each, and ends with a multidimensional account of relation uncertainty. The method is deliberately plural. Observation, documents, archives, interviews, institutional rules, statistical regularities, formal models, computational traces, and historical reconstruction can each contribute to identification when the inferential bridge between manifestation and target relation is made explicit.

Identification should be distinguished from characterization. A study can possess strong evidence that a relation exists while remaining uncertain about its intensity, reciprocity, duration, asymmetry, or meaning. Conversely, a dataset can attach a numerical weight to an edge whose underlying relational interpretation remains weakly warranted. Section 173 will address characteristics of identified relations. The present task is prior: determining what kind of evidential and inferential support permits the relation to enter the research object in the first place.

The distinction between relational and manifestational reality is decisive here. A recorded transfer, signed contract, observed conversation, administrative code, spatial co-presence, or statistical association is a manifestation or trace available to inquiry. Depending on the target claim, the manifestation can constitute part of the relation, provide evidence for it, or merely correlate with it. The inverse problem developed in Section 113 therefore remains active. Relation identification proceeds from manifestations under stated conditions toward a bounded claim about relational reality; the apparent visibility of the manifestation should not be confused with transparent access to the complete relation.

Definition 7.47 (Relation identification)**.** *Relation identification* is the warranted assignment of a specified relational status to a candidate relation among stated relata, within a stated boundary, scale, and temporal domain, on the basis of manifestations, traces, institutional conditions, historical evidence, inferential assumptions, or combinations of these sources.

Definition 7.47 makes identification indexed rather than absolute. A relation can be strongly identified at one institutional or temporal scale and remain uncertain at another. The same observed interaction can support identification of communication while providing only weak evidence of trust. A legal record can strongly identify a formal obligation while leaving actual compliance uncertain. An absence claim can be credible within a carefully observed channel while remaining open outside that channel. Relation identification is therefore claim-relative and should state the type of relation being identified rather than relying on an unqualified statement that two entities are “related.”

Table 7.5 summarizes the modes developed below. They are neither mutually exclusive nor exhaustive ontological kinds. A historical institutional relation can be symbolized, negatively structured, and partly latent at the same time. The classification concerns routes of epistemic access and the burdens attached to them. It is therefore compatible with the ontological suspension of Chapter 4: the inquiry can identify a relational status sufficiently for its research purpose without claiming a final metaphysical classification of the relation.

Table 7.5: Principal modes of relation identification and characteristic evidential burdens.

Identification mode	Primary evidential access	Characteristic remainder or risk
Directly observed	Recorded interaction, transaction, co-action, communication, or other manifestation closely matching the target relation	Observation remains selective; the observed act may underdetermine relational meaning or persistence
Inferred	Multiple manifestations connected to the target through an explicit inferential bridge	Dependence on auxiliary assumptions, model structure, and alternative explanations
Latent	Convergent traces, dispositional evidence, patterned consequences, or model-supported hidden structure	Reification of a convenient latent construct or overinterpretation of indirect evidence
Symbolized	Language, signs, declarations, classifications, narratives, images, or symbolic performances	Symbolic representation may diverge from enacted relation while also contributing to its formation
Institutional	Rules, statuses, rights, duties, authority, procedures, and patterned enactment	Formal relation may differ from practical realization across settings
Historical	Archived traces, sequences, retrospective records, material residues, and reconstructed trajectories	Preservation bias, changing categories, missing records, and uncertain continuity
Negative	Evidence of prohibition, exclusion, avoidance, antagonism, blocking, or structured non-cooperation	Risk of confusing structured opposition with simple non-occurrence
Absent	Sustained non-detection under conditions in which the target relation would plausibly have become detectable	Absence of evidence can be mistaken for evidence of absence when detection conditions are weak

7.6.1 Directly Observed Relations

A directly observed relation is identified through a manifestation that closely corresponds to the operational target of inquiry. Examples include a recorded monetary transfer when the target is a transfer relation, a witnessed exchange of messages when the target is communication, a jointly signed agreement when the target is formal contractual linkage, or repeated co-presence when the target is co-location. The term *directly observed* therefore describes the relation between observation and the specified target; it does not imply unmediated access to relational reality in a broader ontological sense.

This distinction is important because observation is produced through instruments, categories, positions, and recording practices. A platform log records actions

that the platform is technically capable of registering. An ethnographer observes from a particular location and under particular access conditions. A financial ledger records transactions according to accounting categories. A legal file records the relation that the legal system recognizes and preserves. The epistemology of manifestation developed in Sections 114–116 therefore applies even where the observed event appears straightforward.

Direct observation can provide strong identification when the target relation is defined at the level of the manifested act. If the research question concerns whether a payment occurred, a verified transaction record can be highly informative. If the question concerns whether the payment expressed solidarity, coercion, obligation, reciprocity, or strategic compliance, the same record provides only part of the required evidence. The inferential burden grows as the target relation includes meanings, dispositions, histories, or institutional consequences that exceed the observed act.

A useful practice is to state the observational granularity. "A message was sent" differs from "a communication relation existed" when delivery, reception, interpretation, and response are relevant. "Two actors met" differs from "they coordinated" when joint planning is the target. "A transfer occurred" differs from "a dependency relation existed" when the broader pattern of resource access matters. Such distinctions protect direct evidence from being asked to carry a stronger relational claim than its manifest content supports.

Direct observation can also be distributed across time. A single observed interaction may identify an event relation without warranting a durable relation. Repeated interactions can support stronger continuity claims when the criteria for persistence are specified. Section 174 will examine that problem directly. For present purposes, the key discipline is to keep the unit of identification aligned with what the observation makes available.

Claim 7.48 (Observation-relative directness)**.** *A relation can be treated as directly observed when the recorded manifestation closely matches the specified relational target at the relevant scale and time, while additional relational meaning, persistence, or generative significance remains subject to separate inference.*

Claim 7.48 prevents "direct" from becoming a rhetorical marker of privileged access. Directness is useful precisely when its scope is narrow enough to be inspectable.

7.6.2 Inferred Relations

Many relations of substantive interest are identified inferentially. Trust, dependence, influence, informal authority, exclusion, coordination, institutional constraint, shared expectation, and field position can become visible through patterns of behavior, testimony, records, outcomes, and comparative evidence without appearing as single directly observable acts. In these cases, relation identification requires an explicit bridge from manifestations to the proposed relation.

The compatibility-set logic of Section 113 is useful. A manifestation can remain compatible with several relational explanations. Repeated consultation of one actor before decisions can indicate expertise, hierarchy, trust, procedural requirement,

or strategic deference. Similar transaction patterns can arise from preference, constraint, common exposure, or institutional routing. Identification improves when additional evidence removes alternatives or identifies relational properties shared by the serious reconstructions that remain.

Inference can rely on several forms of support. Process evidence can show how one actor's decision enters another's choice. Cross-context comparison can reveal whether the proposed relation persists under changing conditions. Intervention or natural variation can test whether altering one relational condition changes the expected manifestation. Interviews can clarify meanings that behavioral traces leave ambiguous. Formal or statistical models can estimate relations that are difficult to observe directly, provided that model-imposed structure remains distinguishable from evidential constraint. Giere's purposive account of scientific representation is relevant because a model represents selected aspects of a target under stated purposes and respects of similarity rather than reproducing the target without remainder (Giere 2004).

The background assumptions of the inference should therefore be visible. Longino's account of evidential relevance emphasizes that observations acquire evidential force through background assumptions and critical scrutiny (Longino 1990). Within the present framework, those assumptions can concern boundary, scale, comparability, classification, detection, temporal ordering, or the manifestation relation itself. An inferred relation becomes methodologically stronger when plausible alternatives and the assumptions that distinguish them are stated rather than left implicit.

Definition 7.49 (Inferential bridge)**.** An *inferential bridge* is the stated set of evidential relations, assumptions, mechanisms, comparison rules, or model structures through which one or more manifestations are taken to support identification of a specified relation.

The definition makes inferred relations auditable. Different traditions can construct different bridges: process tracing, statistical estimation, ethnographic interpretation, archival reconstruction, formal deduction, network inference, legal analysis, or mixed-method triangulation. The relevant standard is not uniformity of technique but adequacy of the bridge to the target claim.

7.6.3 Latent Relations

A latent relation is proposed when the target relation is not directly manifest in the available evidential field yet appears necessary or useful for explaining a structured pattern of traces, dispositions, or consequences. Latency here is broader than the technical use of latent variables in statistical modeling. It refers to relational organization whose epistemic access is indirect and whose manifestations can be dispersed across observations.

Examples include a durable dependency that becomes visible only when alternative resource channels disappear, an informal hierarchy inferred from recurrent deference across settings, a trust relation revealed through willingness to accept vulnerability, or a coordination structure reconstructed from synchronized action without an observable command. The relation can be relationally consequential before it re-

ceives explicit symbolic articulation, consistent with Chapter 4's claim that relational reality need not await perception or naming.

Latent identification requires particular care because explanatory convenience can be mistaken for relational evidence. A hidden relation should not be introduced merely because it permits a model to fit observed outcomes. Competing explanations can include common causes, measurement artifacts, selection processes, aggregation effects, or omitted institutional rules. Convergent manifestations from different sources are therefore especially useful. A proposed latent relation becomes more credible when behavioral, documentary, historical, and positional evidence point toward a compatible structure while making materially different errors.

The distinction between a latent relation and an unobserved relation is also important. A relation can be unobserved simply because data are unavailable. Latency adds a stronger methodological claim: the relation is partly hidden from direct manifestation in the current evidential regime, yet its presence is supported through indirect traces or structural consequences. The researcher should therefore specify what would count as evidence against the latent interpretation as well as what currently supports it.

Proposition 7.50 (Latent-relation discipline)**.** *Identification of a latent relation is strengthened when the proposed relation explains a specified pattern across heterogeneous manifestations, survives plausible alternative reconstructions, and generates further discriminating observations or historical expectations.*

This proposition keeps latency revisable. A relation initially treated as latent can later become more directly observable when access, instruments, archives, or institutional records change. The reverse can also occur when a previously visible relation moves into informal or opaque channels.

7.6.4 Symbolized Relations

Symbolized relations become epistemically accessible through language, signs, declarations, classifications, narratives, images, ritual forms, legal texts, interfaces, or other symbolic media. A person may call another a colleague, debtor, citizen, mentor, rival, dependent, partner, or stranger; an institution may classify a person as eligible, liable, authorized, resident, employee, or beneficiary. Such symbols can reveal relational interpretation while also participating in the production and stabilization of the relation itself.

The performative dimension developed in Chapter 5 is therefore central. Symbolization can be descriptive, constitutive, strategic, contested, aspirational, or retrospective. A declaration of friendship can express an existing relation, attempt to establish one, or mask a deteriorating one. A legal classification can identify an institutional status while simultaneously activating rights and duties. A statistical category can render a population administratively visible while shaping later allocation and policy. Historical work on quantification and classification shows how representational infrastructures can become institutionally consequential rather than remaining neutral mirrors (Porter 1995; Desrosières 1998).

Relation identification should therefore preserve at least two questions. First, what

relation does the symbol claim, imply, or make legible? Second, what relation does the act of symbolization help generate, sustain, transform, or contest? These questions can have different answers. Symbolic recognition may be weakly enacted in practice; practical coordination may precede a shared vocabulary; competing symbols can organize the same relation differently across groups.

Symbolized relations are also sensitive to translation. A term used in one historical or cultural setting can lack a precise equivalent in another. Administrative translation can compress relational distinctions; computational extraction can normalize several terms into one edge type. The methodological response is to preserve provenance and, where material, the original symbolic form together with the analytical translation applied to it.

Remark 7.51 (Symbolization and identification). Symbolization can supply evidence about a relation and can participate in constituting that relation. Relational inquiry should distinguish these epistemic and generative roles where their separation affects interpretation.

This distinction prepares later analysis of relational meaning in Section 173 while avoiding the assumption that symbolic naming is either sufficient or irrelevant to relational existence.

7.6.5 Institutional Relations

Institutional relations arise through systems of rules, statuses, authority, obligations, procedures, expectations, and patterned enforcement. Examples include ownership, citizenship, employment, trusteeship, regulatory authority, contractual liability, professional jurisdiction, fiduciary duty, entitlement, and organizational office. Such relations can persist despite turnover in particular actors because their continuity is carried through institutional arrangements.

Identification of an institutional relation can begin from formal sources: statutes, contracts, charters, organizational rules, registries, judicial decisions, administrative classifications, or authorized records. Institutional analysis, however, also requires attention to enactment. A formally granted right can remain practically inaccessible; an official hierarchy can coexist with informal authority; a contractual relation can be reconfigured through dependence on infrastructures or intermediaries. North's account of institutions as constraints structuring interaction and Searle's analysis of status functions and institutional facts provide different resources for understanding how rule-governed relations acquire persistence and practical consequence (North 1990; Searle 1995).

The methodological problem is therefore two-layered. The first layer identifies the formal institutional relation. The second asks whether and how that relation is enacted, recognized, enforced, circumvented, or transformed in practice. A study concerned with legal status may legitimately stop at the first layer if its target is narrowly specified. A study concerned with effective access, power, dependence, or generative consequence usually requires the second.

Institutional identification can also involve distributed evidence. Authority may be documented in one institution, operationalized through another, and experienced

through a third. Rights and duties can be layered across jurisdictional scales. A person's relation to a welfare system, for example, can involve statute, administrative category, caseworker discretion, digital eligibility systems, and appeal procedures. The relation can therefore be institutionally real while manifesting differently across interfaces.

This is one point where the scale analysis of Section 7.5 becomes important. An institutional relation identified at a field or legal scale can be unevenly enacted at organizational or interpersonal scales. Cross-scale divergence does not by itself invalidate the institutional identification; it reveals that formal status and practical realization should be represented separately.

7.6.6 Historical Relations

Historical relations are identified through evidence whose meaning depends on temporal sequence, preservation, changing categories, and criteria of continuity. Some relations are no longer directly observable because the actors, institutions, or practices have disappeared. Others persist into the present but can be understood only by reconstructing how they formed, stabilized, changed, or acquired their current meaning.

Historical identification therefore works through traces: archives, correspondence, contracts, statistics, maps, material remains, oral histories, institutional records, prior classifications, legal documents, publications, and later reconstructions. These traces were produced under historically specific manifestation relations. Their survival is also selective. Records can be destroyed, may not have been created, can be unevenly preserved, or can be concentrated among actors with greater institutional capacity to document their activities.

A silence in the record is consequently ambiguous. It can indicate that a relation was absent, that it was not institutionally legible, that relevant actors lacked record-producing capacity, that evidence was suppressed, or that surviving archives are incomplete. Section 7.6.8 will return to absence directly. For historical inquiry, the central discipline is to reconstruct the conditions under which a relation could have left a trace and the conditions under which that trace could survive.

Historical categories also change. Hacking's work on historical ontology and Abbott's emphasis on temporality and events support attention to the historically changing objects through which inquiry is organized (Hacking 2002; Abbott 2001). A recorded category can retain the same label while its institutional meaning changes, or different labels can refer to relations with substantial continuity. Identification should therefore rely on historically appropriate relational criteria rather than lexical sameness alone.

Sequence can provide evidence that a static observation does not provide on its own. A relation may become identifiable through repeated dependence, progressive closure of alternatives, cumulative institutionalization, or path-dependent stabilization. Pierson's work on increasing returns illustrates how timing and sequence can become consequential in institutional development (Pierson 2000). Historical identification can therefore involve reconstruction of trajectories through which a relation becomes durable enough to warrant a claim of continuity.

Definition 7.52 (Historically reconstructed relation)**.** A *historically reconstructed relation* is a relation whose identification depends materially on temporally ordered traces and on an account of the historical conditions governing their production, preservation, interpretation, and continuity.

Definition 7.52 keeps historical identification compatible with later revision. New archives, improved digitization, newly accessible testimony, or a changed conceptual vocabulary can alter the evidential field without implying that prior reconstruction lacked methodological seriousness.

7.6.7 Negative Relations

Relational inquiry should distinguish a negative relation from the absence of relation. A negative relation is present when actors, institutions, or positions are connected through structured opposition, prohibition, exclusion, avoidance, blocking, sanction, incompatibility, or another relational form whose content constrains or prevents a class of interactions. The term *negative* describes relational organization, not moral evaluation.

Examples include a legal prohibition, an institutional veto, a blacklist relation, enforced separation, strategic avoidance, a boycott, exclusion from an access channel, or an antagonistic relation that predictably reorganizes conduct. In such cases, the non-occurrence of a positive interaction can be generated by an active relation. Two actors who do not exchange resources because one is institutionally barred from the channel are relationally different from two actors who simply have no relevant connection.

Identification therefore requires evidence of structured non-connection or opposition. Relevant manifestations can include explicit prohibitions, repeated blocking behavior, sanctions, avoidance patterns under conditions of opportunity, testimony concerning anticipated consequences, or counterfactual changes when the negative relation is removed. The evidential burden should remain sensitive to alternative explanations. Repeated non-interaction can arise from distance, irrelevance, lack of opportunity, measurement gaps, or preference without constituting a stable negative relation.

Negative relations can also operate at several scales. An interpersonal conflict can remain local. An organizational rule can generalize exclusion across many dyads. A field-level stigma can shape interaction even when a particular pair has not encountered one another. Multiscale inquiry can therefore ask whether the negative relation is carried through local action, institutional status, symbolic classification, infrastructural design, or a combination of these mechanisms.

Definition 7.53 (Negative relation)**.** A *negative relation* is an identified relational structure in which opposition, prohibition, exclusion, avoidance, blocking, sanction, or comparable constraint organizes the possible interaction among specified relata within a stated domain.

The definition helps later economic analysis because restricted access, gatekeeping, exclusion from markets, denial of institutional recognition, and blocked conversion pathways can be relationally consequential even when the most visible manifestation

is non-participation.

7.6.8 Absent Relations

An absent relation is a claim that a specified relation is not present within the stated boundary, scale, temporal window, and detection regime. Such claims are methodologically demanding because non-detection has several possible explanations. The relation can be absent, weak, intermittent, hidden, outside the observation window, expressed through an unmeasured channel, or obscured by a manifestation process that the inquiry does not understand well.

The phrase “absence of evidence is not evidence of absence” captures a useful caution but can itself become too strong when treated without qualification. Sustained non-detection can provide evidence of absence when the inquiry has credible reasons to expect the relation to generate detectable manifestations under the conditions observed. The relevant question is therefore whether the detection regime had adequate opportunity and sensitivity to register the target relation.

Consider communication. Failure to observe messages in one platform does little to establish absence if actors can use other channels. Failure to observe a legally required filing can be stronger evidence when the institutional procedure makes filing necessary and records are complete. Repeated inability to detect a predicted pathway across several independent data sources can weaken a relational hypothesis substantially. Historical absence is more difficult when record production and preservation are uncertain.

A useful absence claim therefore states the target relation, the observation opportunities, the expected manifestations, the sensitivity of the detection procedure, and the remaining alternative channels. It can also state a confidence horizon: absence during a specified interval does not imply absence before or after that interval.

Definition 7.54 (Evidentially supported relational absence)**.** *Evidentially supported relational absence* is a bounded claim that a specified relation is not present within a stated domain when repeated or appropriately sensitive observation under credible detection conditions fails to reveal manifestations expected if that relation were present, and materially plausible alternative channels have been considered.

This definition preserves the difference between absence, missingness, and invisibility. Section 193 will later address missingness in relational data as a methodological object in its own right. The present section concerns the narrower inferential question of when absence itself can be identified.

7.6.9 Relation Uncertainty

Relation uncertainty concerns the degree and form of unresolvedness attached to identification. It should be represented more precisely than a binary present/absent flag. A candidate relation can be well supported as present while its type remains uncertain; its existence can be secure at one scale and doubtful at another; its historical continuity can be uncertain even when present manifestations are clear; its institutional status can be documented while practical enactment remains variable.

At least several dimensions can matter. *Existence uncertainty* concerns whether

the relation is present. *Type uncertainty* concerns which relational category best fits the evidence. *Relata uncertainty* concerns who or what occupies the positions connected by the relation. *Manifestation uncertainty* concerns how reliably available traces reveal the relation. *Boundary uncertainty* concerns whether omitted actors or domains alter identification. *Scale uncertainty* concerns whether the relation persists under alternative resolutions. *Temporal uncertainty* concerns onset, duration, intermittency, and continuity. *Historical uncertainty* concerns reconstruction under incomplete or changing records. *Model uncertainty* concerns dependence on statistical, computational, formal, or conceptual representations.

These dimensions need not move together. A legal ownership relation can have low existence uncertainty and high uncertainty about practical control. A latent trust relation can have moderate existence uncertainty and substantial uncertainty about relational meaning. A historical dependency can have strong evidence for its existence during one period while its exact onset remains unclear. A network edge inferred from communication data can have low uncertainty within the platform and high boundary uncertainty if important communication occurs elsewhere.

The multidimensional confidence approach of Section 128 therefore carries directly into methodology. A single numerical confidence score can be useful in some designs, yet it can also compress distinctions needed for interpretation. Relational inquiry can use probabilities, intervals, sensitivity ranges, competing reconstruction sets, qualitative confidence categories, or structured uncertainty statements according to the evidential form and research purpose.

Definition 7.55 (Relation-identification profile)**.** A *relation-identification profile* is a structured statement of the evidential status of a candidate relation across the dimensions material to its identification, including the available manifestations, inferential bridge, boundary and scale, temporal scope, plausible alternatives, and remaining uncertainties.

The profile is especially useful when several methods contribute different pieces of evidence. An interview can clarify meaning while transaction data establish frequency; institutional records can establish formal status while ethnography reveals enacted variation; archival materials can establish historical continuity while quantitative data estimate current distribution. The profile allows these contributions to accumulate without forcing them into one epistemic metric.

Contingent encounter can also alter relation identification. An unexpected archival juxtaposition, anomalous residual, phrase in an interview, spatial pattern, or institutional inconsistency can make a previously unconsidered relation salient. Aesthetic judgment may contribute to the initial recognition that the pattern is structurally interesting or generatively promising. Methodological identification begins when that salience is converted into a candidate relation with explicit relata, manifestations, alternatives, and revision conditions. This distinction remains important in AI-assisted research: automated systems can generate large numbers of candidate edges or latent structures, while the evidential status of those candidates still depends on the manifestation regime, model assumptions, independent evidence, and accountable judgment.

Proposition 7.56 (Identification discipline)**.** *Relational inquiry becomes more ac-*

countable when the status of a candidate relation is stated together with the manifestations or traces that support it, the inferential bridge connecting those manifestations to the target, the boundary, scale, and temporal domain of the claim, the principal alternatives considered, and the uncertainties that remain material to interpretation.

Proposition 7.56 completes the sequence begun in Sections 7.3–7.5. Object specification states what kind of relational object is provisionally under study. Boundary construction states the domain within which relevance is assessed. Scale selection states the resolution at which differences are represented. Relation identification states what evidence warrants entry of a candidate relation into that object. These operations remain recursive: an identification failure can motivate boundary revision, a latent relation can require a new scale, and historical evidence can alter the object specification itself.

The next section turns from the evidential status of relation presence to the properties through which identified relations differ. Section 173 develops direction, intensity, duration, reciprocity, dependence, constraint, enablement, asymmetry, multiplexity, and relational meaning. Keeping identification and characterization separate allows the later analysis to ask not only whether a relation is present, but what kind of relation it has become and which of its properties are sufficiently warranted for further inquiry.

7.7 Characterization of Relations

Section 7.6 addressed the prior question of when available evidence warrants treating a candidate relation as present, absent, latent, institutional, historical, symbolically mediated, or otherwise identifiable within a specified research configuration. The present section moves from identification to characterization. Its role is to specify the properties through which an identified relation can differ from another relation and through which the same relation can change across time, scale, domain, and mode of manifestation. The discussion develops direction, intensity, duration, reciprocity, dependence, constraint, enablement, asymmetry, multiplexity, and relational meaning. These dimensions are treated as analytically distinguishable and potentially interdependent. Their characterization should remain indexed to the evidence through which the relation was identified, the boundary and scale selected in Sections 170–171, and the uncertainty retained in the relation-identification profile.

Characterization is therefore neither a decorative description added after relation identification nor an assumption that can be read directly from the presence of a tie. A relation can be well identified while several of its properties remain weakly known. A formal employment relation can be documented with high confidence while practical dependence, intensity of supervision, reciprocity of obligation, or relational meaning vary substantially across workers and periods. A communication edge can be directly observed while the direction of influence remains uncertain. A durable institutional relation can contain intermittent interaction. A symmetric exchange frequency can coexist with asymmetric dependence. Methodological adequacy requires these distinctions to remain visible.

Definition 7.57 (Relational characterization profile)**.** A *relational characterization*

profile is a question-relative and revisable specification of the warranted properties of an identified relation, including the evidential basis, temporal scope, scale, boundary, relevant dimensions, and remaining uncertainty associated with those properties.

Definition 7.57 gives the section a practical unit of analysis. A characterization profile need not be complete across the dimensions developed below. Some inquiries require careful reconstruction of direction and dependence while intensity is secondary. Others focus on duration, multiplexity, or meaning. The relevant discipline is to distinguish properties that have been investigated from properties that remain unspecified, rather than silently filling unknown dimensions with assumptions inherited from a dataset, formal representation, or institutional category.

Table 7.6 summarizes the dimensions developed in this section. The table should be read as a methodological map rather than a claim that relations possess a fixed universal coordinate system. The dimensions can overlap in empirical manifestation, and some research traditions may operationalize them differently. Their value lies in making explicit which relational properties are being claimed and what kinds of evidential error are especially plausible.

7.7.1 Direction

Direction concerns the ordered orientation of a relation. The relevant ordering can involve movement of resources, information, commands, recognition, obligations, influence, care, risk, or other relationally specified contents. Direction should therefore be defined with respect to the relation under study rather than assumed from the order in which two entities appear in a dataset. A directed edge can record who sent a message, while the analytically relevant direction may concern who initiated coordination, who exercised authority, who became dependent on the information, or whose conduct changed afterward.

Several directions can coexist between the same relata. An employee may receive instructions from a supervisor while providing information upward, producing value for the organization, depending on the organization for income, and possessing specialized knowledge on which the supervisor relies. A lender can transfer capital toward a borrower while obligations of repayment run in the opposite direction. A teacher can transmit instruction toward a student while feedback, questions, and performance data modify the teacher's subsequent practice. Characterization should therefore state *which relational content is directed*.

Temporal order can help identify direction while remaining insufficient by itself for some claims. A precedes B does not establish that A caused B. Likewise, a payment from A to B does not establish that influence, dependence, or obligation runs in the same direction. Direction of manifestation, direction of causal effect, direction of normative obligation, and direction of dependence are analytically distinguishable. A study can characterize one of these while leaving another unresolved.

Direction can also vary across scale. A local dyad may show repeated influence from one actor toward another while organizational rules governing both actors originate elsewhere. At the institutional scale, the relation may therefore appear to be conditioned by a third source. Conversely, a distributed institutional pattern can be

Table 7.6: Dimensions of relational characterization and characteristic inferential risks

Dimension	Characterization question	Illustrative evidence	Characteristic inferential risk
Direction	In what direction does a flow, obligation, effect, recognition, or authority relation operate?	Ordered transfers, commands, replies, obligations, temporal sequence	Observed order is mistaken for causal or normative direction
Intensity	How strongly is the relation enacted or consequential within the stated domain?	Frequency, magnitude, salience, exposure, resource volume, reported importance	Frequency or volume is treated as intensity without relational interpretation
Duration	How long does the relation persist, recur, or remain institutionally available?	Longitudinal records, repeated interaction, contracts, archival continuity	Calendar continuity is confused with unchanged relational content
Reciprocity	To what extent do relevant relational acts or obligations return across relata?	Mutual exchange, acknowledgment, response, reciprocal obligation	Reciprocity is equated with equality or symmetry
Dependence	How much does one relatum rely on another for valued resources, capacities, recognition, access, or alternatives?	Exit options, substitutability, resource access, switching costs, counterfactual loss	Association or repeated use is interpreted as dependence
Constraint	Which possibilities are limited, conditioned, delayed, or made costly through the relation?	Rules, sanctions, bottlenecks, vetoes, opportunity restrictions	Constraint is inferred from unfavorable outcomes without a relational pathway
Enablement	Which capacities, options, access routes, or forms of action become available through the relation?	Access, coordination, knowledge transfer, recognition, infrastructure, support	Availability is treated as realized benefit or equal capability
Asymmetry	Which relational properties differ across positions or directions?	Unequal authority, dependence, information, exit capacity, exposure, conversion power	Difference is automatically interpreted as injustice or domination
Multiplexity	Which distinct relational channels connect the same or overlapping relata?	Work, kinship, finance, communication, authority, care, symbolic recognition	Several channels are collapsed into one undifferentiated tie
Meaning	How is the relation interpreted, classified, experienced, and institutionally recognized?	Interviews, texts, symbols, practices, legal categories, situated interpretation	One actor's account or one formal label is treated as exhaustive meaning

sustained through many local directional interactions. Multiscale analysis should preserve the distinction between a direction observed within a focal scale and a direction inferred across scales.

Definition 7.58 (Relational direction)**.** *Relational direction* is the warranted ordering of a specified relational content among identified relata within a stated temporal, spatial, institutional, and analytical domain.

Definition 7.58 makes direction content-specific and bounded. It also prepares

later work on causal and generative inquiry, where claims about directional production or transformation will require stronger evidence than claims about ordered interaction alone.

7.7.2 Intensity

Intensity concerns the degree to which an identified relation is enacted, salient, resource-bearing, behaviorally consequential, or otherwise strong with respect to a stated analytical criterion. This formulation is intentionally plural because intensity has no single empirical manifestation across relational domains. Ten messages can constitute a weak routine contact, while one legal decision can reorganize a relation profoundly. A small financial transfer can have substantial consequences under severe scarcity, whereas a larger transfer can be marginal for an actor with abundant alternatives. Frequency and magnitude are therefore possible indicators of intensity rather than definitions of it.

Characterizing intensity requires specifying the dimension along which strength is assessed. Relevant dimensions can include frequency of interaction, volume of transferred resources, duration of exposure, salience to participants, institutional enforceability, behavioral consequence, degree of commitment, opportunity cost, or the magnitude of change associated with the relation. These measures can diverge. A rarely activated emergency guarantee can be institutionally strong despite low frequency. A frequent digital interaction can be socially shallow. A formally weak advisory relation can become practically influential when alternative expertise is scarce.

Intensity is also relative to baseline conditions. The same transfer can represent a small share of one actor's resources and a large share of another's. The same supervisory intervention can be consequential in a tightly controlled organization and routine in another setting. A characterization profile should therefore record the denominator or comparison condition where intensity is quantified. When intensity is interpreted qualitatively, the criteria supporting labels such as strong, weak, consequential, or peripheral should remain recoverable.

Measurement can itself alter perceived intensity. Platform logs privilege interactions that leave digital traces. Administrative records can capture formal transactions while informal support remains weakly recorded. Interview accounts can foreground experiences that participants consider salient while routine relations become less narratively visible. Triangulation across manifestations can therefore be especially valuable when intensity is theoretically important.

Remark 7.59 (Intensity is multidimensional). A relation can be intense along one dimension and weak along another. High interaction frequency can coexist with low dependence, while low-frequency relations can carry strong legal, symbolic, or material consequences. Characterization should preserve the dimension on which intensity is claimed.

This remark matters for later economic analysis. Market frequency, monetary volume, bargaining dependence, institutional enforceability, and generative consequence can move differently. Collapsing them into a single edge weight can obscure the relational mechanism that the inquiry is trying to explain.

7.7.3 Duration

Duration concerns the temporal extension, recurrence, persistence, intermittency, and availability of an identified relation. A relation can exist continuously, recur periodically, remain dormant while institutionally available, or be reconstructed as a sequence of related but changing relational episodes. Characterizing duration therefore requires more than recording the interval between first and last observations.

A contractual relation can persist during periods with little visible interaction because obligations and expectations remain active. A friendship can involve long periods without communication while retaining a meaningful capacity for renewed interaction. An institutional affiliation can remain formally continuous while practical participation changes sharply. Conversely, repeated transactions between the same actors do not necessarily constitute one durable relation if the basis, meaning, or governing conditions of the interaction change materially.

Several temporal properties should be distinguished where relevant. *Onset* concerns when the relation becomes sufficiently constituted to identify. *Persistence* concerns the extent to which it remains recognizable through time. *Intermittency* concerns gaps in manifestation without necessarily implying dissolution. *Recurrence* concerns repeated reactivation. *Termination* concerns the point at which the relation ceases to satisfy the criteria under which it was identified. *Latency* concerns periods in which a relation remains consequential or institutionally available despite weak observable enactment.

Historical inquiry adds the problem of changing relational content. A relation can preserve a name while its obligations, authority, material basis, or symbolic meaning evolve. Duration should therefore be distinguished from identity through time. Section 174 will address relational identity and persistence directly. For present purposes, a duration claim should state whether it concerns persistence of formal status, continuity of interaction, continuity of effect, continuity of meaning, or another specified property.

Definition 7.60 (Relational duration)**.** *Relational duration* is the temporally bounded characterization of the persistence, recurrence, intermittency, dormancy, or termination of an identified relation under stated criteria of continuity.

The definition keeps duration connected to evidential conditions. A missing observation in a longitudinal dataset can indicate inactivity, unobserved interaction, data loss, or dissolution. Duration claims therefore inherit the missingness and detection problems developed in Section 172 and later revisited in the chapter's treatment of relational data.

7.7.4 Reciprocity

Reciprocity concerns the extent to which relational acts, obligations, recognition, resources, or responses move across positions in ways that are meaningfully returned or mutually constituted. Reciprocity should be distinguished from symmetry. A relation can be reciprocal while remaining highly asymmetric in magnitude, timing, authority, dependence, or meaning. Parent and child, teacher and student, lender and borrower, state and citizen, employer and employee, or clinician and patient

can occupy reciprocal relations without occupying interchangeable positions.

The form of return also matters. A resource transfer can be reciprocated by money, labor, care, recognition, information, future obligation, institutional compliance, or another form of response. If analysis defines reciprocity only as exchange of the same measurable object, it can miss heterogeneous return relations. This is particularly important for GRE, where later chapters will examine heterogeneous value forms and conversions that may resist a common metric.

Reciprocity can be immediate or temporally extended. A response may occur within seconds, after a contractual period, across a career, or across generations. Short observation windows can therefore make reciprocal structures appear unilateral. At the same time, indefinite expectations of future return should not be used to infer reciprocity without evidence. A characterization profile can record the expected form and temporal horizon of return together with uncertainty about whether reciprocal realization has occurred.

Institutional rules can organize reciprocity even when local interactions look one-directional. Taxation and public provision, membership obligations and institutional benefits, or credentialing and professional duties can involve distributed forms of reciprocity that do not map neatly onto one dyad. Conversely, formally reciprocal obligations can be enacted asymmetrically when one party possesses greater enforcement capacity or exit options.

Remark 7.61 (Reciprocity and symmetry). Reciprocity concerns relational return or mutual constitution. Symmetry concerns similarity across specified relational properties. A relation can therefore be reciprocal while remaining asymmetric in authority, dependence, intensity, timing, exposure, or capacity to exit.

Preserving this distinction prevents a common methodological shortcut in which mutual exchange is taken as evidence of relational equality. Later analysis of power and justice will require more detailed attention to which properties remain asymmetric within apparently reciprocal relations.

7.7.5 Dependence

Dependence concerns the extent to which a relatum's valued options, capacities, resources, recognition, security, or ability to continue a course of action rely on a specified relation. Dependence is therefore relational and counterfactual: it concerns what becomes difficult, costly, unavailable, or substantially altered if access through the relation changes. Repeated interaction alone provides limited evidence of dependence when substitutes are readily available and exit is inexpensive.

Several conditions can contribute to dependence. These include scarcity of alternatives, switching costs, legal restrictions, sunk investments, informational specialization, social attachment, infrastructural concentration, geographic immobility, credential requirements, or control over conversion interfaces. The same observed relation can therefore generate different levels of dependence for different participants. A worker with several comparable employment options can occupy the same formal employment relation as a worker whose legal status or geographic location makes exit difficult, yet their dependence profiles differ.

Dependence can also be domain-specific. An organization can depend on a supplier for one specialized input while retaining broad autonomy elsewhere. A researcher can depend on an institution for laboratory access without depending on it for intellectual identity. A community can depend on a platform for visibility while maintaining offline support networks. Characterization should state the valued domain in which dependence is claimed.

Counterfactual reasoning is useful but should remain calibrated. Removing a relation can create losses because the relation was beneficial, because alternatives were suppressed, because transition costs are high, or because surrounding institutions were built around that relation. These mechanisms imply different forms of dependence. Evidence can include observed exit behavior, substitution patterns, participant accounts, institutional rules, resource concentration, natural experiments, historical disruptions, or comparative cases with different alternatives.

Definition 7.62 (Relational dependence)**.** *Relational dependence* is the degree to which a relatum's specified valued capacities, options, resources, recognition, or continuity of action rely on maintaining access through an identified relation under the alternatives available within the stated domain.

Dependence should not be treated automatically as domination or injustice. Some dependencies are voluntarily cultivated, mutually beneficial, or constitutive of valuable forms of cooperation. Their normative evaluation depends on properties such as reversibility, alternatives, voice, distribution of benefits and burdens, vulnerability to unilateral change, and broader institutional context.

7.7.6 Constraint

Constraint concerns the ways in which an identified relation conditions, narrows, delays, redirects, penalizes, or raises the cost of possible actions or trajectories. Constraint can be explicit, as in a legal prohibition, contractual restriction, technical access control, or organizational veto. It can also be distributed through expectations, resource dependencies, classification systems, infrastructures, or relational configurations that make some actions difficult without a single actor issuing a command.

A constraint claim should identify the constrained possibility and the relational pathway through which the limitation is produced. An unfavorable outcome alone is weak evidence that a relation constrained the actor. The actor may have lacked resources for unrelated reasons, preferred another option, misperceived available alternatives, or faced a broader environmental limitation. Relational inquiry therefore asks how the identified relation changed the feasible or practically accessible set of actions relative to plausible alternatives.

Constraints can be enabling for coordination at another level. Traffic rules restrict possible movements while supporting predictable collective mobility. Research ethics procedures can delay some forms of inquiry while protecting participants and sustaining institutional legitimacy. Contractual obligations can limit immediate discretion while stabilizing expectations needed for cooperation. The analytical task is therefore to characterize what is constrained, for whom, at what scale, over what horizon, and with what consequences, rather than assigning a globally constraining identity to the relation.

Constraint can also be latent. An actor may not encounter a sanction because anticipated enforcement already shapes conduct. A platform rule can influence behavior even when no account is removed. A professional norm can limit publicly imaginable options through expected reputational consequences. Evidence for such constraints may require participant accounts, institutional documents, comparative cases, observed behavior around rule changes, or counterfactual variation.

Definition 7.63 (Relational constraint)**.** A *relational constraint* is a warranted condition through which an identified relation limits, conditions, delays, redirects, or raises the cost of a specified class of possible actions or trajectories for one or more relata within a stated domain.

This definition treats constraint as possibility- and domain-specific. It also leaves room for constraints that operate through several scales, such as institutional rules enacted through organizational routines and experienced in local interactions.

7.7.7 Enablement

Enablement concerns the capacities, access routes, resources, coordination possibilities, forms of recognition, or actionable options that become available or more feasible through an identified relation. As with constraint, enablement should be characterized relative to a specified possibility and evidential pathway. The mere presence of a resource or institutional entitlement does not establish that a person can effectively convert it into capability or action.

Relations can enable through several mechanisms. They can transmit knowledge, provide material resources, coordinate complementary activity, authorize participation, confer recognition, reduce uncertainty, share risk, provide infrastructure, create trust, or connect actors to further relations. The same relation can enable one class of action while constraining another. Organizational membership can provide resources and professional identity while imposing role obligations. A financial relation can provide liquidity while creating repayment dependence. A legal status can confer protection while subjecting activity to specified procedures.

Enablement can also depend on complementary relations. Access to a scholarship may have limited practical effect if housing, language support, transportation, or legal permission remain unavailable. Digital access may not become informational capacity without literacy, time, or trusted interpretive support. A research collaboration can offer data access while leaving participants without authority to shape the questions asked. Characterization therefore benefits from distinguishing nominal availability from effective convertibility.

This distinction will later matter for GRE's analysis of generativity. An enabling relation can expand present options without necessarily producing durable generative capacity. Conversely, a modest immediate resource can become highly generative if it enters a relational configuration that supports learning, coordination, or repeated conversion. The present section remains at the level of relation characterization; Chapter 8 will address stronger claims about generation and subsequent transformation.

Definition 7.64 (Relational enablement)**.** *Relational enablement* is a warranted condi-

tion through which an identified relation expands, supports, authorizes, coordinates, or lowers the cost of a specified class of capacities, access routes, or possible actions within a stated domain.

Constraint and enablement should therefore be characterized separately rather than treated as logical opposites. A relation can do both, and the balance can vary across actors, timescales, and scales.

7.7.8 Asymmetry

Asymmetry concerns differences in relational properties across positions, directions, or relata. These differences can involve authority, dependence, information, intensity, exposure, risk, mobility, recognition, resource contribution, conversion capacity, exit options, or capacity to define the meaning of the relation itself. Asymmetry is therefore a comparative property of a relation rather than a synonym for hierarchy.

Some asymmetries are built into differentiated roles. A surgeon and patient, judge and litigant, teacher and student, or pilot and passenger occupy positions with different responsibilities and competencies. Other asymmetries can emerge historically through resource accumulation, institutional privilege, infrastructural control, or differential alternatives. The methodological task is to identify the dimension of difference and its consequences before making a normative judgment.

Asymmetry can also be concealed by symmetric data representations. A network dataset can record an undirected connection between two organizations while one controls most of the relevant resources. A contract can list mutual obligations while enforcement capacity differs sharply. Two actors can exchange similar monetary amounts while one faces much higher opportunity cost. Characterization therefore requires attention to the property that is being compared rather than assuming that a symmetric edge implies a symmetric relation.

The reverse problem also occurs. A visibly asymmetric relation may be normatively justified or practically necessary within a specified domain, especially when responsibilities, expertise, risk, or consent differ. Empirical asymmetry should therefore be kept distinct from conclusions about domination, exploitation, injustice, or legitimacy. Those conclusions require additional normative and causal analysis.

Definition 7.65 (Relational asymmetry)**.** *Relational asymmetry* is a warranted difference across positions or directions in one or more specified properties of an identified relation, such as authority, dependence, information, intensity, exposure, alternatives, or capacity to alter the relation.

This definition will support later economic analysis of bargaining power, ownership, value capture, access, and generativity return without assuming that each form of relational difference has the same normative significance.

7.7.9 Multiplexity

Multiplexity concerns the coexistence of several relational channels among the same or overlapping relata. Two people can simultaneously be colleagues, friends, coauthors, creditors, neighbors, and members of the same institution. Two organizations can compete in one market while collaborating on standards, sharing infrastructure,

exchanging personnel, and depending on the same regulator. A state can relate to an organization through taxation, licensing, procurement, regulation, subsidy, data exchange, and legal adjudication. Collapsing these channels into one undifferentiated tie can obscure how relational properties interact.

The channels need not be independent. One relation can alter the meaning or consequence of another. Friendship can change how professional criticism is interpreted. Financial dependence can affect bargaining in a contractual relation. Shared institutional membership can make communication possible. A symbolic relation can legitimize a material transfer. Multiplexity therefore concerns more than counting tie types; it concerns the configuration through which several relation types coexist, reinforce, compensate for, or conflict with one another.

Methodologically, multiplexity raises identification and measurement problems. A survey question about "support" can combine emotional, informational, financial, and practical assistance. Administrative records can capture contractual ties while informal advice remains invisible. Network layers can be available at different temporal resolutions. A researcher can therefore construct artificial multiplexity or artificial simplicity depending on how categories are defined and data sources are combined.

Scale also matters. At a dyadic scale, multiplexity concerns several channels between two relata. At an organizational or field scale, it can concern overlapping systems of finance, authority, information, recognition, infrastructure, and regulation. Cross-scale relations can themselves be multiplex: an institution can influence local conduct through law, funding, classification, professional norms, and technical standards at the same time.

Definition 7.66 (Relational multiplexity)**.** *Relational multiplexity* is the coexistence of analytically distinguishable relational channels among the same or overlapping relata, together with the possibility that those channels condition one another's operation, meaning, or consequence.

The definition prepares later network, higher-order, and field-based analysis. It also matters for economic praxis because material exchange, authority, trust, symbolic recognition, knowledge, and institutional access can circulate through partially overlapping relational infrastructures.

7.7.10 Relational Meaning

Relational meaning concerns how an identified relation is interpreted, classified, experienced, expected, narrated, symbolized, and institutionally recognized by participants and relevant surrounding actors. Meaning is analytically important because materially similar interactions can occupy different relational structures when participants understand their obligations, permissions, identities, or expectations differently. A monetary transfer can be a wage, gift, loan, tax, bribe, reimbursement, inheritance, donation, or ritual contribution. The physical movement of money does not by itself establish the relation being enacted.

Meaning can be accessed through language, interviews, ethnographic observation, documents, legal categories, symbols, rituals, practices, institutional classifications,

and comparative context. These sources provide partially different forms of evidence. A participant's account can reveal lived interpretation without exhausting the institutional meaning of the relation. A legal category can establish formal status while practical meaning differs in everyday enactment. An external researcher can identify structural dependence that participants do not describe in those terms. Relational meaning is therefore reconstructed through situated evidence rather than assigned exclusively by one source of authority.

Meaning can also be contested within a relation. An organization can describe a work arrangement as flexible collaboration while workers experience it as dependence. A state can classify a transfer as assistance while recipients interpret it as entitlement, compensation, or surveillance. A family relation can carry different expectations across generations. Contested meaning is itself a relational fact when the disagreement shapes conduct, legitimacy, trust, or conflict.

Historical change further complicates meaning. The same institutional category can acquire different associations, rights, obligations, and symbolic valence over time. A relation can also be reclassified deliberately, as when an informal practice becomes legally recognized, a market exchange becomes regulated as employment, or a customary entitlement is reframed as a discretionary benefit. Such reclassification can change behavior because symbolic and institutional meanings enter the relation's consequences.

Meaning interacts with the other dimensions developed in this section. Direction can be interpreted as authority, advice, care, or coercion. Reciprocity can be understood as exchange, obligation, solidarity, or indebtedness. Dependence can be experienced as security, vulnerability, commitment, or constraint. Asymmetry can be accepted as legitimate specialization in one context and contested as domination in another. Multiplexity can make these meanings coexist and sometimes conflict.

Definition 7.67 (Relational meaning)**.** *Relational meaning* is the historically and contextually situated interpretation, classification, expectation, and symbolic significance through which an identified relation is understood and enacted by relevant participants, institutions, or interpretive communities.

Definition 7.67 avoids treating meaning as either purely subjective or fully fixed by formal classification. Meaning is relationally produced and can remain contested. Its reconstruction therefore benefits from methodological pluralism, especially when participant accounts, documentary categories, observed practices, quantitative patterns, and institutional rules diverge.

The ten dimensions developed in this section should be treated as a characterization architecture rather than a mandatory checklist. Their relevance depends on the research question and the relation identified. A careful study can leave some dimensions unspecified while stating why they are outside its scope. What matters is that unexamined properties are not silently assumed. Characterization also remains revisable: new evidence can change an estimate of dependence, reveal previously hidden multiplexity, alter the inferred direction of influence, or show that the meaning of a relation changed across periods.

This revisability is especially important under contingent encounter. A relation initially characterized as weak can become analytically important when an unexpected

event reveals high dependence. A formally reciprocal relation can appear differently after an archival record exposes asymmetric enforcement. A relation represented as purely material can acquire a symbolic dimension through an interview, ritual, or institutional dispute. Aesthetic judgment can make such discrepancies salient before their epistemic significance is established; subsequent inquiry should determine whether the discrepancy warrants revision of the characterization profile.

AI-assisted analysis can increase the number of relational properties that can be extracted, compared, and modeled across large bodies of text, administrative records, networks, and longitudinal data. This expands methodological possibility while increasing the importance of semantic discipline. Automatically generated edge weights, sentiment labels, inferred roles, or relational categories remain representations whose meaning depends on training data, operational definitions, context, and validation. Abundance of characterized relations therefore does not remove the need to ask what each characteristic means and how it was warranted.

The next section turns from characterization at a given analytical moment to a harder temporal question. Section 174 examines relational identity and persistence: under what conditions can a changing relation be treated as the same relation through time, when does transformation become reconstitution, and how can continuity be reconstructed without assuming that persistence requires invariance.

7.8 Relational Identity and Persistence

Section 7.7 characterized identified relations through dimensions such as direction, intensity, duration, reciprocity, dependence, constraint, enablement, asymmetry, multiplexity, and meaning. The present section addresses the temporal problem that follows from such characterization: when observations separated in time may be treated as phases of one continuing relation, when change warrants reclassification, and when a relation has dissolved while some of its effects remain. Its role is methodological rather than primarily ontological or epistemological. Chapters 4 and 5 established that relational reality can persist through changing realization and that relational identity claims require explicit continuity criteria. Here those commitments are converted into a research procedure for reconstructing formation, continuity, transformation, dissolution, symbolic continuity, discontinuity, historical identity, persistence criteria, and uncertainty of identity.

The problem arises because persistence is compatible with change. An employment relation can continue through changes in wages, tasks, supervisors, contractual instruments, and working arrangements. A credit relation can continue through refinancing or restructuring. An institutional relation can retain legal continuity while its practical authority changes. A professional, kinship, or diplomatic relation can remain available during long intervals of sparse interaction. Conversely, continuity of a name, account identifier, organization, office, or legal form can conceal substantial relational reconstitution. Temporal inquiry therefore requires more than matching labels across observations. It requires a defensible account of what carries continuity and which changes matter for the research question.

A further complication follows from Sections 7.4–7.7. Identity judgments inherit

the boundary, scale, identification, and characterization choices through which the relation was specified. A relation can appear continuous at an institutional scale while undergoing repeated local reconstitution. It can remain formally stable while dependence, meaning, or reciprocity changes. It can be intermittent in observable enactment while persisting through recognized obligations, memory, infrastructure, or latent capacity. Relational identity is therefore best treated as a structured temporal judgment whose evidential basis remains recoverable.

Definition 7.68 (Relational identity profile)**.** A *relational identity profile* is a question-relative and revisable record that specifies the relation being tracked, its identity-bearing dimensions, continuity carriers, relevant temporal and spatial scope, evidence of formation and persistence, transformations, possible discontinuities, dissolution conditions, and remaining uncertainty.

Definition 7.68 provides the practical unit for this section. The profile does not require the researcher to declare a relation permanently identical or permanently different across an entire history. It can represent continuity in some dimensions together with transformation in others, periods of dormancy, contested transitions, or alternative identity hypotheses. This is especially useful for longitudinal work in which later evidence changes the interpretation of earlier observations.

Table 7.7 summarizes the main temporal operations developed below. The categories are analytical aids rather than mutually exclusive states. Formation can be gradual, continuity can contain transformation, dissolution can leave residues, and symbolic continuity can coexist with practical discontinuity.

7.8.1 Relation Formation

Relation formation concerns the entry of a candidate relation into a sufficiently organized state for the specified inquiry. Formation should be distinguished from first observation. The earliest surviving record can postdate the practical emergence of a relation, while a formal creation date can precede the point at which the relation becomes enacted. A contract may be signed before work begins. A legal office may be created before authority becomes practically effective. Trust can develop through repeated encounters without a unique inaugural event. A market relation can become economically consequential before a durable statistical category exists for recording it.

Methodological reconstruction therefore benefits from a *formation window* when the evidence does not support a singular date. The window can contain precursor interactions, negotiations, symbolic acts, institutional decisions, initial exchanges, repeated coordination, or other processes through which the relation becomes recognizable under the identity criterion. A narrow legal inquiry can legitimately use a formal date when legal status is the target. A study of practical dependence may require a different formation threshold. A historical inquiry may distinguish several stages, such as precursor conditions, initial enactment, stabilization, and public recognition.

Definition 7.69 (Relation formation record)**.** A *relation formation record* is a temporally ordered account of the manifestations, precursor conditions, entry criteria, and evidential uncertainties through which a relation is judged to have formed for a specified analytical target.

Table 7.7: Temporal operations in relational identity analysis

Operation	**Methodological question**	**Illustrative continuity evidence**	**Characteristic inferential risk**
Formation	When does the target relation become sufficiently organized to enter the inquiry as a relation of the specified kind?	First enforceable obligation, repeated coordinated practice, stabilized expectation, recognized status, recurrent exchange	First observation is mistaken for first formation
Continuity	Which identity-bearing dimensions remain connected across time?	Recurring obligations, records, memory, infrastructure, role succession, repeated interaction	Surface similarity is treated as sufficient continuity
Transformation	Which changes materially alter the relation while preserving some lineage or continuity?	Changed rules, dependence, authority, meaning, realization, or reproduction mechanism	Change is either ignored or treated as complete replacement too quickly
Dissolution	When do the relevant persistence conditions cease to hold?	Termination, loss of obligation, disappearance of coordination, ineffective authority, replacement of carrying mechanisms	Non-observation is treated as dissolution despite latency or missing evidence
Symbolic continuity	How do names, categories, records, narratives, and symbols preserve or reshape relational continuity?	Persistent designation, credential, archive, ritual, legal category, public memory	Symbolic persistence is equated with substantive relational persistence
Discontinuity	Which identity-bearing dimensions exhibit a consequential break?	Rupture of obligations, replacement of mechanism, institutional break, changed participants or capacities	A single event is treated as total discontinuity across scales and dimensions
Historical identity	How are later relations connected to earlier relations through lineage, succession, inheritance, or path dependence?	Succession records, inherited assets, rules, infrastructures, obligations, institutional memory	Historical descent is equated with unchanged identity
Persistence criterion	Which dimensions and tolerances define continuity for the research target?	Explicit criterion, continuity carrier, temporal resolution, failure condition	The criterion is selected after seeing the desired conclusion
Identity uncertainty	Which competing continuity accounts remain plausible?	Alternative timelines, missing intervals, conflicting records, contested interpretations	Ambiguity is hidden through forced binary classification

A formation record helps prevent retrospective compression. Once a relation is well established, earlier events can appear to have led inevitably toward it. The record should preserve uncertainty about alternatives that were available during formation when those alternatives affect interpretation. Failed negotiations, competing institutional forms, unrealized expectations, and contingent encounters can reveal

that the later relation was one historical resolution among several possibilities.

Formation can also occur at different times across scales. A dyadic exchange relation may form before a wider organizational routine stabilizes around it. An institutional relation can be formally established before local actors adopt the corresponding practices. A transnational arrangement can exist legally while implementation remains uneven across jurisdictions. The relational identity profile should therefore state the scale at which formation is being claimed and avoid treating one formation date as automatically applicable across nested relations.

The role of manifestation also requires care. A declaration, classification, public ceremony, price, credential, or platform status can mark formation when the relation is partly constituted through symbolic recognition. In other cases, the manifestation records a relation that had already become practically operative. The evidential task is to determine whether the manifestation is a constitutive event, a public indicator, a delayed record, or a later reinterpretation of formation.

7.8.2 Relation Continuity

Relation continuity concerns the connection between temporally separated states of a relation under a stated identity criterion. Continuity can be carried through repeated interaction, legal succession, memory, records, obligations, routines, infrastructure, positional structure, shared expectations, or other mechanisms that connect earlier and later states. The relevant carrier depends on the relation under study. A continuing debt can persist through an account balance and enforceable obligation even when borrower and lender have little interaction. A professional relation can persist through institutional position and recognized responsibility. A friendship can persist through memory and expectation during a long period of sparse communication.

The methodological problem is therefore to identify a *continuity carrier* rather than infer persistence from duration alone. Calendar time does not explain how a relation remains connected across change. A database can show that an identifier appears for ten years while leaving open whether the underlying authority, dependence, or meaning changed. Conversely, turnover of personnel or technology can coexist with strong continuity when roles, obligations, institutional memory, or infrastructure reproduce the relation.

Definition 7.70 (Continuity carrier)**.** A *continuity carrier* is a relation, record, practice, obligation, memory, infrastructure, recognized status, or other empirically traceable mechanism through which identity-bearing features of a relation remain connected across a specified temporal interval.

Continuity carriers can be multiple and partially substitutable. An organization may preserve a relation through legal succession, standardized routines, archived records, and role inheritance. If one carrier weakens, others may sustain continuity. This plurality can also create disagreement. Legal continuity may remain strong while interactional continuity becomes weak; practical dependence may persist after the formal relation changes; symbolic recognition may outlive material exchange. The relational identity profile should preserve these divergences rather than compress them into one binary continuity variable.

Intermittence deserves separate treatment. An inactive period does not necessarily terminate a relation. Dormant credit, seasonal employment, recurrent ritual obligations, kinship responsibilities, emergency powers, or long-distance professional ties can retain recognized possibility and expectation during periods with few observable events. Evidence of latency can include continuing entitlements, retained access, standing obligations, preserved infrastructure, or credible expectations of resumption. Where such carriers are absent, an inactivity interval places stronger pressure on a persistence claim.

Continuity also remains scale-sensitive. A supply relation between organizations can appear continuous at the organizational scale while its operational pathways, personnel, and technologies change repeatedly. A community relation can persist while individual participants enter and leave. A field-level dependency can remain stable while particular dyadic links are replaced. Methodological reporting should state the scale at which continuity is claimed and preserve lower- or higher-scale changes that materially affect interpretation.

7.8.3 Relation Transformation

Relation transformation concerns change that materially alters one or more identity-bearing dimensions while preserving enough continuity or lineage to make comparison with the earlier relation analytically meaningful. The concept is needed because persistence and replacement do not exhaust the temporal possibilities of relational change. A relation can remain historically connected to its earlier form while changing in authority, dependence, reciprocity, medium, institutional basis, meaning, or mode of reproduction.

The characterization dimensions from Section 7.7 provide one route for diagnosing transformation. A long-standing exchange relation can remain continuous while dependence becomes more asymmetric. An institutional relation can preserve formal authority while practical compliance weakens. A care relation can persist while its material and emotional organization changes. A platform relation can retain the same account identifiers while algorithmic mediation changes access, visibility, and bargaining conditions. The question is whether the change is sufficiently consequential for the target inquiry that an unqualified statement of continuity would conceal an important difference.

Transformation thresholds can be qualitative, quantitative, institutional, or mixed. A quantitative study may specify a threshold in network position or exchange volume. A legal inquiry may treat amendment, novation, merger, or formal reconstitution as a decisive change. Historical inquiry may identify a transition through converging evidence that the relation now operates through different mechanisms. Ethnographic or interview-based inquiry may reveal a change in meaning or obligation that remains invisible in administrative records. Methodological pluralism is therefore useful because different forms of evidence can reveal transformation in different dimensions.

A productive reporting form is *continuity with transformation*. This formulation preserves both facts when the evidence supports them: the later relation belongs to the same historical lineage under one or more continuity criteria, while a specified set of relational properties has changed enough to require explicit qualification. Such

reporting is often more informative than forcing the case into either complete sameness or complete replacement.

Transformation can also propagate across scale. Changes in an institutional rule may alter organizational implementation, dyadic interaction, and individual dependence at different rates. Conversely, accumulated changes in local practices may eventually reconstitute an institutional relation. The temporal profile should therefore preserve the sequence and cross-scale pathways through which transformation occurs rather than treating the transition as simultaneous across the system.

7.8.4 Relation Dissolution

Relation dissolution concerns the failure of the persistence conditions relevant to the specified relation. It can be formal, practical, gradual, abrupt, partial, or contested. A contract can terminate on a stated date while informal obligations persist. A relation of trust can erode gradually before participants acknowledge the change. A regulatory authority can remain formally assigned while becoming practically ineffective. A market relation can cease through the disappearance of transactions, expectations, and enabling infrastructure even without a formal termination event.

The evidential problem resembles the problem of absent relations in Section 7.6. Non-observation provides stronger evidence of dissolution when the observation regime would probably have detected continuing enactment and when the relevant continuity carriers have also disappeared or become ineffective. Sparse data, hidden activity, altered recording practices, latency, or migration to another medium weaken the inference from silence. A dissolution judgment should therefore record both the cessation evidence and the detection conditions under which continued relation would have been observable.

Formal dissolution can carry substantial weight when formal status constitutes the target relation. Cancellation of a contract, abolition of an office, revocation of a license, or legal dissolution of an organization can immediately alter recognized rights and obligations. Yet residual consequences can remain. Debts, records, reputations, infrastructures, learned routines, classifications, symbolic meanings, and distributions produced during the relation's persistence can continue to condition later configurations.

Proposition 7.71 (Persistence and residual efficacy)**.** *For a specified relational identity criterion, evidence that a relation has dissolved can coexist with evidence that products or residues generated during its persistence remain causally or interpretively consequential in later configurations.*

Proposition 7.71 prevents the end of a relation from being confused with erasure of its history. The proposition is especially important for economic and institutional inquiry, where past relations can remain encoded in property distributions, debt, infrastructure, credentials, legal precedent, organizational memory, or reputational structure.

Dissolution can also be scale-specific. A dyadic relation can end while a wider organizational dependency remains. An organization can dissolve while interpersonal networks formed within it continue. A legal regime can terminate while administra-

tive routines survive. Reporting should therefore specify the relational object that is judged to have dissolved and identify relevant residual relations that remain outside that identity claim.

7.8.5 Symbolic Continuity

Symbolic continuity concerns persistence of names, categories, narratives, records, representations, rituals, credentials, public identities, or other symbolic forms associated with a relation. Such continuity deserves separate analysis because symbolic persistence can relate to relational persistence in several ways. It can record continuity, help reproduce continuity, conceal transformation, or survive after practical dissolution.

A name can remain stable while the relation it denotes changes substantially. An institution can preserve its title while authority, membership, financing, or purpose is reorganized. A currency name can continue across changes in monetary architecture. A professional category can retain legal recognition while the practices and dependencies associated with it change. In these cases symbolic continuity provides evidence of a historical or institutional connection while offering limited support for continuity of the full relational profile.

Symbolic forms can also act as continuity carriers. A credential can preserve access across organizations. A legal title can sustain rights and expectations through personnel turnover. A family designation can organize obligations across physical separation. An organizational narrative can coordinate action by connecting present participants to a remembered institutional history. The methodological question is therefore whether a symbol merely indicates continuity or participates in reproducing it.

Definition 7.72 (Symbolic continuity role)**.** A *symbolic continuity role* specifies whether a persistent symbolic form functions primarily as an indicator of relational continuity, a mechanism that helps reproduce continuity, a historical trace, a contested claim of continuity, or a residual form after substantive transformation or dissolution.

This distinction becomes especially important in archival and AI-assisted research. Name matching, entity resolution, and record linkage can produce apparently continuous longitudinal series from repeated labels. Such procedures are useful for discovery while remaining vulnerable to both false continuity and false discontinuity. A renamed organization can remain relationally continuous; an unchanged identifier can contain major reconstitution. Automated linkage should therefore preserve the provenance and basis of identity matches rather than silently converting lexical similarity into historical identity.

Symbolic discontinuity can likewise occur without substantive dissolution. New terminology, rebranding, language change, legal recodification, or altered classification can modify manifestation while practical relations remain substantially continuous. Researchers should therefore compare symbolic and substantive temporal profiles rather than treating them as interchangeable.

7.8.6 Relational Discontinuity

Relational discontinuity concerns a consequential break in one or more identity-bearing dimensions of a relation. Discontinuity can be abrupt, cumulative, partial, multidimensional, or scale-specific. A political event can rapidly alter recognized authority. A technological transition can progressively displace a communication relation. A merger can terminate corporate identities while preserving employment routines. A migration can interrupt local interaction while leaving obligations and emotional relations active. The method should identify which dimension has broken and over what interval.

A discontinuity judgment benefits from comparison with the continuity carriers identified earlier. Evidence becomes stronger when previously operative carriers cease, are replaced, or lose efficacy. A relation organized through repeated face-to-face practice may be interrupted by physical separation yet reconstituted through digital communication. In that case discontinuity of medium need not equal discontinuity of relation. If the relevant obligations, expectations, and interaction cease as well, the case for a stronger discontinuity judgment increases.

Discontinuity can also take branching or merging forms. One institutional relation can split into several successor relations. Several local relations can be consolidated under a new organizational form. A transformed relation can retain partial lineage with more than one predecessor. These cases are poorly represented by a single continuous line. A branching temporal representation, event history, relational genealogy, or versioned record may be methodologically more adequate.

Periodization should therefore remain relation-specific. A major historical event can supply a useful temporal boundary while different relations cross that boundary in different ways. Some may rupture immediately, some may transform gradually, and others may remain comparatively stable. The event can still be causally significant without functioning as a universal breakpoint for the entire relational field.

Contingent encounter is relevant here because discontinuity is sometimes first noticed through an anomalous trace: a missing obligation, changed phrase, altered category, unusual transaction pattern, newly absent actor, or unexpected archival juxtaposition. Aesthetic judgment can make the discontinuity salient by registering that the pattern no longer fits the expected continuity. That salience motivates inquiry; the discontinuity claim itself requires later evidence about the identity-bearing dimensions and continuity carriers involved.

7.8.7 Historical Identity

Historical identity concerns the relation between persistence and lineage. A later relation can inherit assets, obligations, categories, infrastructures, records, participants, or institutional memory from an earlier relation while changing enough that unqualified identity becomes analytically misleading. Conversely, substantial changes in realization can occur while continuity remains strong at the scale and target relevant to the inquiry. Historical identity therefore benefits from recording lineage and sameness separately.

Lineage asks where a relation comes from and which earlier configurations partic-

ipate in its formation. Identity asks whether earlier and later configurations should be treated as phases of one relation for a specified research purpose. The two questions often overlap while remaining distinguishable. A successor organization can inherit records and obligations from a predecessor without satisfying each plausible criterion of organizational continuity. A new monetary arrangement can descend from an earlier system while changing the mechanisms through which claims are settled. A transformed institutional relation can preserve precedent and personnel while reallocating authority.

Historical identity can consequently be multidimensional. Continuity of legal status, practical function, participant expectations, infrastructure, symbolic recognition, and generative effects can diverge. A historical account can report strong institutional lineage, moderate functional continuity, and weak interactional continuity without contradiction. Such a profile is often more informative than a single label of sameness or difference.

Historical identity also depends on temporal resolution. At a short interval, a relation can appear stable; over decades, several phases become visible. A long horizon can reveal that what appears to be one continuous relation contains recurring dissolution and reconstitution. Conversely, a high-frequency record can exaggerate temporary fluctuation and obscure durable organization. The scale discipline developed in Section 7.5 therefore applies temporally as well as structurally.

Path dependence can contribute to historical identity when earlier relational states alter later options, costs, expectations, or institutional possibilities. Yet inherited constraint alone does not establish persistence of the original relation. A dissolved relation can condition later arrangements through its residues, as Proposition 7.71 emphasizes. Historical explanation should therefore distinguish persistence of the relation from persistence of effects generated by the relation.

7.8.8 Criteria of Persistence

Criteria of persistence make the preceding judgments auditable. A persistence criterion specifies which dimensions carry identity, what degree of variation is compatible with continuity, how gaps are treated, which evidence is required, and what observations would place sufficient pressure on the continuity claim to trigger revision. The criterion follows the inferential target rather than being selected solely for convenience of available data.

Several forms of persistence criterion can be useful. A *legal-institutional criterion* can emphasize recognized status, succession, rights, and obligations. An *interactional criterion* can emphasize recurring coordination or exchange. A *functional criterion* can track continuity of a specified relational capacity. A *dependency criterion* can focus on continuing reliance, substitutability, and exposure. A *symbolic criterion* can examine recognized identity, classification, or narrative continuity. An *infrastructural criterion* can track the material or technical arrangements through which a relation remains available. A *historical-lineage criterion* can emphasize succession and inherited organization. Several criteria can be combined when the research question genuinely requires them.

Proposition 7.73 (Target-relative persistence criterion)**.** *A persistence claim becomes*

methodologically stronger when the identity-bearing dimensions, continuity carriers, tolerated variation, temporal resolution, and revision conditions are specified in relation to the research target before the final continuity judgment is made.

The timing in Proposition 7.73 matters because criteria selected after the outcome is known can be adjusted opportunistically to preserve or dissolve identity. Pre-specification is especially useful in confirmatory quantitative work. Historical and exploratory inquiry often develops criteria iteratively, in which case the revisions should remain documented so that readers can see how the identity judgment changed with evidence.

Sensitivity analysis can strengthen the account. A study can ask whether its substantive conclusion changes under another plausible identity criterion. Suppose a corporate relation is continuous legally but discontinuous in ownership and authority. If an economic conclusion depends entirely on legal continuity, that dependence should be visible. If several reasonable criteria support the same continuity judgment, confidence increases. If criteria diverge, the divergence can itself reveal the multidimensional organization of the relation.

Persistence criteria should also remain compatible with the boundary and scale choices developed earlier in the chapter. A criterion can work well for an organization while being inappropriate for a community or field. It can be adequate over a five-year interval and too coarse for daily interaction. It can preserve lineage across personnel turnover while failing to capture a change in local meaning. Methodological adequacy therefore lies in alignment among research question, object, boundary, scale, evidence, and identity criterion.

7.8.9 Uncertainty of Relational Identity

Uncertainty of relational identity arises when the available evidence leaves more than one continuity account plausible or when key components of the identity profile remain weakly known. Sources include uncertain formation dates, missing observation intervals, ambiguous participant linkage, changing categories, contested meanings, multiple possible continuity carriers, unknown transformation thresholds, and incomplete evidence of dissolution. Uncertainty can also result from genuine multidimensional divergence, such as legal continuity combined with practical reconstitution.

A binary variable for “same relation” can therefore conceal several different uncertainties. Researchers can distinguish uncertainty about whether the relation formed, whether two records refer to the same relational object, whether a continuity carrier remained operative, whether a transformation crossed the chosen threshold, whether an inactive interval represents latency or dissolution, and whether symbolic continuity corresponds to substantive continuity. These uncertainties need not receive the same confidence assessment.

Definition 7.74 (Relational identity uncertainty profile)**.** A *relational identity uncertainty profile* records the principal competing continuity interpretations, the evidence bearing on each interpretation, the temporal intervals and dimensions in which ambiguity remains, and the consequences of alternative classifications for the substantive analysis.

Definition 7.74 favors preserved ambiguity over forced certainty when the evidence remains genuinely underdetermined. A study can report a formation interval rather than an exact date, represent two plausible succession paths, classify a period as uncertain dormancy, or provide results under alternative identity codings. Such practices preserve information for later reanalysis and reduce the risk that an early coding decision becomes invisible in subsequent cumulative research.

AI-assisted longitudinal analysis increases both opportunity and risk in this area. Automated record linkage, text comparison, sequence detection, and entity resolution can help reconstruct long histories at scales previously difficult to inspect manually. The same systems can overmerge relations that share names, infer continuity from recurring language, smooth over missing periods, or create an appearance of coherent lineage from heterogeneous records. An auditable workflow should therefore retain source-level provenance, confidence in linkages, alternative matches where material, and the human or institutional judgments through which an identity profile was accepted or revised.

Contingent evidence can also reopen an apparently settled identity judgment. A newly digitized archive, testimony, recovered contract, unusual transaction, or previously inaccessible institutional record can reveal an earlier formation date, hidden interruption, alternative successor, or different continuity carrier. Aesthetic judgment can contribute to noticing such anomalies, especially when a trace appears strangely inconsistent with the accepted history. Epistemic warrant still depends on reconstruction of the relevant evidence and alternatives.

The methodological sequence of Sections 7.6–7.8 can now be stated more clearly. Relation identification asks whether a relation is sufficiently warranted to enter the inquiry. Relational characterization specifies what properties are warranted at relevant times and scales. Relational identity analysis reconstructs which temporally separated states belong to one continuing history, where transformation occurs, and where discontinuity or dissolution becomes the better-supported account. The next section extends this temporal discipline to configurations containing several relations. Section 175 turns to reconstruction of relational configurations, where the identity, interaction, and higher-order organization of multiple relations become the object of inquiry.

7.9 Reconstruction of Relational Configurations

Sections 7.6–7.8 established procedures for identifying relations, characterizing their properties, and reconstructing their persistence through time. The present section moves from the analysis of a relation considered in relative isolation toward the reconstruction of configurations in which several relations are organized together. Its role is to specify when a set of relations warrants treatment as a configuration, how dyadic and triadic structures differ from higher-order organization, how nesting and relations among relations can be represented, how recurring motifs and topology can be used without reducing relational inquiry to graph theory, and how uncertainty should be preserved when the configuration remains only partially observed. The discussion proceeds from small configurations toward progressively broader re-

lational organization while retaining the boundary, scale, and epistemic disciplines established earlier in the chapter.

A relational configuration is not simply a list of ties. The arrangement among relations can condition what individual relations mean, which capacities they enable, which constraints they impose, and how they change through time. A transfer between two organizations can have one significance when it occurs within a competitive field and another when the same organizations share governance, ownership, or regulatory dependence. A dyadic relation of trust can change when a third actor becomes an interpreter, guarantor, broker, witness, or rival. A formally similar institutional relation can generate different consequences depending on the surrounding configuration of law, finance, infrastructure, symbolic recognition, and organizational practice. The methodological problem is therefore to reconstruct enough of the configuration to support the target inference without presuming that a complete representation of the surrounding relational world is either available or necessary.

Definition 7.75 (Relational configuration)**.** A *relational configuration* is a question-relative and revisable specification of several identified relations together with the organization among them that is relevant to interpretation, constraint, enablement, dependence, persistence, or subsequent transformation within a stated boundary, scale, and temporal interval.

Definition 7.75 places organization, rather than mere multiplicity, at the center of configuration reconstruction. The same set of relata can support several configurations depending on which relations are included, how relation types are distinguished, what scale is selected, and which historical interval is examined. Configuration reconstruction therefore remains an epistemic operation under ontological suspension. A graph, hypergraph, institutional map, legal relation matrix, ethnographic diagram, process map, or narrative reconstruction can each represent part of a configuration without being treated as the configuration's final ontology.

Table 7.8 summarizes the principal configuration forms developed below. The table should be read as a methodological map. The categories can overlap, and a research object can move among them as evidence and analytical purpose change.

7.9.1 Dyadic Configurations

Dyadic configurations provide the smallest relational unit in which two positions can be analyzed together. They remain methodologically important because many consequential relations are organized through bilateral exchange, obligation, authority, communication, care, credit, contract, recognition, or dependence. A dyadic configuration can therefore support close analysis of direction, reciprocity, asymmetry, dependence, meaning, and persistence using the characterization dimensions developed in Section 7.7.

A dyad should nevertheless be distinguished from a dyadic representation. Two actors can be selected as the focal relata while their relation depends substantially on surrounding institutions, infrastructures, third parties, or field conditions. A borrower–lender relation can depend on collateral law, payment infrastructure, credit scoring, guarantors, and monetary policy. A patient–clinician relation can depend on professional regulation, insurance, institutional routines, diagnostic

Table 7.8: Forms of relational configuration and characteristic reconstruction problems

Configuration form	Analytical focus	Illustrative evidence or representation	Characteristic reconstruction risk
Dyadic	Organization within a focal two-position relation	Interaction records, contracts, exchange histories, interviews, bilateral obligations	Surrounding relations are treated as irrelevant merely because the focal relation is dyadic
Triadic	Effects introduced by a third position or relation	Brokerage records, guarantees, mediation, coalition, witness, referral, triadic interaction	The third actor is treated as an additive variable rather than a structural change in the configuration
Higher-order	Joint relations involving several relata or irreducible group organization	Group decisions, committees, team production, joint obligations, hyperedges, simplicial or group-level representations	Group structure is projected onto pairwise ties that fail to preserve the relevant joint condition
Nested	Relations embedded within broader relations or institutional layers	Teams within organizations, organizations within regimes, local units within transnational structures	Nesting is confused with simple hierarchy or assumed to be perfectly aligned across levels
Relations among relations	One relation conditions, authorizes, interprets, guarantees, or transforms another	Legal authorization, collateral, referral, meta-governance, interdependence among contracts or institutions	Relations are flattened into independent edges and higher-order dependence is lost
Motif	Recurrent local relational form across cases or locations	Repeated triads, brokerage patterns, role configurations, recurring institutional forms	Recurrence is interpreted as common mechanism without historical or contextual verification
Topology	Broader organization of connectivity, separation, clustering, reachability, and positional structure	Network maps, blockmodels, institutional architecture, qualitative relational maps	Formal topology is reified or mistaken for substantive meaning by itself
Uncertain configuration	Competing or incomplete reconstructions of relational organization	Alternative maps, confidence-weighted ties, missing records, contradictory testimony	One convenient reconstruction is treated as settled configuration

categories, and technical systems. The focal relation can therefore be dyadic for analytical purposes while remaining embedded in a broader configuration. The boundary remainder introduced in Section 170 and the scale remainder introduced in Section 171 provide ways to preserve these omitted conditions without forcing them into the focal representation.

Dyadic reconstruction begins by specifying the two positions, the relation type or types connecting them, and the temporal interval over which the dyad is treated as the focal configuration. Multiplexity deserves particular attention. Two organizations may simultaneously exchange information, money, labor, data, legitimacy, and regulatory obligations. A dyadic representation that compresses these channels into

one edge can conceal relations that differ in direction, intensity, dependence, or normative standing. Where the channels condition one another, the dyad is already a small multiplex configuration rather than a single tie.

Dyadic evidence can also be asymmetric. One participant may leave extensive records while the other leaves few. Institutional data can register transfers but omit interpretation. Interviews can reveal meaning while providing limited evidence about frequency or historical sequence. Relation reconstruction should therefore keep the evidential basis of each dyadic property visible rather than treating the dyad as uniformly observed.

Remark 7.76 (Dyadic focality)*.* A dyadic focal configuration can be methodologically adequate even when broader relations matter, provided that the omitted relations are either substantively negligible for the target claim or preserved as explicit contextual, boundary, or scale remainders.

Remark 7.76 prevents relational inquiry from becoming methodologically unbounded. The aim is selective inclusion guided by the target claim, with the conditions of focalization kept explicit and revisable.

7.9.2 Triadic Configurations

Triadic configurations introduce a third position into the relational architecture. This addition can change the form of the configuration rather than merely increasing its size. Classical relational thought has long recognized the distinctive analytical possibilities introduced by triadic organization, including mediation, brokerage, coalition, exclusion, secrecy, and forms of interaction that depend on the presence of a third position Peirce 1960; Simmel 1971. The methodological significance lies in the possibility that a relation between two positions acquires different properties because of how a third position connects to one or both of them.

A third actor can serve as guarantor, interpreter, broker, witness, monitor, gatekeeper, competitor, coalition partner, or audience. Consider a bilateral exchange in which a third institution guarantees payment. The observable transfer remains between the original two parties, yet the guarantee can alter trust, bargaining power, risk, and willingness to transact. In another case, a broker can connect otherwise separated actors and gain positional advantage from controlling access. A regulator can shape a relation without participating directly in the focal exchange. A public audience can transform a private interaction by changing reputational stakes. These examples show why the third position should be reconstructed according to its relational role rather than treated as a generic additional variable.

Triadic closure and triadic separation can also matter. If A is connected to B and B to C, the presence or absence of a direct A–C relation can alter information flow, verification, coalition possibilities, and dependence on B. Yet the implications depend on relation type and context. Closure in friendship, credit, professional collaboration, or regulatory oversight can carry different meanings. Methodology should therefore avoid treating a formally similar triangle as a substantively identical configuration across domains.

Triadic analysis can be qualitative, historical, legal, quantitative, or formal.

Archival evidence can reconstruct how an intermediary entered a relation. Ethnography can show how a third party changes meaning and conduct in situated interaction. Legal analysis can specify guarantee or agency relations. Quantitative network analysis can identify brokerage or closure patterns. Formal models can examine how triadic organization changes incentives or information. The forms of access differ, and the configuration claim should remain linked to the evidence supporting the role assigned to the third position.

Definition 7.77 (Triadic reconfiguration)**.** A *triadic reconfiguration* occurs when the introduction, removal, or repositioning of a third relatum or relation materially changes the interpretation, constraints, enablements, dependencies, or possible trajectories of a focal dyadic relation within the stated research configuration.

Definition 7.77 emphasizes change in organization rather than simple increase in actor count. It also prepares later work on brokerage, mediation, network structure, and generative mechanisms.

7.9.3 Higher-Order Configurations

Some relational structures are poorly represented as collections of pairwise ties. A committee decision, a team production process, a joint obligation, a coalition, a household arrangement, a collective ritual, or a multi-party contract can depend on the simultaneous organization of several positions. Higher-order network research provides formal tools for representing interactions that involve groups of three or more units and for examining structural and dynamical properties that can differ from pairwise approximations Battiston et al. 2020. The broader methodological point is that the relevant relation can sometimes attach to a set or configuration rather than decomposing cleanly into independent dyads.

A pairwise projection can lose several kinds of information. It can erase whether participation was simultaneous, whether an outcome required a threshold number of participants, whether an obligation was joint or several, whether a coalition acted collectively, or whether the meaning of participation depended on group membership. Suppose four organizations jointly authorize a standard. Representing the event as six pairwise ties records co-participation but may fail to preserve the fact that authority was exercised through a collective procedure. Similarly, a research team can contain pairwise collaborations while producing an outcome that depends on coordinated complementarity across the team.

Higher-order configuration does not imply that pairwise relations become irrelevant. Pairwise and group-level relations can coexist and condition one another. A committee can possess a formal collective decision rule while members also have bilateral trust, rivalry, mentorship, or dependence. A household can have shared obligations at the group level alongside differentiated dyadic care relations. A coalition can act jointly while internal bargaining remains asymmetric. Reconstruction should therefore specify which properties belong to the higher-order unit and which remain properties of constituent relations.

Formal representations such as hypergraphs or simplicial complexes can be useful where they preserve the relevant relational arity. Their use remains representational rather than ontological. The fact that a phenomenon can be encoded as a hyperedge

does not establish that the world is fundamentally hypergraphic. Conversely, qualitative or legal inquiry can reconstruct higher-order organization without adopting those formalisms. The methodological requirement is preservation of the joint relational condition relevant to the target claim.

Proposition 7.78 (Higher-order preservation)**.** *When a substantive claim depends on a relation or condition that is jointly constituted by several relata, a representation becomes methodologically stronger when it preserves that joint condition rather than replacing it with pairwise ties whose combination does not retain the relevant structure.*

Proposition 7.78 is deliberately scoped. Pairwise approximations can remain useful when the target property survives projection or when the approximation is explicitly treated as such. The point is to identify the remainder created by the projection and determine whether it matters for the inference.

7.9.4 Nested Relations

Nested relations arise when one relational configuration is situated within another configuration whose organization is analytically consequential. Teams operate within organizations, organizations within legal and market institutions, local communities within regional infrastructures, and national systems within transnational regimes. Nesting can also occur temporally or functionally: a short-term project can operate within a durable institutional relation, or a local authority relation can be nested within a wider governance arrangement.

Nesting should not be equated automatically with hierarchy. A nested unit can possess substantial autonomy, reciprocal influence, overlapping membership, or cross-cutting relations that complicate simple top-down ordering. Organizational teams can coordinate laterally across departmental boundaries. Municipalities can participate in national legal structures while also forming translocal networks. Households can be embedded in markets, kinship structures, welfare institutions, and digital platforms simultaneously. Several nesting relations may therefore coexist and fail to align perfectly.

The methodological task is to specify the container relation or broader configuration and the pathway through which it conditions the nested configuration. A national law can alter local authority by defining jurisdiction. An organizational budget can constrain team activity. A professional field can shape what counts as legitimate practice. A digital infrastructure can mediate interactions across organizations. The existence of a larger-scale context alone does not establish that it causally explains local variation; the cross-scale bridge developed in Section 171 remains necessary when stronger claims are made.

Nested analysis also requires care with aggregation. A property of the containing configuration should not be assigned automatically to each nested unit, and a property observed locally should not be generalized automatically to the containing level. A university can possess a formal commitment that is enacted unevenly across departments. A region can show economic growth while particular communities experience contraction. A national institution can remain stable while local implementations diverge. Multiscale reconstruction should preserve these differences.

Definition 7.79 (Nested relational configuration)**.** A *nested relational configuration* is a configuration whose relevant relations are situated within one or more broader configurations that condition its resources, meanings, constraints, enablements, boundaries, or possible transformations through specified relational pathways.

This definition treats nesting as a relational condition rather than a geometric metaphor alone. It also leaves room for partial, overlapping, and historically changing forms of nesting.

7.9.5 Relations among Relations

Relational inquiry sometimes requires analysis of relations whose relata are themselves relations, obligations, contracts, rules, or relational configurations. A guarantee relation can support a credit relation. A legal rule can authorize an organizational authority relation. A referral relation can create conditions for a later professional relation. A confidentiality obligation can constrain an information relation. A governance arrangement can specify how several contractual relations are interpreted or revised. In such cases, flattening the configuration into independent actor-to-actor edges can obscure the dependence among relations.

The phrase *relations among relations* should be used carefully. It does not require a commitment to relations as metaphysically independent entities. It identifies an analytical situation in which one relation becomes an object or condition within another relation. The category-theoretic language introduced in Chapter 4 provides one possible formal vocabulary for compositional and relational structure, but the methodological idea can be expressed equally through legal doctrine, institutional analysis, historical reconstruction, qualitative process mapping, or formal network representations.

Several forms are useful to distinguish. A *constitutive relation* can help define another relation, as legal status can define who is authorized to enter a contract. A *conditioning relation* can alter the intensity, risk, or meaning of another relation without constituting it. A *guaranteeing relation* can stabilize another relation by backing performance or enforcement. An *interpretive relation* can shape how participants classify or understand another relation. A *transformative relation* can change the terms or persistence conditions of another relation. These forms can overlap in empirical settings.

Relations among relations are especially important for institutional and economic analysis. Property, credit, employment, taxation, insurance, corporate governance, and platform access can be interconnected through layered rights, obligations, permissions, infrastructures, and conversion pathways. A change in one relation can therefore alter several others even when the focal actors remain the same. Later GRE chapters on economic architecture, allocation, value conversion, and generative return will depend on this capacity to represent relational interdependence without reducing it to actor attributes.

Definition 7.80 (Second-order relational specification)**.** A *second-order relational specification* records a warranted relation in which one or more relata are themselves identified relations or relational configurations, together with the evidential pathway through which their dependence, authorization, interpretation, guarantee,

or transformation is inferred.

The phrase *second-order* marks analytical level rather than ontological superiority. Higher-order analysis can be useful when the research question concerns the organization among relations; it can be unnecessary when the same claim is adequately supported at a simpler level.

7.9.6 Relational Motifs

Relational motifs are recurring local forms of relational organization that appear across cases, locations, periods, or portions of a larger configuration. Network science has developed motif-oriented approaches for detecting recurrent structural patterns within complex networks, while social network analysis more broadly studies clustering, positions, recurring connectivity patterns, and local structures Newman 2003. In GRE and GR inquiry, the methodological value of motifs lies in using recurrence to organize comparison and generate hypotheses about relational form without assuming that repeated topology entails repeated meaning or mechanism.

A motif can be specified qualitatively or formally. A recurring brokered triad can be identified through network data. A recurring legal configuration can involve principal, agent, and guarantor. A historical motif can consist of repeated sequences in which local innovation becomes institutionally standardized and later controlled by a gatekeeping organization. An ethnographic motif can involve recurrent patterns of informal mediation around a formal rule. An economic motif can link resource transfer, dependency, and symbolic legitimation across several cases.

Recurrence can be informative for several reasons. It can indicate that similar constraints produce similar relational forms, that institutions reproduce a template, that actors imitate established arrangements, that a configuration is selected because it supports a valued function, or that the motif emerges from broader topology. These possibilities should remain hypotheses until supported by evidence. Similar form can arise through different histories, and different forms can realize similar functions. The multiple-realization discipline from Chapter 4 therefore applies here as well.

Motif comparison benefits from explicit equivalence criteria. Two configurations can count as instances of the same motif under one criterion and differ under another. A purely topological criterion may treat relation types as interchangeable, while a typed-relational criterion preserves differences between authority, exchange, care, information, and recognition. A temporal criterion can require a shared sequence rather than merely a shared static pattern. A historical criterion can require lineage or institutional similarity. The selected equivalence relation should match the inferential purpose.

Caution 7.81 (Motif equivalence). Repeated relational form supports a claim of structural recurrence only under the equivalence criteria used to define the motif. Additional evidence is required before recurrence is interpreted as common meaning, mechanism, historical origin, normative standing, or generative consequence.

Caution 7.81 prevents a common overextension from pattern detection to explanation. Motifs can orient inquiry, especially in AI-assisted or computationally large search spaces, while substantive interpretation remains tied to evidence and context.

7.9.7 Relational Topology

Relational topology concerns broader organization among positions and relations: connectivity, separation, clustering, reachability, bridging, redundancy, centralization, components, positional equivalence, and other forms of structural arrangement. Network science offers a mature formal vocabulary for many of these properties Newman 2003, while blockmodeling and relational sociology provide approaches to roles and positions defined through patterns of relations across several networks White et al. 1976; White 2008. The present framework treats these tools as important methodological resources while preserving the distinction between formal topology and substantive relational meaning.

Topology can matter because the consequences of a relation often depend on where it is located in a wider configuration. The same dyadic trust relation can have different implications if it bridges otherwise separated communities, sits within a dense cluster, or depends on a highly centralized gatekeeper. The same resource transfer can be redundant in one configuration and indispensable in another. The same institutional rule can be buffered by alternative pathways or become decisive when it controls a narrow bottleneck. Positional properties therefore complement the dyadic characterization developed in Section 7.7.

Topological analysis can be conducted with several kinds of representation. Quantitative network analysis can estimate centrality, clustering, components, paths, or community structure. Historical maps can reconstruct changing centers and peripheries. Institutional analysis can identify veto points, jurisdictional overlaps, or chains of authorization. Ethnographic inquiry can reveal informal pathways that differ from formal organizational charts. Legal analysis can reconstruct networks of rights and obligations. A topology claim should therefore state what counts as a node, relation, path, and boundary in the chosen representation.

Formal topology also has limits. A short path in a network does not necessarily imply practical accessibility when language, law, trust, cost, discrimination, or institutional procedure obstructs movement. A central node in communication data may not possess authority. A dense cluster may reflect repeated reporting rather than substantive cohesion. A disconnected component can still be influenced by a field-level condition not represented as an edge. Topological properties become substantively meaningful through interpretation of the represented relations and the mechanisms through which position matters.

Topology is scale-sensitive. A configuration can be decentralized at one scale and centralized at another. A local network can appear cohesive while depending on a single external infrastructure. Aggregation can create apparent bridges that do not exist for particular subgroups, and decomposition can hide institutional coherence visible at a coarser resolution. The scale-selection principles of Section 171 and the multiscale architecture planned for later generative inquiry are therefore integral to topological reconstruction.

Proposition 7.82 (Topology–meaning separation)**.** *A topological property becomes a substantive relational claim only when the representation of nodes, relations, boundaries, and scales is linked to an interpretation of how the identified structural property bears on the research question.*

This proposition preserves the usefulness of formal structure while maintaining ontological and epistemic restraint. A network representation can reveal organization that is difficult to perceive otherwise; its analytical force depends on the adequacy of the mapping between representation and target relation.

7.9.8 Configuration Uncertainty

Configuration uncertainty arises when the organization among relations remains incompletely observed, ambiguously specified, contested, or sensitive to plausible alternative reconstructions. It can originate from uncertain relation identification, missing ties, uncertain direction, ambiguous relation type, disputed institutional status, incomplete archives, changing boundaries, uncertain scale, or unresolved historical continuity. These uncertainties can interact. A single uncertain edge can have minor consequences in a redundant configuration and major consequences when it determines whether two regions are connected.

Uncertainty should therefore be represented at the configuration level rather than inherited only from individual relations. Researchers can preserve alternative maps, intervals for edge or relation confidence, competing historical reconstructions, uncertain group membership, plausible boundary variants, or several motif codings. Sensitivity analysis can then examine whether substantive conclusions depend on one uncertain component or remain stable across several plausible configurations.

Definition 7.83 (Configuration uncertainty profile)**.** A *configuration uncertainty profile* records the principal uncertain components of a reconstructed relational configuration, the evidence and alternatives associated with those components, the resulting plausible configuration variants, and the substantive conclusions that change or remain stable across those variants.

Definition 7.83 encourages preservation of alternative relational worlds when available evidence does not justify a single reconstruction. A historical study can present two plausible alliance structures for an interval with missing records. An organizational study can report formal and enacted networks separately. A network analysis can examine results under several plausible edge thresholds. A qualitative study can preserve competing participant accounts of who mediated a conflict. The purpose is not to multiply uncertainty gratuitously, but to show where a conclusion depends on a reconstruction choice.

Configuration uncertainty is also a site where contingent encounter can be methodologically productive. An unexpected archive, interview, residual pattern, or institutional inconsistency can reveal a previously invisible relation that reorganizes the whole configuration. Aesthetic judgment can make the anomaly salient before its evidential significance is known. The subsequent task is to test whether the new relation is sufficiently warranted and whether adding it materially changes the configuration, motif, topology, or interpretation. This sequence preserves the distinction between generative orientation and epistemic validation developed in Chapter 6.

AI-assisted configuration reconstruction expands the scale at which candidate structures can be generated and compared. Automated relation extraction, entity resolution, graph construction, pattern detection, and higher-order representation can expose configurations that would be difficult to inspect manually. The same

processes can also propagate extraction errors, merge distinct relations, infer links from semantic similarity, or create visually persuasive structures from uncertain evidence. Provenance should therefore remain attached to identified relations and to the transformations through which configuration-level representations are built.

Proposition 7.84 (Configuration reconstruction discipline)**.** *A relational configuration becomes methodologically more accountable when its constituent relations, organizational assumptions, boundary and scale choices, higher-order structures, uncertainty, and revision conditions remain traceable to the evidence and transformations through which the configuration was reconstructed.*

The sequence developed in Sections 169–175 now reaches a first methodological closure. The research object is provisionally specified; its boundary and scale are selected; relations are identified and characterized; persistence is reconstructed; and configurations among several relations are then mapped with explicit attention to higher-order organization and uncertainty. The next sections turn from this general relational architecture toward particular modes of evidential access. Section 176 begins with documentary inquiry, where administrative, institutional, organizational, public, and digital records become sources for reconstructing relations while raising questions of provenance, selective recording, and documentary silence.

7.10 Documentary Inquiry

Sections 7.3–7.9 established a general procedure for specifying relational objects, constructing boundaries, selecting scales, identifying and characterizing relations, reconstructing persistence, and mapping relational configurations. The present section turns from that general architecture toward a first family of evidential access: documentary inquiry. Its role is to specify how records, documents, registries, correspondence, public files, and digital traces can support relational reconstruction while preserving the mediation introduced by record production itself. The discussion examines administrative, institutional, organizational, personal-correspondence, public, and digital records before developing provenance and documentary silence as cross-cutting methodological problems.

Documentary inquiry is particularly important for relational research because many consequential relations become visible through records before they become directly observable to the researcher. Contracts register obligations; minutes register authorized decisions; case files register classifications and interventions; budgets register allocations; registries register legal or administrative status; correspondence registers communication and interpretation; digital systems register events, transactions, access, and sequence. Documentary sources can therefore extend inquiry across time, institutions, and scales that are inaccessible to direct observation. Documentary-method traditions have long emphasized that such sources require source assessment rather than transparent reading Scott 1990. Within the present framework, the requirement is stronger: a document is treated as a historically and institutionally produced manifestation whose evidential significance depends on the relation between the record, the process that produced it, and the relational object being reconstructed.

A document can enter inquiry in several roles. It can function as evidence *about* a relation, as evidence about the institution or practice that produced the record, and in some cases as an operation that helps constitute or transform the relation itself. A signed contract can record an agreement while also changing the parties' legal relation. A register can record a classification while helping institutionalize that classification. A rating can describe a position while contributing to later access, reputation, or allocation. A digital log can record an event while being produced by a technical architecture that determines which events count as recordable. Documentary inquiry therefore requires separation among descriptive, infrastructural, and performative roles.

Definition 7.85 (Documentary relation record)**.** A *documentary relation record* is a materially or digitally preserved inscription that bears evidence concerning a relation, relational event, position, configuration, or institutional act, together with identifiable conditions of production, classification, preservation, access, and interpretation relevant to the target claim.

Definition 7.85 keeps the record and the target relation analytically distinct. A document can be authentic as a record and still provide incomplete, strategically produced, category-dependent, or misleading evidence about the target relation. Conversely, a document produced for administrative rather than research purposes can become highly informative when its production conditions are understood. Table 7.9 summarizes the source forms developed below and their characteristic relational uses and risks.

7.10.1 Administrative Records

Administrative records arise from the routine operation of organizations and public authorities. Tax files, school records, health-service encounters, benefit registers, migration files, licenses, censuses, transaction systems, case-management databases, inspection records, and regulatory submissions can provide repeated traces across large populations and long intervals. Contemporary data infrastructures increasingly make such records central to economic and policy research, while international data-governance frameworks distinguish administrative data from survey, citizen-generated, and machine-generated sources World Bank 2021. Their value for relational inquiry lies in the possibility of reconstructing recurrent interactions between persons, organizations, and institutions at scales that direct observation rarely reaches.

The same feature that gives administrative records analytical power also requires caution. Administrative data are generated for operational purposes. Their categories reflect eligibility rules, organizational responsibilities, legal definitions, information systems, reporting practices, and changing administrative priorities. Statistical and administrative categories have histories, and the production of comparability often requires classification, coding, aggregation, and standardization rather than merely recording a pre-given world Desrosières 1998; Bowker and Star 1999. A category such as employed, unemployed, resident, household, firm, disability status, educational completion, or service user can therefore carry institutional assumptions that matter to relational interpretation.

Table 7.9: Documentary source forms and characteristic relational inference problems

Source form	Characteristic relational access	Analytical strength	Characteristic risk
Administrative records	Classification, transactions, eligibility, service contact, taxation, registration, compliance	Repeated large-scale traces generated through routine administration	Administrative categories are treated as natural categories or complete descriptions of lived relations
Institutional records	Authority, rules, rights, obligations, decisions, jurisdiction, formal status	Reconstruction of institutional position and authorized action	Formal record is equated with enacted institutional relation
Organizational documents	Procedures, roles, workflows, strategy, reporting, resource allocation, internal coordination	Access to organizational self-description and formalized coordination	Prescribed practice is mistaken for actual practice
Correspondence	Communication, negotiation, interpretation, expectation, conflict, trust, mediation	Fine-grained access to relational meaning and sequence	Survival, authorship, audience, and strategic self-presentation biases are ignored
Public records	Legal events, public decisions, ownership, filings, proceedings, official disclosures	Publicly inspectable traces with institutional standing	Availability is treated as equivalent to completeness or equal visibility
Digital records	Transactions, interactions, timestamps, versioning, access, computational events	High-resolution and potentially large-scale event traces	Platform ontology and logging architecture are mistaken for the underlying relational ontology
Provenance record	Production, custody, transformation, linkage, extraction, version history	Supports auditability and calibrated reuse	Later transformations are detached from source history
Documentary silence	Missing, unrecorded, inaccessible, destroyed, uncategorized, or undiscoverable traces	Reveals limits and possible structure of visibility	Silence is converted too quickly into evidence of absence or deliberate suppression

For relational inquiry, an administrative record should be analyzed at two levels. The first concerns the target relation indicated by the record: payment, registration, service provision, sanction, referral, attendance, licensing, or another institutional interaction. The second concerns the administrative relation that made the record possible. A benefits record can provide evidence about a transfer while simultaneously revealing an eligibility relation between claimant and authority. A migration database can record entry and exit while also expressing a jurisdictional classification. A school record can register attendance while being generated through institutional definitions of enrollment and absence. These second-order relations can become analytically important when the research question concerns institutional power, recognition, access, or exclusion.

Administrative coverage is also selective. Populations outside registration systems, persons using informal institutions, organizations below reporting thresholds, or in-

teractions that leave no required administrative trace can remain weakly visible. Changes in forms, coding standards, database migrations, or legal definitions can create apparent discontinuities that are partly documentary. Longitudinal analysis should therefore separate substantive change from changes in the recording regime where evidence permits.

Proposition 7.86 (Administrative mediation)**.** *An administrative record supports stronger relational inference when the analysis specifies both the relational event recorded and the administrative categories, procedures, and institutional relations through which that event became recordable.*

Proposition 7.86 does not make administrative records epistemically inferior to researcher-generated data. It identifies their distinctive mediation. Their operational origin can provide valuable regularity and scale, while the administrative process itself remains part of the evidential pathway.

7.10.2 Institutional Records

Institutional records document formally recognized relations, positions, decisions, obligations, and authorities. Statutes, regulations, court decisions, treaties, contracts, licenses, incorporation records, minutes, appointment records, accreditation files, registries, and formal resolutions can establish what an institution recognized, authorized, prohibited, or required at a given time. Such records are especially important when relational status depends on institutional recognition. Ownership, office, citizenship, guardianship, fiduciary duty, corporate authority, legal liability, and many forms of entitlement may be difficult to reconstruct adequately from observed interaction alone.

Institutional records can therefore have constitutive force. A judgment, registration, license, appointment, or signed agreement can change what actions are authorized and what obligations can be enforced. In the three-register architecture developed earlier in the book, the institutional document is then more than a passive representation of relational reality. Its production can enter the recursive pathway through which a represented relation becomes institutionally stabilized and later causally effective. Documentary analysis should accordingly distinguish the record's evidential role from its possible performative role.

Formal institutional status nevertheless remains distinct from enacted relational practice. A regulation can authorize an entitlement that is difficult to exercise. An organizational charter can allocate authority that operates differently in practice. A contract can specify reciprocal duties under conditions of highly asymmetric bargaining power. A legal prohibition can coexist with recurrent informal conduct. Documentary inquiry should therefore resist equating formally documented relation with fully realized relation. Institutional records are often strongest for claims about recognized status, authorized procedure, formal obligation, or official decision; additional evidence may be required for claims about enactment, experience, compliance, or consequence.

Versioning matters as well. Institutional records can be amended, repealed, superseded, interpreted, or selectively enforced. A current text can obscure the rule in force during an earlier period. A digitized legal database can collapse amend-

ment histories into an apparently timeless document. Historical relational reconstruction should therefore identify the applicable version and the institutional pathway through which it acquired force.

Definition 7.87 (Institutional documentary act)**.** An *institutional documentary act* is a recorded institutional operation whose issuance, registration, authorization, or recognition can itself alter the rights, obligations, status, authority, or recognized position of one or more relata.

This definition helps distinguish documents that merely report institutional activity from documents whose institutional standing participates in producing the relation under study.

7.10.3 Organizational Documents

Organizational documents include policies, standard operating procedures, internal reports, budgets, organizational charts, project plans, audit files, meeting minutes, memoranda, performance dashboards, strategy documents, training materials, workflow descriptions, and internal guidance. They offer access to how organizations describe their own roles, categories, objectives, responsibilities, resource distributions, and expected relations among units. In relational inquiry, these materials can help reconstruct formal coordination, reporting chains, decision rights, budgetary dependencies, institutional interfaces, and the organizational categories through which activity becomes legible.

Their evidential role should be differentiated carefully. A policy manual records prescribed practice. A strategy document records an authorized orientation or declared priority. An organizational chart records a formalized structure. A budget records approved or reported allocations under particular accounting conventions. None of these documents alone establishes how practice was enacted. Informal coordination, workaround, discretion, tacit norms, conflict, and cross-unit dependence can diverge from the documented structure. The contrast between formal and enacted relation developed in Sections 172–175 is therefore particularly relevant.

Organizational documents can also be strategic artifacts. They may be written for internal coordination, regulatory compliance, fundraising, external legitimacy, litigation preparation, employee instruction, or public communication. The intended audience changes what is likely to be recorded and how. A performance report written for a funder can emphasize different relations from an internal incident log. A strategic plan can express an aspirational configuration that has not yet been realized. A post-crisis review can reorganize earlier events into a coherent account. Documentary interpretation should therefore ask what practical task the document performed within the organization.

Classification systems deserve particular attention. Organizational categories can determine which cases move through which workflows, which costs appear in which budget line, which people are treated as belonging to a role, and which outcomes become measurable. Bowker and Star's analysis of classification infrastructures provides an important precedent for treating categories and standards as socially consequential components of information systems rather than neutral labels Bowker and Star 1999. In GRE applications, this matters because categories can channel access to

resources, recognition, labor, evaluation, and future opportunity.

Organizational documents can be compared across layers. Formal policy, internal reporting, case records, and correspondence can reveal whether the same relation is represented consistently across the organization. Divergence among these records can itself become evidence about institutional fragmentation, ambiguity, discretion, or contested interpretation. Such disagreement should not be averaged mechanically; it can disclose the configuration through which organizational reality is produced.

7.10.4 Correspondence

Correspondence provides a different documentary access relation. Letters, memoranda, email, direct messages, meeting follow-ups, diplomatic communications, professional exchanges, and other addressed communications can reveal negotiation, expectation, uncertainty, trust, conflict, interpretation, obligation, and changing relational meaning with a temporal resolution that formal records often lack. Correspondence is therefore particularly useful for reconstructing how participants understood relations while those relations were developing.

The evidential value of correspondence depends on audience and communicative situation. A private letter, an official memorandum, a copied email, and a message written with anticipated disclosure are different documentary acts. Participants can strategically present motives, conceal information, exaggerate agreement, soften conflict, or write for multiple audiences simultaneously. The relation between writer, recipient, copied parties, institution, and anticipated future reader should therefore enter interpretation where relevant.

Survival is also selective. One side of a correspondence can be preserved while the other disappears. Institutional archives can retain official email while deleting informal channels. Senior actors can leave extensive records while precarious workers, clients, migrants, or community participants leave fewer durable traces. Differences in literacy, language, access to recording technologies, archival custody, and legal risk can structure whose relational interpretations survive. Documentary abundance from one position should therefore not be mistaken for greater relational importance.

Sequence matters. A single message can be ambiguous outside the exchange that preceded and followed it. Thread reconstruction, date verification, drafts, attachments, and changes in address or audience can alter interpretation. Where a claim concerns relational change, correspondence should be situated within a sequence rather than extracted solely as a quotable statement.

Correspondence is also a useful site for identifying latent and contested relations. Repeated requests for approval can reveal dependence; copied recipients can reveal authority or monitoring; shifts in salutation can accompany changes in distance or status; strategic silence can indicate uncertainty, conflict, or withdrawal. Such interpretations remain hypotheses until linked to broader evidence. The methodological value of correspondence lies partly in generating candidate relational interpretations that can then be checked against institutional records, behavior, interviews, or subsequent outcomes.

Caution 7.88 (Correspondence asymmetry). The volume, detail, and survival of cor-

respondence from one relational position should not be used as a direct proxy for that position's importance, credibility, or influence without evidence concerning the communication and preservation conditions that produced the asymmetry.

7.10.5 Public Records

Public records include court filings, legislative records, company registries, procurement notices, public budgets, election records, land and property records, regulatory disclosures, public hearings, official statistics, published decisions, and other materials made available through institutional procedures. Their public status can support inspectability, replication, and contestation, but public availability should be distinguished from epistemic completeness.

A public record exists within a regime of disclosure. Law, institutional capacity, filing requirements, publication formats, fees, retention rules, redaction, search interfaces, language, and digitization shape which relations become visible to whom. Two jurisdictions can both maintain "public" records while providing very different practical access. A record can be formally public yet difficult to discover, technically inaccessible, costly to retrieve, or intelligible only with specialized knowledge. Publicness is therefore a relation between record, institution, access infrastructure, and user rather than a simple binary property.

Public records often provide identifiable provenance through an issuing authority, date, case number, registry, or legal process. Yet their substantive meaning still requires interpretation. A corporate filing can establish reported ownership at a filing date while leaving beneficial control more complex. A court filing can establish that an allegation was made without establishing its truth. A procurement notice can establish formal award conditions while leaving implementation uncertain. Documentary claims should track the level of warrant appropriate to the record.

Public records can also be linked across institutions to reconstruct configurations whose relevant traces are distributed across several sources. Company registration, procurement, court, licensing, and budget records can together reveal organizational and institutional relations. Such linkage introduces additional identity-resolution and boundary problems. Names can change; entities can split or merge; identifiers can be reused or inconsistently recorded. The relational identity procedures of Section 174 remain applicable to documentary linkage.

Ethical obligations persist even when records are public. Aggregation, linkage, and computational search can change the practical visibility of information. A dispersed set of individually public records can become a highly revealing relational profile when assembled. Research design should therefore consider foreseeable harms, contextual expectations, and institutional requirements rather than treating public availability as automatic ethical permission for unrestricted reuse.

7.10.6 Digital Records

Digital records extend documentary inquiry into event logs, platform traces, transactional databases, version histories, metadata, machine-generated records, sensor outputs, access records, repositories, collaborative editing histories, and born-digital

communication. Their granularity can make relational sequence, frequency, timing, and topology visible at scales difficult to achieve through conventional documents. Digital systems can also preserve transformation histories, identifiers, and timestamps that support fine-grained provenance.

Digital abundance does not remove documentary mediation. A platform logs events according to its technical ontology: accounts, sessions, clicks, messages, transactions, permissions, commits, views, or other predefined event types. Events that the system does not instrument can become weakly visible or invisible. System redesign can change the meaning of an event code. Automated deduplication, synchronization, moderation, ranking, retention, or privacy mechanisms can alter the record before the researcher encounters it. The digital trace is therefore produced jointly by participants, software, infrastructure, institutional policy, and data-management practice.

This point is important for AI-assisted relational inquiry. Automated extraction can identify entities, relations, temporal order, and patterns across large documentary corpora, but its outputs add another representational layer. Entity resolution can merge distinct actors; relation extraction can infer a tie from linguistic co-occurrence; summarization can suppress minority interpretations; retrieval can privilege well-indexed documents; and generated metadata can detach a claim from its original context. Datasheet-style documentation and related provenance practices provide useful precedents for making dataset composition, collection, transformations, and intended use more inspectable Gebru et al. 2021. FAIR principles similarly emphasize reusable data and metadata with provenance and community standards Wilkinson et al. 2016.

Digital authenticity and provenance also deserve separate treatment from substantive truth. Contemporary content-provenance standards can support cryptographically verifiable claims about origin, modification, and signing while explicitly avoiding the stronger conclusion that authenticated content is true or normatively trustworthy Coalition for Content Provenance and Authenticity 2026. The distinction aligns closely with the epistemology of this book: provenance strengthens knowledge about the history of an artifact; it does not settle the adequacy of the artifact's representation of the world.

Digital records can disappear rapidly despite apparent abundance. Platforms close, accounts are deleted, APIs change, links decay, formats become obsolete, retention policies shift, and access permissions can be revoked. Reproducible documentary inquiry should therefore record retrieval dates, versions, identifiers, export procedures, relevant software transformations, and preservation decisions where those details affect later reconstruction.

Proposition 7.89 (Digital trace discipline)**.** *A digital trace supports a relational claim more strongly when the analysis distinguishes participant activity from the platform, software, logging, and transformation processes through which that activity became a researchable record.*

7.10.7 Provenance

Provenance concerns the history through which a documentary object reaches the researcher in its present form. It includes origin, authorship or issuing authority, date, custody, version, classification, transmission, preservation, redaction, digitization, extraction, transcription, linkage, transformation, and access history where these are consequential to interpretation. In relational inquiry, provenance is not merely bibliographic housekeeping. It is part of the evidential relation connecting manifestation to claim.

A record can pass through several transformations before analysis. A handwritten register can be microfilmed, scanned, transcribed, normalized, translated, coded, linked to another dataset, and processed by an AI system. Each transformation can improve access while also introducing loss, reinterpretation, or error. The final spreadsheet or graph may therefore be many operations removed from the source inscription. Provenance makes those operations recoverable enough for later researchers to assess whether the transformation preserved the properties relevant to the claim.

Definition 7.90 (Documentary provenance chain)**.** A *documentary provenance chain* is the recorded sequence of source production, custody, versioning, selection, preservation, transformation, linkage, and analytical processing through which a documentary object becomes evidence for a research claim.

The appropriate depth of a provenance chain depends on the claim. A quotation from an official regulation may require source, version, date, and issuing authority. A longitudinal dataset assembled from changing administrative systems may require detailed mapping of coding changes, linkage rules, missing periods, and transformations. A digital image used to establish authenticity may require cryptographic or repository-level metadata. Epistemic humility therefore favors claim-relative provenance rather than an unrealistic demand to document technical events at uniform depth.

Provenance also interacts with relational identity. If records from two periods are linked as referring to the same organization, person, institution, or relation, the linkage rule becomes part of the evidential chain. If an archival series changes filing practice, the apparent relation between documents can partly reflect archival reorganization. If a dataset is reclassified to match later categories, historical differences can be compressed. The transformation itself should remain visible when it bears on the substantive inference.

Proposition 7.91 (Provenance adequacy)**.** *Documentary provenance is methodologically adequate when it preserves the source and transformation history needed to evaluate the specific inferential moves on which the research claim depends.*

Proposition 7.91 aligns documentary inquiry with the broader research-practice principle of recoverable translation. More provenance can be valuable, but adequacy is tied to the risks and dependencies of the claim rather than to maximal metadata accumulation.

7.10.8 Documentary Silences

Documentary silence concerns the structured limits of what enters, survives, becomes accessible within, or becomes discoverable through a documentary corpus. Historical and archival scholarship has shown that power can shape source production, preservation, narrative construction, and retrospective significance Trouillot 1995. For relational inquiry, silence is especially important because the absence of a record can arise at several different stages. An interaction may never have been recorded; a record may have been destroyed; access may be restricted; a category may not exist in the recording system; the item may be misclassified; digitization may exclude it; search systems may fail to retrieve it; or the researcher may lack the language, resources, or institutional position required to encounter it.

These forms should be distinguished because they support different inferences. Failure to find a record is not equivalent to evidence that the relation did not exist. Section 172 developed this distinction for absent relations; documentary inquiry adds a source-production layer. A documented absence can sometimes be informative when a system was designed to record the relevant event reliably and the record series is sufficiently complete. In other settings, non-recording may reflect weak administrative reach, strategic concealment, informal practice, archival loss, or categories that rendered the relation unrecordable.

Silence can also be relationally patterned. Powerful actors may produce extensive records while less institutionally recognized actors appear mainly through records produced about them. Organizations can document financial transfers carefully while leaving care, informal labor, or tacit coordination weakly recorded. Legal systems can preserve adjudicated disputes while leaving avoided claims invisible. Digital platforms can retain monetizable interactions more systematically than forms of social meaning that do not enter platform metrics. Such patterns affect whose relations become reconstructable and which forms of value, harm, contribution, or dependence become visible.

Classification contributes to silence as well as visibility. A record system makes some distinctions possible by stabilizing categories, and the same categories can render other differences difficult to express. Bowker and Star emphasize the infrastructural consequences of classification and the invisibility that can accompany standardized categories Bowker and Star 1999. Documentary inquiry should therefore ask which relational distinctions the recording system could represent at the time, which were compressed, and which fell outside its ontology.

Strategic secrecy represents another form of documentary limitation. Institutions and actors may intentionally restrict access to information in order to preserve privacy, security, bargaining position, professional confidentiality, or power. Secrecy is itself relationally organized and can differentiate access among participants Simmel 1906. The existence of restricted records does not by itself establish wrongdoing; the methodological task is to identify how access conditions shape the available evidence and which claims remain correspondingly uncertain.

Definition 7.92 (Documentary silence profile)**.** A *documentary silence profile* records the principal pathways through which potentially relevant relations, actors, events, or meanings may be absent or weakly visible in a documentary corpus, including

production, classification, retention, access, digitization, discoverability, and interpretive limitations.

A documentary silence profile can guide sensitivity analysis. Researchers can compare formal records with correspondence, oral history, ethnography, interviews, external archives, or later records; examine whether missingness clusters around particular actors or periods; test whether coding changes coincide with apparent structural change; or report where evidence remains insufficient. The purpose is not to infer an unseen history automatically from silence. It is to prevent the available archive from being mistaken for the full domain of historically possible relations.

Caution 7.93 (Silence interpretation)*.* A documentary silence warrants stronger substantive interpretation only when the study can identify plausible recording conditions, alternative explanations for non-observation, and evidence linking the silence to the proposed relational mechanism or historical process.

This caution is particularly important in AI-assisted research. Search and retrieval systems can create an impression of documentary exhaustiveness because large corpora become rapidly searchable. Yet retrieval quality depends on digitization, indexing, language, metadata, access permissions, ranking, and model behavior. AI can enlarge the encounter surface of documentary inquiry by bringing distant records into relation, and aesthetic judgment can make an unexpected juxtaposition or absence salient. The later epistemic task remains to determine whether the encounter reflects a robust historical relation, a classification artifact, a retrieval bias, or an accidental similarity.

Documentary inquiry therefore extends the relational methodology developed earlier in this chapter without relaxing its epistemic discipline. Records can reveal relations across scales and historical intervals, institutional documents can participate in constituting relations, and digital infrastructures can vastly expand the volume of available manifestations. At the same time, documentary corpora ordinarily have histories of production and preservation that matter to interpretation. Administrative categories, organizational purposes, institutional authority, platform architectures, provenance chains, and documentary silences shape what can be reconstructed from it. The next section turns from documentary sources broadly construed to archival inquiry, where selection, custody, arrangement, preservation, and archival encounter become methodological objects in their own right.

7.11 Archival Inquiry

Section 7.10 treated documentary inquiry as a method for reconstructing relations from records whose production, classification, transformation, and silences remain epistemically consequential. The present section narrows the focus from documentary objects in general to archives as organized infrastructures of historical visibility. Its role is to specify how selection, custody, arrangement, preservation, description, access, and later retrieval shape the set of traces through which past relations can become researchable. The discussion proceeds from archive construction and historical trace to record survival, missing archives, archival power, temporal reconstruction, competing historical interpretations, and archival re-epistemization. Through-

out, the archive is treated as a historically generated relational configuration rather than as a transparent container of an already completed past.

This orientation follows directly from the ontology and epistemology developed in Chapters 4 and 5. A surviving record belongs to manifestational reality and can support inference toward earlier relational configurations, yet the passage from past relation to present archive is mediated by recording practices, institutional categories, custody, loss, appraisal, description, and access. The inverse problem therefore becomes temporally extended. Researchers encounter traces that have themselves passed through historical processes. Archival scholarship has emphasized that archives and archivists participate in the construction of social memory through selection, description, preservation, and access Schwartz and Cook 2002, while historical work on silencing has shown that unequal power can enter source production, preservation, narrative construction, and retrospective significance Trouillot 1995. Stoler's archival analysis further demonstrates the value of treating archival forms and habits as evidence about governing epistemologies and institutional uncertainty rather than using archives only as repositories from which facts are extracted Stoler 2009.

Archival inquiry within the present framework therefore works simultaneously on two relational objects. The first is the historical configuration the researcher seeks to reconstruct. The second is the archival configuration through which traces of that history have survived and become accessible. These objects overlap, because record-making, filing, preservation, and secrecy can themselves form part of the historical process. They should nevertheless remain analytically distinguishable so that archival structure does not silently become historical structure.

Definition 7.94 (Archival configuration)**.** An *archival configuration* is the historically situated arrangement of record-producing actors, documentary series, custodial relations, appraisal practices, classifications, preservation infrastructures, access rules, descriptive systems, and retrieval interfaces through which historical traces become retainable and researchable.

Definition 7.94 makes the archive an object of relational analysis in its own right. An archival configuration can be concentrated in a state repository, distributed across organizations and private collections, partially digital, fragmented across jurisdictions, or reconstructed from dispersed traces. Its boundaries may differ from the boundaries of the historical phenomenon being studied. Table 7.10 summarizes the principal archival operations considered in this section and the epistemic questions associated with them.

7.11.1 Archive Construction

Archives are constructed through sequences of institutional and practical decisions concerning what becomes a record, what enters custody, what is retained, how records are grouped, how they are described, and under what conditions they can be encountered. Construction does not imply fabrication of the underlying historical events. It identifies the mediating processes through which some historical manifestations acquire durable archival form while others remain dispersed, ephemeral, privately held, restricted, or lost. Schwartz and Cook emphasize this active dimen-

Table 7.10: Archival operations and their characteristic epistemic consequences

Archival operation	**Relational function**	**Potential analytical gain**	**Characteristic uncertainty**
Construction	Selection, aggregation, custody, arrangement, description	Reveals how a researchable corpus came into being	Archival organization is mistaken for historical organization
Trace preservation	Retention of documents, objects, metadata, and contextual links	Extends access across historical distance	Surviving trace is treated as complete representation of the past relation
Record survival	Differential preservation across actors, media, periods, and institutions	Supports reconstruction of preservation pathways	Survival bias is confused with historical prevalence or importance
Missing archives	Non-formation, dispersal, destruction, restriction, format loss, weak discoverability	Makes limits of historical visibility explicit	Missingness is assigned a single cause without sufficient evidence
Archival power	Appraisal, description, access, secrecy, digitization, ranking, institutional authority	Reveals how visibility and memory are organized	Power is inferred from archival asymmetry without a specified mechanism
Temporal reconstruction	Ordering of events, records, revisions, and retrospective classifications	Supports process and sequence analysis	Record date, event date, filing date, and later interpretation are conflated
Interpretive comparison	Rival reconstructions from partially shared traces	Preserves contestability and evidential dependence	Disagreement is flattened into one synthetic narrative too early
Re-epistemization	Re-reading preserved traces under later questions, concepts, methods, and evidence	Retains future epistemic option value	Later categories are projected backward without historical discipline

sion of archival practice, including appraisal, selection, description, preservation, and communication Schwartz and Cook 2002.

For relational inquiry, archive construction begins before formal transfer to an archival repository. A ministry's filing rules, a firm's records-management system, a household's preservation habits, a laboratory's data-retention policy, a court's case-management procedure, or a platform's log architecture can influence which relations later become reconstructable. The archive therefore inherits properties from the record-producing system. If an institution organizes records by department, case, individual, transaction, project, or legal category, that arrangement can privilege some relational pathways and obscure others.

Archival arrangement can also create analytically useful relations among records. Series, folders, provenance groupings, accession histories, and finding aids preserve context that might be lost if documents were treated as isolated text fragments. At the same time, those structures reflect archival decisions and institutional histories. A researcher reconstructing a transorganizational relation may need to cross several archival series whose original arrangement follows administrative divisions rather than the relation of interest.

Proposition 7.95 (Archive–history distinction)**.** *Archival organization supports stronger historical inference when the analysis distinguishes relations among archived records from relations among the historical actors, institutions, and processes those records are used to reconstruct.*

The proposition is especially relevant in digitized and AI-assisted archives. Search interfaces can dissolve original order by returning documents according to keywords, embeddings, relevance scores, or generated summaries. This can enlarge the encounter surface of inquiry, because records from distant series become juxtaposed rapidly. It can also weaken awareness of provenance and arrangement if retrieval detaches an item from its archival neighborhood. A robust workflow should therefore preserve both the retrieval path and the archival context needed for interpretation.

Archive construction is also multiscale. A single personal collection may sit within an organizational archive; organizational holdings may enter a national repository; national holdings may be linked through transnational digital infrastructures. Relations visible at one archival scale can disappear or acquire different significance at another. The scale discipline developed in Section 7.5 therefore applies to the archive as well as to the historical object.

7.11.2 Historical Trace

Archival inquiry proceeds through traces: surviving manifestations that bear a recoverable relation to earlier events, practices, classifications, decisions, interactions, or material conditions. A trace can be a letter, ledger entry, map, legal instrument, photograph, memorandum, dataset, marginal annotation, version history, recorded testimony, object, or metadata relation. Its value lies neither in mere age nor in archival location. It lies in the evidential relation that connects the surviving manifestation to the historical claim being considered.

Definition 7.96 (Historical relational trace)**.** A *historical relational trace* is a surviving manifestation whose provenance, content, material form, position within a record system, or relation to other traces provides evidence concerning a past relation, relational event, configuration, or transformation.

Historical traces vary in distance from the target relation. A signed agreement may be closely connected to a formal obligation. A later memoir may provide retrospective evidence filtered through memory and subsequent experience. A statistical compilation may aggregate many earlier records. A finding aid may provide evidence about archival organization more directly than about the historical relation that motivated the original documents. Relational inference should therefore state what kind of trace is being used and how its evidential role is established.

The same trace can support several historically distinct claims. A colonial administrative report can contain claims about a population, reveal categories used by officials, expose uncertainty or disagreement within the administration, and provide evidence about the procedures through which governing knowledge was produced. Stoler's analysis is instructive here because it treats archival documents and forms as evidence concerning the epistemic and affective organization of colonial governance itself Stoler 2009. Such use differs from treating the report as a transparent description of the population it classifies.

Material and textual features can also matter. Revision marks, attachments, omissions, signatures, circulation lists, stamps, annotations, damaged pages, duplicated forms, and changes in handwriting or format may carry relational information that a plain-text extraction does not preserve. Digitization can improve access while reducing some of these material cues. Where the claim depends on material form, the digital surrogate should be treated as a transformation within the provenance chain rather than as an interchangeable substitute.

Remark 7.97 (Trace plurality)*.* A historical trace can be evidentially relevant to several relational objects at once. Its interpretation should specify which trace–claim relation is being used in the local argument.

Trace plurality is important for AI-assisted archival analysis. Models can extract entities, dates, relations, and themes at scale, yet the same document may carry evidential significance through tone, omission, filing context, material form, or relation to adjacent records. Automated extraction can therefore operate as one layer of access while retaining pathways back to the original archival object and its contextual metadata.

7.11.3 Record Survival

The historical record available to a researcher is shaped by differential survival. Paper decays, digital formats become obsolete, private collections disperse, organizational records are destroyed according to retention schedules, records are lost in conflict or disaster, confidential materials remain closed, and some institutions possess substantially greater preservation capacity than others. Survival can therefore be uneven across social position, organizational form, geography, media, and historical period.

This unevenness matters because surviving records can create misleading impressions of historical prevalence. An actor who generated extensive bureaucratic documentation may appear more relationally central than an actor whose activities were oral, informal, poorly funded, or weakly institutionalized. A large institution may preserve correspondence across decades while a short-lived association leaves only fragments. A highly regulated transaction can leave repeated documentary traces while care, trust, informal labor, avoidance, or unrecorded exchange remains comparatively faint.

Definition 7.98 (Record survival trajectory)**.** A *record survival trajectory* is the reconstructable sequence through which a historical record or record series passes from production through use, retention, custody, preservation, migration, restriction, digitization, and present accessibility.

The survival trajectory extends the documentary provenance chain developed in Section 7.10. Provenance asks how a documentary object became evidence for a claim; survival analysis asks which processes allowed that object to remain available while possible alternatives disappeared. The distinction is useful when comparing archival abundance across actors or periods.

Researchers can sometimes estimate survival conditions indirectly. Retention schedules, accession records, catalog histories, repository reports, references in sur-

viving correspondence, later citations to missing documents, duplicate copies, and discontinuities in numbering can reveal that a corpus was once larger or differently organized. Such evidence rarely reconstructs the missing corpus completely. It can nevertheless narrow interpretations of what present abundance and absence mean.

Proposition 7.99 (Survival-aware inference)**.** *Comparisons based on archival frequency or documentary abundance become more credible when plausible differences in record production, retention, preservation, and access are incorporated into the interpretation.*

Survival-aware inference is especially important for quantitative text analysis of historical corpora. Counts, topic frequencies, network edges, and named-entity distributions can appear precise while inheriting severe preservation asymmetries. Computational precision at the level of the surviving corpus does not resolve uncertainty concerning how that corpus came to survive.

7.11.4 Missing Archives

Missing archives extend documentary silence from individual records to archival formations. A relevant archive may not have been formed, may have been dispersed across repositories, may remain privately held, may have been destroyed, may be subject to legal restriction, may exist in an unreadable or obsolete format, may lack adequate description, or may be technically present while remaining difficult to discover. These conditions have different epistemic meanings and should not be compressed into a single category of absence.

Definition 7.100 (Missing-archive profile)**.** A *missing-archive profile* records the principal reasons a potentially relevant body of historical traces is unavailable, weakly visible, fragmented, restricted, unpreserved, undiscoverable, or only indirectly reconstructable, together with the consequences of that condition for the research claim.

The profile can distinguish at least several situations. Non-formation arises when practices generated few durable records. Destruction removes previously produced traces. Dispersal separates records across custodians or jurisdictions. Restriction limits access according to privacy, security, ownership, or institutional policy. Format loss makes records technically inaccessible. Description gaps weaken discoverability. Private custody can make access contingent on relationships or permissions. These pathways can coexist within one project.

Missing archives should also be analyzed relationally. The capacity to preserve, classify, and transfer records is unevenly distributed. Communities with limited archival resources may leave fragmented traces even when their historical activity was extensive. Institutions with coercive or administrative authority may preserve records about others while those others retain fewer records produced from their own positions. Trouillot's analysis of silencing across the production of sources, archives, narratives, and retrospective significance provides an important precedent for tracing such asymmetries through historical knowledge production Trouillot 1995.

A missing archive can sometimes become partially reconstructable through exter-

nal traces. Correspondence held by another party, court records, newspapers, financial ledgers, diplomatic files, oral histories, photographs, citations, institutional minutes, and later compilations can provide indirect evidence. Such reconstruction should preserve the asymmetry of access. Evidence produced about an actor is not equivalent to records produced by that actor, and later testimony is not equivalent to contemporaneous documentation.

Caution 7.101 (Missingness interpretation)*.* A missing archive should be assigned a specific historical explanation only when evidence distinguishes that explanation from plausible alternatives such as non-formation, loss, dispersal, restriction, weak description, or retrieval failure.

This caution preserves epistemic humility. Archival absence can itself be historically significant, yet its cause may remain underdetermined. Reporting the structure of uncertainty is preferable to converting missingness into an overly confident narrative.

7.11.5 Archival Power

Archival power concerns the capacities through which actors and institutions influence historical visibility, preservation, description, access, and later interpretation. It can operate during record creation, appraisal, retention, transfer, classification, cataloging, restriction, digitization, funding, interface design, and public communication. Schwartz and Cook describe archives as active sites in which social memory is shaped through professional and institutional practices Schwartz and Cook 2002. Within relational methodology, this insight can be translated into a more specific question: which relations influence what can become a durable and discoverable trace, and through which mechanisms?

Power analysis should remain mechanism-sensitive. Unequal archival visibility does not by itself establish intentional suppression. Differential record production can arise from organizational function, legal obligation, resource capacity, media practices, survival conditions, or historical accident. Stronger claims about suppression, exclusion, strategic secrecy, or deliberate destruction require evidence concerning the relevant pathway. This discipline is consistent with the broader writing principle that claim strength should track available support.

Archival power can also be productive rather than merely restrictive. Classification and description create pathways through which researchers can encounter records. Preservation programs can rescue fragile materials. Community archives can establish forms of memory that were previously weakly represented. Digitization can broaden geographic access. Translation, transcription, and metadata can create new interfaces between records and research communities. These operations can simultaneously privilege some classifications or access paths over others.

Definition 7.102 (Archival visibility architecture)**.** An *archival visibility architecture* is the configuration of record-production practices, appraisal decisions, preservation resources, descriptive systems, access rules, digitization priorities, retrieval interfaces, and institutional capacities that conditions which historical traces become visible to a given research community.

The architecture is audience-relative as well as historically situated. A record may be physically preserved yet functionally invisible to researchers who lack language skills, institutional credentials, travel resources, technical tools, or knowledge of the relevant finding system. Digital access can reduce some barriers while introducing others through paywalls, platform design, metadata quality, OCR performance, ranking systems, or uneven digitization.

AI-assisted archival research adds a further layer of visibility architecture. Retrieval-augmented systems, semantic search, transcription, translation, entity linking, and clustering can widen access across large corpora. Their outputs depend on the corpus supplied, metadata, ranking procedure, model behavior, and prompt or query design. A model can surface an unexpected relation that a keyword search would miss, yet it can also repeatedly privilege highly indexed or linguistically dominant materials. AI therefore participates in archival visibility without replacing the underlying archival power relations.

Proposition 7.103 (Archival power localization)**.** *Claims about archival power are strengthened when the analysis identifies the stage, actor, institutional capacity, and mechanism through which historical visibility, preservation, description, access, or retrieval is altered.*

7.11.6 Temporal Reconstruction

Archival inquiry reconstructs relations across several temporal layers. The time of an event may differ from the time at which it was recorded. A document may be revised later, transferred to an archive after institutional closure, reclassified during cataloging, digitized decades afterward, and interpreted by researchers under later conceptual conditions. Temporal reconstruction therefore requires more than sorting records by their present metadata date.

Definition 7.104 (Archival temporal stack)**.** An *archival temporal stack* distinguishes, where relevant to the claim, the time of the historical event or relation, the time of record production, later revision or annotation, custodial transfer, archival arrangement, digitization or transformation, and present research interpretation.

This stack helps separate retrospective records from contemporaneous traces. A report written years after an event may contain valuable synthesis while incorporating later categories and political concerns. A registry updated retrospectively can make an earlier status appear contemporaneous. A digitized database may assign standardized dates that compress uncertain historical intervals. Temporal metadata therefore require interpretation in relation to the record-making process.

Sequence reconstruction can draw on explicit dates, internal references, version history, handwriting, administrative procedure, serial numbers, correspondence chains, material characteristics, and relations among records. Contradictions among dates can be informative rather than merely problematic. They may reveal delayed reporting, contested chronology, retrospective classification, or several institutional clocks operating at once.

Multiscale temporal analysis is particularly relevant here. Individual encounters, organizational decisions, institutional reforms, archival transfers, and long-term his-

torical transformations can operate on different timescales. The fast–slow distinctions planned later in the book can therefore be grounded partly in archival reconstruction, provided the relevant temporal bridges are supported by evidence. A rapid sequence of transactions, for example, may sit within a slowly changing legal regime whose archival traces appear in a different record series.

Temporal reconstruction also interacts with relational identity. The continuity criteria developed in Section 7.8 can be applied to archival evidence when the researcher asks whether an institution, obligation, coalition, or other relation persisted through changing names, forms, and documentary regimes. The archival temporal stack helps distinguish historical change in the relation from change in how the relation was recorded.

7.11.7 Competing Historical Interpretations

Archival evidence frequently supports more than one plausible historical reconstruction. Sources can conflict, actors can describe the same relation differently, records can be incomplete, later documents can reinterpret earlier events, and archival organization can privilege one sequence over another. Methodological discipline therefore requires a way to preserve interpretive plurality without treating historical interpretation as unconstrained.

Definition 7.105 (Interpretive divergence profile)**.** An *interpretive divergence profile* records competing historical reconstructions, the archival traces each reconstruction relies upon, the inferential steps connecting those traces to its claims, and the points at which the reconstructions differ in source weighting, chronology, category use, causal interpretation, or treatment of missing evidence.

This profile shifts disagreement from a contest between finished narratives toward a comparison of evidential dependencies. Two interpretations may share most sources but differ in the meaning assigned to one administrative category. Another pair may disagree because one relies heavily on official records while the other incorporates private correspondence. A third disagreement may arise from different temporal boundaries or criteria of relational persistence. Making these dependencies visible can clarify which new evidence would be most informative.

Competing interpretations can also be scale-relative. A policy may appear stable in national records while local archives reveal divergent implementation. An organization may describe a relation as contractual while correspondence reveals negotiated informal practices. A field-level history may identify long continuity while actor-level records show repeated interruption and reconstitution. Such divergences can reflect genuine multiscale organization rather than simple error.

Archival inquiry should therefore preserve disagreement when available evidence remains underdetermining. Synthesis is valuable when it can show how apparently conflicting interpretations refer to different scales, periods, actors, or relational properties. Forced synthesis can erase meaningful incompatibility. The methodological aim is calibrated historical reconstruction: claims should be as strong as the surviving traces and inferential bridges support.

Proposition 7.106 (Interpretive traceability)**.** *Competing historical interpretations be-*

come more productively comparable when their principal claims can be traced to identifiable archival sources, transformations, inferential bridges, temporal assumptions, and treatments of missing evidence.

AI systems can assist this comparison by mapping claims to sources, locating contradictions, grouping alternative chronologies, or identifying documents used asymmetrically across interpretations. Such tools can increase analytical coverage while also producing plausible synthetic narratives whose source dependencies are difficult to see. Human-readable provenance and source-level contestability therefore remain important when AI participates in historical synthesis.

7.11.8 Re-Epistemization from Archives

Archives preserve the possibility that historical materials may acquire new epistemic significance under later questions, concepts, methods, and evidential infrastructures. Section 156 introduced re-epistemization as the re-examination of earlier research under later epistemic conditions. Archival inquiry extends this principle to historical traces more broadly. A record preserved for administrative, legal, personal, or institutional purposes can later become relevant to a question that its creators did not anticipate.

Definition 7.107 (Archival re-epistemization)**.** *Archival re-epistemization* is the disciplined reconstruction of preserved historical traces under later questions, concepts, methods, or evidential resources while retaining the provenance, historical categories, and original production conditions needed to distinguish new interpretation from the earlier context of the record.

Re-epistemization can occur through several pathways. Newly opened archives can change the evidence available for an established debate. Digitization can connect geographically dispersed holdings. New statistical or computational methods can reveal patterns across records that were previously difficult to compare. New conceptual vocabularies can make earlier distinctions newly salient. Oral histories or community archives can alter the interpretation of institutional records. Later institutional changes can also make the historical significance of earlier records more visible.

This process requires historical discipline because later concepts can clarify as well as distort. A contemporary category can help formulate a new question while failing to match the categories through which historical actors understood their situation. Re-epistemization should therefore preserve both the later analytical vocabulary and the historical language encountered in the archive. Translation between them can remain partial.

The preservation argument developed in Sections 156 and 164 becomes especially important here. Archives retain future epistemic option value partly because later researchers are often poorly positioned to predict which traces will become significant. A marginal annotation, failed policy draft, abandoned classification, technical manual, local ledger, correspondence fragment, or apparently routine form may acquire importance when later questions expose a previously unrecognized relation. The value of archival preservation therefore includes possibilities that are difficult to specify prospectively.

This is also where contingent encounter and aesthetic judgment enter archival praxis most directly. Researchers often encounter significance through an unexpected juxtaposition, anomalous phrase, changed category, unusual silence, or record whose form does not fit the current explanatory structure. The initial recognition can be aesthetic in the broad sense developed earlier in the book: a sense that a pattern, discrepancy, or relation deserves attention before its epistemic status is settled. Archival method then subjects that salience to provenance analysis, comparison, contextual reconstruction, and alternative explanation.

AI can greatly expand this encounter surface. Semantic retrieval, transcription, translation, clustering, and multimodal search can bring a researcher into contact with traces that would have been difficult to locate through traditional finding aids alone. The same abundance makes judgment more consequential. Generated connections can reflect real historical structure, model-induced similarity, metadata bias, corpus imbalance, or accidental lexical resemblance. Re-epistemization therefore benefits from AI-assisted discovery when the resulting relation remains traceable to archival objects and open to historical verification.

Proposition 7.108 (Re-epistemization discipline)**.** *Archival re-epistemization is strengthened when later analytical categories and methods remain distinguishable from the historical categories, production conditions, and archival transformations through which the underlying traces became available.*

Archival inquiry thus extends documentary methodology from the interpretation of individual records toward the historical infrastructure of record survival and visibility. Archive construction, trace formation, differential survival, missing archives, archival power, temporal layering, competing interpretations, and re-epistemization jointly condition what can be known about past relations. The archive provides neither unrestricted access to the past nor an arbitrary field of interpretation. It provides a structured and historically mediated evidential environment whose possibilities and limits can themselves be investigated. The next section turns to ethnographic inquiry, where relational evidence is generated through situated presence, observation, participation, and reflexive engagement with ongoing social practice.

7.12 Ethnographic Inquiry

Sections 7.10 and 7.11 examined documentary and archival access to relations that become researchable through records, preservation, classification, and historical trace. The present section turns toward relations encountered through sustained presence in fields of practice. Its role is to specify how ethnographic inquiry can reconstruct situated interaction, tacit coordination, informal institutions, embodied routines, relational meaning, and the researcher's own position within the setting. The discussion proceeds through participant observation, situated observation, everyday relations, tacit practice, relational meaning, field position, reflexive field notes, and limits of ethnographic access. The aim is methodological: ethnography is treated here as one mode of relational access whose strengths and limitations depend on the research object, field conditions, duration, researcher position, and evidential question.

This treatment follows directly from the ontology and epistemology developed in

Chapters 4 and 5. Ethnographic observation concerns manifestations of relations in practice and provides mediated access to relational reality. Conduct, speech, silence, spatial organization, artifacts, routines, interruptions, and participant interpretations can support inference toward relations, yet each manifestation is situated within a field and mediated by the researcher's access. Hammersley and Atkinson describe ethnography as a reflexive process in which research activity remains part of the social world being studied Hammersley and Atkinson 2019. Geertz's account of interpretive inquiry provides a precedent for treating situated action as intelligible through contextual reconstruction of situated action Geertz 1973. Bourdieu's theory of practice further supports attention to practical regularities that may be enacted without being exhaustively articulated by participants Bourdieu 1977.

Ethnographic inquiry is especially useful where formal rules, administrative categories, documentary representations, or interview accounts leave important aspects of practical relational organization unresolved. A workplace may possess an official reporting hierarchy while everyday coordination depends on informal brokers. A public service may be governed by formal eligibility criteria while access is practically shaped by queues, discretionary interpretation, language, familiarity, or repeated interaction. A market may be described through prices and contracts while trust, reputation, timing, embodied skill, and tacit conventions organize exchange. The ethnographic task in such cases is to reconstruct how practical and formal relations are enacted together and how they diverge or reinforce one another.

Definition 7.109 (Ethnographic relational access)**.** *Ethnographic relational access* is sustained, situated empirical access to relations through observation, participation, interaction, contextual interpretation, and reflexive documentation of the researcher's position within a field of practice.

Definition 7.109 emphasizes access and keeps claims of epistemic privilege outside the definition. Sustained presence can disclose practical organization that remains weakly visible in records or retrospective accounts, while presence also changes what the researcher can encounter and how participants encounter the researcher. Table 7.11 summarizes the main ethnographic operations developed below.

7.12.1 Participant Observation

Participant observation combines presence in a field with varying degrees of participation in its activities. The methodological significance of participation lies in the forms of access it can create. Some relations become visible only when the researcher encounters schedules, interruptions, role expectations, embodied coordination, informal repair, mutual dependence, and practical constraints from within an activity. Participation can therefore reveal differences between a formally specified process and the process through which work is practically accomplished.

Participation should nevertheless be described precisely. A researcher who observes a meeting, works alongside participants, joins a volunteer activity, shadows a professional, resides in a community, or participates through a digital platform occupies different relational positions. The relevant distinction concerns what activities the researcher can enter, what responsibilities accompany that access, how participants understand the researcher's role, and which relations become observable or

Table 7.11: Ethnographic operations and characteristic relational access

Ethnographic operation	Primary relational access	Potential analytical contribution	Characteristic limitation
Participant observation	Interaction and practice encountered while the researcher participates in field activity	Reconstructs coordination, role expectations, practical judgment, and participation-dependent relations	Researcher participation can alter access, conduct, and interpretation
Situated observation	Conduct interpreted in relation to place, time, infrastructure, sequence, and local conditions	Preserves contextual conditions that make a manifestation intelligible	Local density can be overextended beyond the observed setting
Everyday-relations inquiry	Repeated ordinary interactions, routines, interruptions, and informal coordination	Reveals practical relational architecture weakly represented in formal descriptions	Familiar routines can become analytically invisible through habituation
Tacit-practice reconstruction	Skill, embodied coordination, practical know-how, and unarticulated regularity	Makes practical competence and informal ordering researchable	Researcher inference can exceed what observation supports
Relational-meaning reconstruction	Participant interpretations, categories, symbols, affective orientations, and contested meanings	Distinguishes materially similar actions that instantiate different relations	Meaning can be plural, strategic, retrospective, or contested
Field-position analysis	Access, role, identity attribution, trust, authority, language, and institutional location	Makes the conditions of observation and interaction visible	Reflexivity can become overly self-referential if detached from the research object
Reflexive field notes	Versioned records of observation, interpretation, uncertainty, positional change, and emergent questions	Preserves the trajectory from encounter toward later analysis	Notes remain selective constructions whose scope is narrower than the field itself
Access-limit analysis	Unobserved settings, restricted relations, temporal limits, ethical constraints, and participant selection	Bounds inference and identifies complementary evidence needs	Unobserved relations can be inadvertently treated as unimportant

less observable because of that role.

Definition 7.110 (Participation profile)**.** A *participation profile* records the activities, roles, responsibilities, access conditions, interactional permissions, temporal duration, and participant understandings through which the researcher enters and remains within a field setting.

A participation profile supports later interpretation because field access often changes over time. Initial observation may occur under formal supervision, while later access depends on trust or familiarity. Participants may become more candid, more guarded, or differently oriented toward the researcher as the relationship develops. The researcher's practical competence can also change. An unfamiliar routine that initially appears complicated may later become ordinary, while previously unnoticed distinctions become salient.

Participant observation is therefore temporally structured. Early impressions can be analytically valuable because unfamiliarity makes tacit assumptions visible. Later participation can be valuable because practical understanding deepens. Neither phase should automatically be treated as superior. Recording how access, competence, trust, and role attribution change makes it possible to interpret differences between early and later observations.

The researcher can also become part of the relational configuration being studied. A request for explanation may interrupt a routine. Participation can redistribute labor, attention, authority, or social alignment. Participants may use the researcher's presence strategically, seek recognition, avoid topics, perform compliance, or recruit the researcher into existing disputes. Reflexive ethnography therefore asks how observation is conditioned by participation while keeping the effects of researcher involvement open to analysis. Hammersley and Atkinson's reflexive account is useful here because it treats researcher involvement as a condition to be analyzed within the research process Hammersley and Atkinson 2019.

Proposition 7.111 (Participation-conditioned access)**.** *Ethnographic claims are strengthened when the analysis specifies how the researcher's form of participation enabled, restricted, or altered access to the relations on which the claim depends.*

7.12.2 Situated Observation

Ethnographic observation is situated in space, time, institutional arrangement, material infrastructure, and ongoing relational sequence. The same visible action can acquire different significance when its setting changes. Waiting may indicate exclusion in one context, procedural sequencing in another, strategic delay in a third, or ordinary temporal coordination in a fourth. A queue, doorway, screen, counter, office layout, shared tool, platform interface, or transportation route can condition who encounters whom and under what terms.

Situated observation therefore records more than behavior. It attends to where interaction occurs, what precedes and follows it, which participants are present or absent, what artifacts and infrastructures mediate it, what institutional rules are relevant, and how the scene relates to broader routines. Hutchins' analysis of distributed cognition provides a useful precedent for examining how practical activity can be organized across persons, artifacts, procedures, and material arrangements across persons, artifacts, procedures, and material arrangements Hutchins 1995.

The methodological boundary developed in Section 7.4 remains active. A field site is not automatically the boundary of the relation. A workplace observation may depend on supply chains, regulatory requirements, software systems, household obligations, or transnational communication that are only partially visible at the site. Ethnographic inquiry can therefore combine dense local observation with explicit boundary remainders. The field site provides a point of relational access, while the wider relational domain may extend beyond the site.

Scale selection from Section 7.5 is similarly important. An observed exchange may be analyzed at the dyadic level, while its practical meaning depends on organizational roles or institutional categories. Repeated local practices may aggregate into an organizational regularity, yet the cross-scale bridge requires evidence. Ethnographic

density supports locally grounded claims; movement toward a broader population or field requires an additional inferential bridge.

Definition 7.112 (Situated observation record)**.** A *situated observation record* preserves an observed interaction together with the spatial, temporal, material, institutional, and relational conditions judged relevant to interpreting that interaction.

This form of record supports later comparison. Two scenes that appear behaviorally similar can be distinguished by setting, authority structure, participant composition, temporal sequence, or infrastructural conditions. Conversely, different visible actions may instantiate a similar relation when they perform comparable functions under different local conventions.

7.12.3 Everyday Relations

Many consequential relations are reproduced through ordinary activity, while exceptional events can reveal different properties of the same configuration. Greeting practices, turn-taking, requests for help, informal advice, repeated deference, joking, correction, waiting, avoidance, shared maintenance, routine reporting, and small acts of coordination can sustain trust, hierarchy, belonging, expertise, dependency, exclusion, or mutual obligation. Ethnographic inquiry is particularly well suited to these relations because their practical significance can remain weakly represented in formal documents and retrospective interviews.

Everyday relations require analytical patience. Their recurrence can make them appear trivial to participants and researchers. Yet repetition can stabilize expectations and reduce the need for explicit negotiation. An informal colleague who repeatedly interprets rules for others may become a practical access point despite lacking formal authority. A routine pattern of who speaks after whom can reveal an interactional hierarchy that remains absent from the organizational chart. Repeated small acts of maintenance can sustain shared infrastructure while remaining weakly recognized in accounting or role descriptions.

Bourdieu's practice theory is relevant here because durable dispositions and practical regularities can organize conduct with limited explicit calculation or verbal formulation Bourdieu 1977. Within the present framework, observed regularity therefore remains a candidate for further reconstruction whose interpretation requires evidence beyond recurrence itself. It motivates a research question: which repeated relations appear sufficiently patterned to warrant further reconstruction, and what evidence distinguishes durable practice from temporary coincidence?

Everyday inquiry should also preserve interruption. Breakdown, absence, substitution, conflict, unexpected demand, or the arrival of an unfamiliar participant can expose relations that ordinary smooth functioning conceals. When a routine fails, participants may articulate assumptions that usually remain tacit. Repair practices can reveal who possesses authority, practical expertise, access to resources, or responsibility for continuity.

This point connects directly to contingent encounter. Ethnographic fields generate unplanned encounters whose significance may initially appear only as surprise, elegance, tension, anomaly, or a felt mismatch between formal expectation and ob-

served practice. Aesthetic judgment can make such an encounter salient before its epistemic status is clear. Subsequent observation, comparison, participant interpretation, documentary evidence, or interviews can then determine whether the encounter represents a recurring relation, an exceptional event, a misunderstanding, or a feature of the researcher's position.

Remark 7.113 (Ordinary-event asymmetry)*.* Routine events and exceptional events can disclose different properties of a relational configuration. Repetition may reveal stabilized expectations, while interruption may reveal dependencies, repair mechanisms, authority, and assumptions that remain less visible during ordinary functioning.

7.12.4 Tacit Practice

Tacit practice concerns competent action whose organization is only partly available through explicit participant description. Skilled work, timing, spatial orientation, embodied coordination, informal classification, practical sequencing, sensitivity to cues, and learned forms of anticipation can be difficult to reconstruct through interview accounts alone. Ethnography provides one route into these practices by observing performance across repeated situations and by participating where ethically and practically appropriate.

Tacit practice identifies a gap between enacted competence and explicit articulation. A participant may perform a task reliably while offering only a partial account of how judgments are made. Another participant may provide a formal explanation that differs from observed practice because the explanation draws on institutional categories that differ from the practical sequence. Ethnographic inquiry can place these forms of evidence in relation while keeping practice and speech as distinct evidential sources.

The identification problem from Section 7.6 remains important. Repeated cooccurrence of action and outcome supplies limited support for a tacit mechanism until additional relational evidence is available. Researchers can overinterpret gesture, timing, silence, or embodied routine through their own conceptual expectations. A stronger reconstruction combines repeated observation, variation across situations, participant explanation where available, comparison among practitioners, and attention to breakdown or learning.

Definition 7.114 (Tacit-practice reconstruction)**.** A *tacit-practice reconstruction* is a provisional account of recurring practical organization inferred from observed performance, contextual variation, participant interpretation, artifacts, and relevant contrasts where explicit verbal description remains incomplete.

This definition keeps tacit-practice claims revisable. What initially appears tacit may later become explicitly articulated in training materials or interviews. What appears to be an embodied skill may depend heavily on material infrastructure. A practice that seems individual may prove distributed across colleagues, tools, and procedures. Hutchins' work is again useful as a precedent for this broader distribution of practical organization Hutchins 1995.

AI-assisted video, audio, sensor, or text analysis can expand the tractability of

repeated practice, yet automated pattern detection introduces another representational layer. Detected regularities require substantive interpretation, and ethically sensitive recordings may be inappropriate to collect or process in some settings. Computational abundance therefore increases the value of field judgment, informed consent, contextual knowledge, and proportionality between data collection and the research question.

7.12.5 Relational Meaning

Ethnographic inquiry can reconstruct how participants understand, contest, and enact the meaning of relations. Materially similar actions can instantiate different relations. Sharing food can express hospitality, obligation, ritual membership, compensation, care, reciprocity, hierarchy, or strategic alliance. Silence can indicate deference, refusal, uncertainty, exclusion, fatigue, confidentiality, or practical irrelevance. A repeated transfer can be interpreted as wage, gift, allowance, debt repayment, entitlement, patronage, or family support. Relational meaning therefore requires contextual reconstruction through contextual reconstruction that supplements visible form.

Geertz's interpretive approach is relevant because meaning becomes intelligible through contextual webs through contextual webs surrounding behavioral units Geertz 1973. Within GR methodology, contextual interpretation remains evidentially disciplined. Participants may disagree about what a relation means. Public descriptions can differ from private accounts. Meaning can shift historically or vary across roles. Strategic presentation can coexist with sincere interpretation. The researcher therefore reconstructs a field of meanings while preserving plurality and contestation where the evidence supports them.

Definition 7.115 (Ethnographic relational-meaning profile)**.** An *ethnographic relational-meaning profile* records the participant categories, interpretations, symbolic forms, practical enactments, contextual contrasts, disagreements, and researcher inferences through which the meaning of a relation is reconstructed.

The profile links directly to the characterization work in Section 7.7. Relational meaning is one property among several. A relation can be materially asymmetric while interpreted by participants as reciprocal. A formally voluntary relation can be experienced as strongly constrained. A relation called friendship can carry substantial economic dependence. Ethnographic interpretation helps reconstruct these meanings alongside analysis of material flows, authority, legal status, and dependency.

Meaning can also be performative. A category, ritual, title, label, or repeated narrative can contribute to stabilizing the relation it describes. When participants repeatedly treat someone as senior, trusted, peripheral, indebted, expert, or outsider, symbolic recognition can become part of the relational configuration. This possibility should be examined through practice and consequence through practice, consequence, and vocabulary considered together.

Caution 7.116 (Interpretive closure)*.* A coherent ethnographic interpretation should remain distinguishable from the range of participant meanings and evidential manifestations from which it was constructed, especially where interpretation is contested or role-dependent.

7.12.6 Field Position

Field position concerns the researcher's changing relational location within the setting. Access can depend on institutional sponsorship, gatekeepers, language, profession, age, perceived expertise, nationality, class position, organizational role, prior relationships, or the practical usefulness attributed to the researcher. Some of these properties may be relatively stable during fieldwork; others are interpreted differently by different participants or change through interaction.

Field position affects visibility. A researcher introduced by senior management may gain access to formal processes while encountering guarded behavior from junior staff. A researcher embedded with frontline workers may observe practical coordination while remaining distant from strategic decision making. Fluency in a local language can open informal interaction while also creating expectations about cultural familiarity. Digital fieldwork can provide extensive trace access while limiting embodied, spatial, or off-platform observation.

The methodological response is to document the position from which access occurs and examine how that position changes the evidential field. Hammersley and Atkinson's emphasis on reflexivity is useful precisely because the researcher is treated as part of the research situation as a participant in the research situation whose position can be examined Hammersley and Atkinson 2019.

Definition 7.117 (Field-position trajectory)**.** A *field-position trajectory* records changes in the researcher's access, attributed role, trust relations, participation, dependencies, institutional affiliations, and interactional possibilities during ethnographic inquiry.

This trajectory can help interpret changes in evidence. If sensitive topics begin to appear only after several months, the timing may reflect increasing trust. If some participants disappear after the researcher becomes associated with another group, the change may reflect field alignment. If access expands following organizational authorization, observed practice may still differ from settings outside the authorized pathway.

Field position also has ethical consequences. Participation can create obligations, expectations of assistance, exposure to confidential information, or risks for participants whose association with the researcher becomes visible. Researchers may encounter harmful conduct, urgent need, or conflicting responsibilities. These issues require more than reflexive description; they call for ethical judgment, institutional safeguards where appropriate, and attention to consequences for participants and communities.

Proposition 7.118 (Positional traceability)**.** *Ethnographic warrant is strengthened when changes in access, role attribution, trust, participation, and field alignment can be related to changes in the evidence available to the researcher.*

7.12.7 Reflexive Field Notes

Field notes create a documentary interface between lived encounter and later analysis. They can record scenes, dialogue, sequence, spatial arrangement, material objects, participant categories, emerging questions, interpretive hypotheses, uncertain-

ties, access changes, emotional responses, and decisions about what to pursue next. Emerson, Fretz, and Shaw emphasize that fieldnotes are constructed through selective attention, memory, descriptive choices, organization, coding, and revision as selective records shaped through the process of writing Emerson et al. 2011.

This constructed character makes provenance important. A brief note written during an interaction, an expanded account written that evening, a later analytic memo, and a coded excerpt occupy different positions in the evidential chain. Collapsing them into one undifferentiated record can obscure when interpretation entered the account. A reflexive note system therefore benefits from versioning and from distinguishable layers of observation and interpretation.

Definition 7.119 (Reflexive field-note chain)**.** A *reflexive field-note chain* is the recoverable sequence linking field encounter, contemporaneous notation where available, expanded description, interpretive memo, later coding or synthesis, and revisions to the researcher's understanding of the field.

This chain parallels the provenance disciplines developed for documentary and archival inquiry in Sections 7.10 and 7.11. Ethnographic perception is selective and conceptually mediated. The purpose of the chain is to preserve enough of the trajectory that later researchers, and the researcher at a later stage, can distinguish an observed manifestation from a subsequent inference with reasonable clarity.

Reflexive field notes can also record contingent encounter and aesthetic judgment explicitly. A researcher may note that an event felt unusually striking, elegant, troubling, contradictory, or generative before understanding why. Preserving that initial salience can be useful because later theory may otherwise rewrite the encounter as if its significance had been obvious from the beginning. Subsequent notes can then record how the initial impression was confirmed, revised, contextualized, or abandoned.

AI-assisted transcription, summarization, coding, and retrieval can support large ethnographic corpora, particularly where notes, interviews, images, and documents accumulate over long field periods. Such assistance should preserve source linkage and the distinction between researcher-authored description and model-generated synthesis. Sensitive ethnographic material can also create privacy and security risks when processed through external systems. The appropriate workflow depends on consent, data sensitivity, institutional obligations, and the potential consequences of disclosure.

Proposition 7.120 (Field-note provenance)**.** *Ethnographic analysis is strengthened when consequential interpretations remain traceable to the field-note stages, observations, interactions, and later analytic transformations through which they were produced.*

7.12.8 Limits of Ethnographic Access

Ethnographic access is dense yet partial. Researchers observe selected sites during finite periods, interact with a subset of participants, and encounter practices conditioned by their field position. Some relations occur in restricted spaces, private communication, moments of crisis, executive settings, households, informal networks,

or digital channels beyond the researcher's access. Ethical limits can appropriately prevent observation of vulnerable participants or highly sensitive activity. Language, mobility, institutional permission, cost, and time further shape what becomes observable.

Partiality calls for claim calibration while leaving room for well-supported local inference. A dense account of one organizational unit can strongly support a claim about how a practice is enacted there while providing weaker support for population prevalence. Repeated observation across settings can widen inferential reach, yet broader generalization still requires a specified bridge. Complementary documentary, interview, archival, quantitative, legal, or computational evidence may be appropriate when the claim extends beyond what field access can sustain.

Definition 7.121 (Ethnographic access profile)**.** An *ethnographic access profile* records the sites, periods, participant groups, activities, communication channels, roles, restrictions, ethical exclusions, and materially relevant inaccessible domains that bound the evidential field of an ethnographic study.

The profile should include absences created by the research design itself. Daytime observation may miss night-shift relations. Formal organizational access may exclude informal spaces. Participation in one group can reduce access to another. Digital observation may miss embodied and off-platform activity. Long residence in one location may deepen local understanding while narrowing comparative exposure. These are research-design properties that should remain visible in the interpretation of ethnographic evidence.

Reactive effects also require calibration. Participants can alter conduct when observed, yet this effect need not be constant. Some changes diminish with familiarity; others persist because the researcher's presence remains consequential. The relevant question is which relations appear sensitive to observation and what evidence supports that interpretation. Comparing periods, settings, observer roles, documentary records, or participant accounts can help reconstruct such effects.

Ethnographic interpretation also faces temporal limits. A stable practice observed over several months may later dissolve under policy change, turnover, crisis, technological transformation, or economic restructuring. Historical and archival evidence can therefore become important when a claim concerns persistence or origin. Similarly, an ethnographic snapshot of a rapidly changing field may require shorter temporal intervals and more explicit versioning.

Caution 7.122 (Ethnographic reach)*.* The inferential reach of ethnographic evidence should remain aligned with the sites, periods, participants, practices, and field positions through which the relevant relation became observable.

A final limit concerns recognition. Sustained presence can reveal relations unavailable through distant observation, but familiarity can also make recurring structures less noticeable. Deliberate comparison, return to early field notes, discussion with participants, movement across settings, and encounters with contradictory evidence can reopen attention. AI-assisted retrieval may surface forgotten passages or recurring patterns, yet algorithmic salience can reflect coding choices, frequency, or model expectations and therefore requires separate assessment of substantive importance.

Ethnographic inquiry therefore contributes a distinctive form of relational evi-

dence as one situated route into relational reality with identifiable strengths and limitations. Its strength lies in sustained access to enactment, context, practical meaning, tacit coordination, and situated change. Its limitations arise from partial presence, positionality, interpretation, ethics, temporal scope, and the uneven visibility of relations within the field. These properties make ethnography especially valuable when combined with the object, boundary, scale, relation-identification, characterization, persistence, configuration, documentary, and archival disciplines developed across Sections 7.3–7.11. The next section turns to interview-based inquiry, where participant accounts, memory, narration, and the interviewer–participant relation become the primary evidential interface.

7.13 Interview-Based Inquiry

Section 7.12 examined ethnographic access to relations through situated presence, observation, participation, and reflexive documentation. The present section turns to interview-based inquiry, where participant accounts become a primary evidential interface for reconstructing experience, interpretation, memory, relational meaning, and historically situated knowledge. Its role is to specify what interviews can contribute to relational inquiry, how interviewer–participant relations condition the evidence produced, and how narrative divergence, memory, silence, and comparison can be handled without treating testimony as transparent access to an underlying relation. The discussion proceeds through narrative accounts, relational accounts, experiential knowledge, memory, contradictory testimony, interviewer–participant relations, interpretation of silence, and comparative interview analysis.

The approach follows the ontology and epistemology developed in Chapters 4 and 5. Interview speech belongs to manifestational reality and can provide mediated access to relational reality through recollection, interpretation, narrative organization, categorization, and interaction. A participant may describe a relation directly, recount events from which a relation can be inferred, interpret the meaning of an institutional practice, or explain how a relation changed through time. These contributions can be evidentially valuable while remaining conditioned by memory, language, present interests, interviewer prompts, institutional setting, and the relational history of the interview encounter. Brinkmann and Kvale emphasize the practical, epistemological, and ethical dimensions of qualitative research interviewing and describe interview knowledge as produced through a social practice Brinkmann and Kvale 2015. Weiss similarly treats qualitative interviewing as a method for eliciting detailed accounts of events and experiences through a cooperative research relation Weiss 1994. Holstein and Gubrium develop an explicitly active conception of interviewing in which interviewer and participant contribute to the situated production of meaning Holstein and Gubrium 1995.

Within the present framework, these traditions support a relational interpretation of interview evidence without requiring a single theory of interview knowledge. Some research questions depend strongly on factual reconstruction, others on experience, meaning, institutional interpretation, narrative form, or disagreement among positions. The methodological task is therefore to specify what kind of claim an interview segment is being asked to support and what inferential bridge connects the

account to that claim.

Definition 7.123 (Interview-based relational access)**.** *Interview-based relational access* is mediated empirical access to relations through elicited participant accounts whose evidential significance depends on the account's content, production conditions, temporal position, interviewer–participant relation, and connection to the relational object under study.

Definition 7.123 keeps the interview encounter within the evidential architecture developed in Section 7.6. An interview can support relation identification, characterization, persistence analysis, configuration reconstruction, and historical interpretation, while the evidential route varies across these uses. Table 7.12 summarizes the main interview operations developed below.

7.13.1 Narrative Accounts

Narrative accounts organize events and relations through sequence, selection, emphasis, and retrospective interpretation. In relational inquiry, their value often lies in reconstructing how participants connect episodes through time: how a professional relationship formed, how trust changed, when an institutional rule became consequential, how an obligation was interpreted, or how a conflict reorganized a wider configuration. Narrative therefore contributes more than a list of remembered facts. It can reveal the participant's temporal organization of relational change.

A narrative account is still a present production about a past or ongoing configuration. Events may be compressed, causal connections sharpened, uncertainty reduced, or earlier meanings reinterpreted through later outcomes. These properties need not invalidate the account. They indicate that the interview contains several analytically distinguishable objects: recollected events, present interpretation of those events, narrative ordering, and the interview situation in which the account is produced.

Definition 7.124 (Narrative account profile)**.** A *narrative account profile* records the events, temporal ordering, actors, relations, turning points, interpretive categories, uncertainty markers, and present standpoint through which a participant reconstructs a relational trajectory.

The profile is useful when a study compares narrative chronology with documentary, archival, observational, or other interview evidence. A participant may remember that an informal collaboration preceded a formal agreement, while institutional records date the relation from contract signature. The difference can be substantively meaningful. It may distinguish practical formation from legal recognition, reveal retrospective reinterpretation, or expose disagreement about what counts as the beginning of the relation.

Narrative analysis should therefore preserve temporal markers with an appropriate degree of precision. Approximate phrases such as "around that period," "after the reorganization," or "before the new director arrived" can be analytically informative even when calendar dates remain uncertain. Converting such phrases into falsely exact dates would strengthen the representation beyond the evidence. Historical triangulation can later narrow the interval where the research question requires

Table 7.12: Interview operations and characteristic relational access

Interview operation	**Primary relational access**	**Potential analytical contribution**	**Characteristic limitation**
Narrative reconstruction	Sequenced accounts of events, episodes, transitions, and consequences	Reconstructs temporal ordering, perceived turning points, and participant-defined continuity	Narrative coherence can be produced retrospectively and may compress uncertainty or competing sequences
Relational elicitation	Accounts of dependence, authority, trust, obligation, access, conflict, care, exchange, and coordination	Identifies candidate relations and participant interpretations of relational properties	Named relations may rely on local categories whose meaning requires contextual reconstruction
Experiential inquiry	Felt consequences, practical knowledge, embodied difficulty, recognition, and situated judgment	Makes participant experience and first-person practical knowledge researchable	Experience does not by itself establish population prevalence or external mechanism
Memory reconstruction	Recollection of prior events, relations, routines, and change	Extends inquiry beyond directly observed periods and can reveal historical meaning	Recall is selective, reconstructive, temporally displaced, and influenced by later events
Contradictory-testimony analysis	Divergent accounts of a shared event, relation, category, or institutional process	Reveals positional differences, contested meaning, unequal information, or uncertainty	Divergence can arise from memory, incentives, vocabulary, temporal position, or genuinely different experiences
Interview-relation analysis	Prompting, trust, authority, identity attribution, language, disclosure conditions, and interactional sequence	Makes conditions of elicitation visible and supports interpretation of response variation	Reflexive analysis can become detached from the substantive research object if expanded without purpose
Silence analysis	Pauses, refusals, omissions, topic avoidance, inaccessible domains, and interviewer non-elicitation	Identifies candidate boundaries of disclosure, knowledge, legitimacy, or relevance	Silence is multiply interpretable and requires contextual or comparative evidence
Comparative interview analysis	Structured comparison across participants, positions, times, sites, and interview conditions	Distinguishes shared patterns from positional, institutional, and historical variation	Apparent comparability can exceed equivalence of prompts, categories, access, or participant positions

it.

Narrative form can also reveal attributed causality. Participants often connect events with formulations such as “because,” “after that,” or “that was when.” These connections provide evidence about participant interpretation and can orient mechanism reconstruction. Additional evidence is needed when the research claim concerns an external causal relation extending beyond the participant’s interpretation. This distinction preserves experiential and interpretive knowledge while keeping causal warrant proportionate to the evidence.

7.13.2 Relational Accounts

Interview participants frequently describe relations using categories such as colleague, friend, supervisor, client, partner, competitor, creditor, family member, ally, intermediary, or authority. These labels can provide efficient entry points into relational inquiry, yet the labels alone rarely characterize the relation sufficiently. The same category can contain substantial variation in dependence, reciprocity, obligation, trust, material exchange, authority, duration, emotional meaning, or exit capacity.

Relational elicitation therefore benefits from moving between category labels and concrete episodes. Questions about who was involved, what happened, what could be requested, what happened when expectations were violated, how decisions were made, and what alternatives were available can help connect named relations to the properties developed in Section 7.7. The goal is not to replace participant vocabulary with an external analytical vocabulary. The goal is to preserve both and make the translation between them explicit.

Proposition 7.125 (Relational elicitation discipline)**.** *Where an interview account supports a claim about a relation, analytical reconstruction should preserve the participant's relational category, the manifestations or episodes through which the relation is described, and the researcher's mapping from those materials to the analytical relation under study.*

Proposition 7.125 is especially important where local language carries institutional or historical meaning. A word translated as "support," "family," "connection," "trust," or "responsibility" may organize relations differently across communities, organizations, languages, or historical periods. Interview comparison can become misleading when such terms are treated as semantically identical before their practical use is reconstructed.

Relational accounts can also identify positions that remain weakly visible in records. Participants may know which person actually mediates access, whose approval carries informal weight, which team absorbs coordination work, or which relation becomes active only during crisis. Such accounts can orient configuration reconstruction, while later evidence should distinguish recurrent structure from a participant's local or positional interpretation.

Interview questions can themselves impose relational categories. Asking "Who do you trust?" assumes that trust is a relevant and sufficiently intelligible category for the participant. In some settings, asking about concrete reliance, disclosure, advice, risk sharing, or expected support may produce a more differentiated evidential basis. The choice depends on whether the study seeks participant-defined meanings, analytically specified relations, or comparison across cases. Interview design should state that choice.

7.13.3 Experiential Knowledge

Interviews provide access to forms of experiential knowledge that may remain difficult to reconstruct from external observation or documents. Participants can describe what an institutional process felt like, which constraints became practically

salient, how uncertainty was navigated, what forms of dependence were recognized, or which interactions altered their willingness to act. Such accounts are particularly valuable when the research object includes subjective orientation, practical judgment, perceived possibility, or relational meaning.

Experiential knowledge has its own evidential domain. A participant can be well positioned to report pain, fear, confidence, confusion, recognition, humiliation, relief, perceived obligation, or felt dependence. The same account may be less well positioned to establish population frequency, hidden institutional motives, or the full mechanism producing the experience. The evidential strength should therefore be indexed to the claim being made.

Definition 7.126 (Experiential warrant)**.** *Experiential warrant* is the claim-relative evidential support provided by a participant's situated account of experience, practical knowledge, interpretation, or perceived possibility within a specified relational context.

Experiential warrant can be strengthened through detailed episodes, internal consistency, repeated observation across time, comparison among positions, and convergence with other evidence. Divergence can also be informative. Two participants can experience the same institutional procedure very differently because their positions, expectations, resources, histories, or exposure differ. The methodological task is then to reconstruct the relational conditions of the difference while preserving those differences during analysis.

Experiential accounts can also contain knowledge of practice acquired through repeated participation. Workers may know how a formal procedure is practically navigated; patients may know where access bottlenecks occur; migrants may know which documentary steps create delay; researchers may know how review practices operate beyond written guidelines. Such knowledge can be highly specific, unevenly distributed, and difficult to articulate until the interview provides occasions for concrete reconstruction.

Researchers should retain the distinction between participant interpretation and researcher extension. If a participant describes a service as inaccessible, the interview strongly supports a claim about experienced inaccessibility under that participant's conditions. A broader claim about institutional accessibility requires additional evidence concerning other participants, eligibility structures, geography, cost, language, timing, or other relevant relations. Epistemic humility here protects the value of the participant account by keeping it from carrying claims beyond its evidential domain.

7.13.4 Memory

Memory extends interview inquiry beyond the period of direct observation. It can provide access to earlier relational configurations, changing meanings, episodes of formation or dissolution, and historical conditions that have left weak documentary traces. At the same time, recollection is produced from a later temporal position. Subsequent events can alter salience, interpretation, sequence, and the categories through which earlier experience is narrated.

The methodological response should preserve memory as temporally situated evidence. A participant's present recollection can support claims about remembered events and present interpretation while carrying uncertainty about chronology, wording, frequency, or detail. Different dimensions of an account may have different levels of confidence. Participants sometimes explicitly distinguish what they remember clearly, infer retrospectively, heard from others, or remain unsure about. Such metacognitive markers should be retained in the research record.

Definition 7.127 (Memory-position profile)**.** A *memory-position profile* records the temporal distance of an account, the participant's position during the recalled episode, later experiences likely to shape interpretation, expressed confidence, source mixing, and external traces available for temporal or substantive cross-checking.

Memory uncertainty is more informative when decomposed by claim type than when collapsed into a global credibility score. A participant may remember the existence of a relationship with high confidence while remaining unsure about the exact date of a meeting. Another may remember an institutional decision clearly but reinterpret its meaning after later conflict. Decomposing the account by claim type can preserve useful evidence while keeping local uncertainty visible.

Collective memory also matters. Participants can reproduce organizational stories, family narratives, professional folklore, public histories, or institutional explanations that circulate beyond individual recollection. These accounts may provide evidence about shared representations even when their correspondence to earlier events remains uncertain. In such cases, the research object should distinguish historical event reconstruction from the later relational effects of the remembered narrative.

Archive and interview can therefore correct one another. Documentary evidence can help establish dates, sequences, and formal decisions; interviews can reveal practical consequences, interpretations, informal relations, and experiences weakly represented in the record. Apparent conflict between memory and archive can become an object of inquiry where the discrepancy reflects different event definitions, institutional categories, or later reinterpretation.

7.13.5 Contradictory Testimony

Contradictory testimony is common where participants occupy different relational positions, possess unequal information, recall different moments, use different categories, or have stakes in how an event is represented. Relational methodology should therefore resist treating contradiction as a defect that has to be eliminated before analysis can proceed. Divergence can reveal the structure of the field in which testimony is produced.

Several sources of contradiction should be distinguished. Participants may disagree about an observable event, about its sequence, about the relation connecting events, about the meaning of an action, about responsibility, or about the persistence of a relation. These disagreements call for different forms of adjudication. Documentary evidence may help with dates; observation may help with enacted practice; additional interviews may reveal position-specific interpretation; formal records may

clarify institutional status; uncertainty may remain where the evidence is genuinely incomplete.

Definition 7.128 (Testimonial divergence profile)**.** A *testimonial divergence profile* records the claims in disagreement, participant positions, temporal standpoints, informational access, relevant incentives, category differences, supporting evidence, and the degree to which the divergence can be adjudicated within the available research design.

The profile keeps disagreement analytically decomposed. If a manager and employee provide different accounts of a workplace decision, the divergence may reflect authority, information asymmetry, strategic presentation, different definitions of the decision, or genuinely different experiences of implementation. A simple choice of one account as credible can erase the relational structure that generated the disagreement.

Contradiction can also indicate multiplexity. Two participants may describe the same pair as cooperative and conflictual because collaboration and competition coexist across different domains. What appears to be inconsistency can therefore motivate a revision of the relational characterization. Similarly, accounts that diverge across time can indicate transformation and should be assessed before being classified as testimonial unreliability.

Proposition 7.129 (Divergence as relational evidence)**.** *Where testimonial divergence is systematically associated with participant position, access, temporal standpoint, or relational domain, the pattern of disagreement can itself provide evidence about the configuration under study.*

Proposition 7.129 does not make disagreement self-validating. Contradiction can also arise from error, memory limitations, misunderstanding, or weak interview design. The proposition identifies a research possibility: patterned disagreement may carry information about relational organization and therefore deserves analysis before being treated as noise.

7.13.6 Interviewer–Participant Relations

The interview is itself a relation. Questions, follow-up prompts, disclosure, trust, perceived authority, identity attribution, language choice, institutional affiliation, recording practices, and expectations about use can influence what becomes sayable and how an account is organized. Holstein and Gubrium's active-interview perspective is especially useful here because it foregrounds the interview encounter as a site of meaning production Holstein and Gubrium 1995. Brinkmann and Kvale likewise place the social and ethical conditions of interviewing within the methodology of interview research Brinkmann and Kvale 2015.

Reflexive analysis should remain connected to the substantive object. The relevant question is which features of the interviewer–participant relation plausibly affected access, disclosure, interpretation, or response form. Age, professional status, organizational sponsorship, language competence, perceived political or institutional alignment, prior acquaintance, and recording arrangements can matter in some studies while remaining less consequential in others.

Definition 7.130 (Interview-relation profile)**.** An *interview-relation profile* records those features of the interviewer–participant relation that plausibly condition elicitation, disclosure, interpretation, or later use of the interview evidence.

The profile can include changes through the interview or across repeated encounters. Trust may increase, fatigue may accumulate, a sensitive topic may change the interaction, or the participant may revise their understanding of the research purpose. Repeated interviews can therefore provide access to relational change within the research encounter itself. This should be documented where it affects interpretation.

Question formulation is part of this relation. Leading assumptions, category choices, sequencing, requests for examples, pauses, and follow-up questions shape the space of possible responses. A transcript therefore preserves interactional production as well as participant speech. Analyses focused on narrative content may reasonably abstract from some interactional detail, while claims about hesitation, disclosure, category formation, or contested meaning may require closer attention to sequence and wording.

Power and ethics are also integral. Participants may perceive consequences for speaking, especially where interviews concern employers, governments, service providers, funders, families, or other consequential relations. Confidentiality procedures, recruitment pathways, consent, data storage, quotation practices, and the possibility of deductive identification can influence both participation and disclosure. Ethical design is therefore connected to evidential quality as well as participant protection.

7.13.7 Interpretation of Silence

Silence in an interview can take several forms: a pause, refusal, topic shift, minimal response, omission, claimed lack of knowledge, emotional interruption, or the absence of a topic that the researcher expected to appear. These forms may be analytically significant, but their meaning is underdetermined. Silence can reflect privacy, fear, uncertainty, irrelevance, fatigue, distrust, linguistic difficulty, interviewer error, institutional constraint, or a participant's judgment that the question is poorly framed.

Interview silence therefore requires the same restraint developed for documentary and archival silence in Sections 7.10 and 7.11. Non-response should not be converted directly into evidence for a hidden relation. The methodological task is to reconstruct the conditions under which the silence occurred and identify what additional evidence could distinguish among plausible interpretations.

Definition 7.131 (Interview-silence profile)**.** An *interview-silence profile* records the form, timing, topic, interactional context, prior and subsequent exchange, participant position, possible disclosure constraints, and comparative evidence relevant to interpreting a silence or omission.

Repeated patterns can strengthen interpretation. If participants from one institutional position consistently avoid a topic that participants elsewhere discuss freely, the pattern may justify inquiry into disclosure risk, category boundaries, shared un-

certainty, or institutional norms. The interpretation remains a hypothesis until supported by further evidence. Follow-up interviews, changed wording, alternative interviewers, documentary evidence, observation, or confidential recruitment can help distinguish among explanations.

The researcher also produces silence through interview design. Topics left unasked, categories excluded from the guide, inaccessible participants, time limits, translation constraints, or early coding decisions can create absences later misread as participant silence. This is one reason interview guides and analytic revisions should remain versioned. A later discovery that an important relation was poorly elicited can then be linked to a specific design history.

Silence can also possess ethical meaning. Participants may choose not to disclose information whose revelation could expose themselves or others to harm. Treating such refusal as a technical obstacle would mischaracterize the research relation. In some settings, preserving the boundary of non-disclosure is part of responsible inquiry even when it limits the resulting evidence.

7.13.8 Comparative Interview Analysis

Comparative interview analysis moves from individual accounts toward patterned variation across positions, sites, periods, or relational configurations. Its purpose can include identifying recurring interpretations, comparing experiences of the same institution, tracing relation-specific vocabularies, reconstructing historical change, or examining how relational position shapes knowledge and narrative.

Comparison requires more than placing transcripts side by side. Participants may have received different prompts, occupied different positions, spoken at different historical moments, or used terms with different meanings. A relational comparison should therefore record the dimensions on which accounts are treated as comparable and preserve relevant asymmetries in access and context.

Definition 7.132 (Comparative interview matrix)**.** A *comparative interview matrix* is a structured representation that relates interview claims to participant positions, relational roles, sites, periods, elicitation conditions, evidential domains, and uncertainty so that patterns and divergences can be compared without presuming full equivalence among accounts.

The matrix can support several forms of comparison. Positional comparison asks how accounts vary between managers and workers, providers and users, center and periphery, or insiders and intermediaries. Temporal comparison examines how accounts change before and after an institutional transition. Site comparison considers how a similar formal rule is experienced under different local relational configurations. Within-participant comparison can examine changes across repeated interviews or across different narrative domains.

Sampling should follow the relational question. A study of institutional access may need participants occupying distinct gatekeeping, applicant, intermediary, and administrative positions. A study of relational persistence may need participants connected to different phases of the relation's history. A study of disputed meaning may need deliberately heterogeneous interpretive positions. Numerical balance can be

useful for some designs, while relational coverage may be more important for others.

Comparative analysis can also combine interviews with the evidential modes developed in preceding sections. Documentary records can clarify formal status, archival inquiry can reconstruct earlier categories, ethnography can reveal enacted practice, and interviews can provide participant interpretation and experience. Divergence among these sources should remain visible where it is analytically meaningful. Triangulation in later Section 194 will develop this coordination more systematically.

AI-assisted analysis can expand the practical scale of interview comparison through transcription, translation, retrieval, thematic grouping, relation extraction, and comparison of narrative segments. These capabilities can enlarge the encounter surface of a large corpus, making unexpected similarities, contradictions, or absences easier to notice. The same tools can also normalize vocabulary, flatten hesitation, mistranslate local categories, or create apparent thematic consistency through model-generated coding. Source-linked review and preservation of the original interview record therefore remain important when an AI-assisted transformation supports a substantive claim.

Contingent encounter and aesthetic judgment retain a distinctive role in interview research. An unexpected phrase, contradiction, metaphor, hesitation, relation named in passing, or surprising similarity across distant participants can make a possible structure salient before the research design contains a category for it. Such moments can motivate revised questions, new comparisons, or reconstruction of the research object. Their value lies in opening inquiry; later evidential work determines whether the perceived relation persists across accounts, contexts, and other forms of evidence.

Proposition 7.133 (Interview reconstruction discipline)**.** *Interview-based relational claims are strengthened when the research record preserves the participant account, the conditions of elicitation, the interpretive transformation, the comparison set, and the inferential bridge connecting the account to the relational claim.*

Proposition 7.133 summarizes the section's methodological orientation. Interview inquiry can contribute unusually rich evidence about experience, memory, meaning, practical knowledge, contested interpretation, and relational history. Its evidential strength increases when these contributions remain differentiated and traceable. Narrative coherence, experiential authority, recollection, silence, and interviewer rapport each support particular kinds of inference under particular conditions. The next section turns to legal inquiry, where formal norms, legal categories, jurisdiction, doctrine, institutional authority, and legal interpretation provide a different mode of access to relational structure.

7.14 Legal Inquiry

Sections 7.10–7.13 developed documentary, archival, ethnographic, and interview-based routes into relational inquiry. The present section examines legal inquiry as a distinct mode of access to relations that are classified, authorized, constrained, enabled, recognized, contested, or transformed through legal institutions. Its role is to

specify how legal categories, rights, duties, authority, legal relations, jurisdiction, institutional interpretation, legal change, and legal infrastructures can enter relational research without equating formal legal representation with the full relational configuration in which law operates. The discussion combines analytical jurisprudence, legal reasoning, socio-legal interpretation, and the relational methodology developed earlier in this chapter.

Legal inquiry can contribute several kinds of evidence. A legal text can identify a formally recognized status or rule; a judgment can disclose an institutional interpretation; an administrative decision can instantiate legal authority in a particular case; a contract can constitute obligations among parties; a jurisdictional rule can delimit the competence of an institution; and observed practice can show how formally specified relations are enacted, modified, resisted, or supplemented. These evidential functions overlap, yet they support different claims. Hart's analysis of primary and secondary rules provides one influential account of the institutional organization through which rules can be recognized, changed, and adjudicated Hart 2012. Hohfeld's analysis of legal conceptions offers a more fine-grained vocabulary for relational legal positions such as rights, duties, privileges, powers, liabilities, immunities, and disabilities Hohfeld 1919. MacCormick's work on legal reasoning emphasizes interpretation, classification, precedent, analogy, coherence, and defeasibility within institutional argument MacCormick 2005. Moore's analysis of semi-autonomous social fields, meanwhile, provides an important socio-legal precedent for examining formal law together with partially autonomous practices of rule formation and compliance Moore 1973.

Within the present framework, these traditions support a layered approach to legal inquiry. Legal norms and classifications belong to manifestational and institutional orders that can condition relational reality, while their practical consequences depend on interpretation, enforcement, organizational capacity, social practice, and historically situated relations. Legal inquiry therefore asks both what a legal order specifies and how that specification enters a relational configuration.

Definition 7.134 (Legal relational inquiry)**.** *Legal relational inquiry* is the reconstruction of relations through legal categories, sources, institutions, interpretations, jurisdictions, and enacted practices, with explicit attention to the distinction between formally specified legal positions and the relational configurations through which those positions are realized, contested, or transformed.

Definition 7.134 gives legal materials a substantive methodological role while preserving ontological and epistemic restraint. A legally recognized relation can be important in its own right, yet a researcher should still specify the source, institutional competence, interpretive pathway, temporal scope, jurisdiction, and evidence connecting formal legal status to the relational claim under study. Table 7.13 summarizes the principal legal operations developed below.

7.14.1 Legal Categories

Legal inquiry often begins with categories. Legal systems classify persons, organizations, assets, transactions, events, territories, statuses, injuries, permissions, and forms of responsibility through terms whose consequences can be considerable. Ex-

Table 7.13: Legal inquiry operations and characteristic relational access

Legal operation	Primary relational access	Potential analytical contribution	Characteristic uncertainty
Category reconstruction	Legal classifications and status criteria	Identifies how persons, entities, events, and objects become legally intelligible	Category scope, historical change, contested classification
Rights and duties analysis	Correlative or otherwise connected legal positions	Clarifies claims, obligations, permissions, remedies, and institutional recognition	Source hierarchy, exceptions, enforceability, interpretation
Authority analysis	Competence to create, interpret, apply, or revise legal consequences	Reconstructs legal powers and institutional pathways	Delegation, ultra vires action, practical capacity, contested competence
Legal-relations mapping	Structured legal positions among actors and institutions	Connects legal status with relational configuration	Multiplexity, overlapping regimes, practical enactment
Jurisdiction analysis	Spatial, personal, subject-matter, and institutional competence	Specifies where and over whom legal authority is claimed or recognized	Overlap, conflict, extraterritoriality, forum and enforcement limits
Interpretive reconstruction	Institutional reasoning and application of legal materials	Traces how categories and rules acquire operative meaning in cases	Precedent, ambiguity, discretion, institutional variation
Legal-change analysis	Temporal transformation of legal positions and institutions	Reconstructs creation, amendment, reinterpretation, repeal, and transition	Lag, transitional rules, implementation, path dependence
Infrastructure analysis	Legal conditions shaping broader relational possibilities	Shows how law can stabilize, channel, enable, or constrain economic and social relations	Difference between formal design and enacted relational effect

amples include employee, tenant, creditor, dependent, corporation, resident, public body, regulated entity, beneficial owner, protected work, taxable income, contractual offer, administrative act, and legally relevant harm. Such categories can organize rights, duties, procedures, remedies, evidentiary burdens, eligibility, and institutional competence.

A relational methodology should treat legal categories as historically and institutionally generated specifications. Their presence in authoritative materials may establish how a legal order formally classifies a case, while the research task can extend to how the classification was produced, which relations it recognizes, which relations it leaves weakly represented, and how the category is enacted in practice. This is consistent with the documentary discipline developed in Section 7.10: the existence of a category in a legal text establishes a particular legal manifestation, while further inference is required before the category is treated as a complete description of the relevant social or economic relation.

Legal categories can be constitutive as well as descriptive. Classification as a corporation, spouse, license holder, employee, beneficiary, debtor, or rights holder can alter the legal relations available to an actor. The legal category can therefore en-

ter the causal and generative structure of the field. At the same time, institutional recognition can be incomplete, disputed, or practically difficult to obtain. A classification may be formally available while access to the procedures needed to establish it remains uneven.

Definition 7.135 (Legal-category profile)**.** A *legal-category profile* records the category's authoritative source, criteria of inclusion, exclusions, legal consequences, relevant jurisdiction, temporal validity, interpretive disputes, institutional pathway of recognition, and relation to the empirical object under study.

The profile helps prevent a category from becoming an unexamined analytical primitive. A researcher studying platform work, for example, may encounter several legal and administrative classifications that overlap imperfectly with participants' practical relations. The methodological task is to retain the category's legal consequences while also examining the relations through which work, control, dependence, risk, and remuneration are organized. A similar discipline applies to property, family status, organizational form, migration status, and other domains in which legal categories structure access and obligation.

Category translation also requires care in comparative and historical research. A term may have different doctrinal content across jurisdictions or periods even when translated by the same English label. Conversely, differently named categories may perform partially comparable legal functions. Comparative inquiry therefore benefits from reconstructing category criteria and consequences before assuming equivalence.

7.14.2 Rights

Rights provide one of the most important relational objects in legal inquiry. A right can connect a rights holder to another actor, an institution, a protected domain, a procedure, or a remedy. Hohfeld's analysis is useful here because it differentiates several legal positions that ordinary language frequently groups under the language of rights Hohfeld 1919. The distinction between claim-rights, privileges, powers, and immunities, together with their correlatives, provides a disciplined starting point for relational reconstruction.

Within GRE and broader GR inquiry, rights should be analyzed through several dimensions. The first concerns the legal position itself: what conduct, status, claim, competence, or protected domain is recognized? The second concerns the correlated position of other actors or institutions. The third concerns institutional realization: which body recognizes, enforces, adjudicates, or remedies the right? The fourth concerns access: what procedures, resources, evidence, standing, language, time, or representation are needed to make the right practically usable? The fifth concerns interaction with other legal and non-legal relations.

This distinction is particularly important when formal rights and practical capabilities diverge. A right can exist as a legally recognized position while its practical exercise remains costly, uncertain, delayed, or dependent on intermediaries. The resulting research question is not whether the formal right is unreal. The question is how formal recognition interacts with access, institutional capacity, social relations, and material conditions.

Rights can also be multiplex. The same relation may include property rights, contractual rights, procedural rights, informational rights, organizational rights, and public-law protections. These positions can reinforce or constrain one another. A research design should therefore specify which legal position is under study and avoid compressing several distinct rights into a single variable unless the aggregation is substantively justified.

Rights also possess temporal structure. They can vest, expire, be suspended, waived, transferred, inherited, limited, or altered through later legal acts. A longitudinal study should therefore link rights analysis to the persistence methodology developed in Section 7.8. The continued use of the same legal label may coexist with changes in scope, remedy, institutional interpretation, or practical accessibility.

7.14.3 Duties

Duties provide a complementary route into legal relations. They can require action, restraint, disclosure, care, payment, performance, compliance, or the fulfillment of a procedural condition. The relational importance of a duty depends partly on the actor to whom it is owed, the institution capable of determining breach, the consequences attached to breach, and the legal setting within which performance is evaluated.

A duty should therefore be reconstructed with greater specificity than a binary indicator of obligation. Relevant dimensions may include the duty bearer, beneficiary or protected interest, triggering conditions, content of performance, temporal requirements, standards of conduct, exceptions, defenses, monitoring arrangements, remedies, and institutional pathway of enforcement. Some duties operate primarily through ex post adjudication; others are embedded in licensing, supervision, reporting, fiduciary relations, professional regulation, contractual governance, or administrative procedure.

The connection between rights and duties can be analytically powerful, yet the relation should not be generalized mechanically. Hohfeld's claim-right and duty correlation provides a precise legal structure for a particular class of legal positions Hohfeld 1919. Other positions, such as privileges, powers, and immunities, have different correlatives. A relational legal methodology therefore benefits from identifying the specific legal position before inferring the structure of the corresponding relation.

Duties can also be distributed across institutional levels. A statute may assign a duty to an organization, internal rules may allocate performance among units, and practical execution may depend on frontline staff, software systems, contractors, or professional judgment. A failure at the point of delivery can therefore arise from several relational locations. Multiscale inquiry from Section 7.5 is useful here: organizational duty, delegated authority, operational responsibility, and individual action may occupy different scales while remaining connected through an institutional pathway.

The same approach helps distinguish legal responsibility from causal contribution or moral responsibility. These concepts can overlap while remaining analytically different. A legal inquiry should identify the rule and institutional basis through which responsibility is attributed before extending the claim into broader normative or causal analysis.

7.14.4 Authority

Authority concerns legally recognized competence to create, interpret, apply, modify, or determine legal consequences. It can attach to legislatures, courts, administrative agencies, local authorities, private bodies exercising delegated functions, corporate organs, arbitrators, contractual decision makers, and other institutions whose acts receive legal significance. Hart's distinction between primary rules and secondary rules is relevant because secondary rules help organize recognition, change, and adjudication within a legal system Hart 2012.

For relational inquiry, legal authority is best reconstructed as a pathway rather than assumed from institutional title alone. A body may possess formal competence while practical decision-making is distributed through delegation, procedure, professional interpretation, information systems, budgetary constraints, and review mechanisms. Conversely, an actor may exercise substantial practical influence without possessing the legal competence to make a binding determination.

Definition 7.136 (Authority pathway)**.** An *authority pathway* is a traceable sequence connecting a legally recognized competence to the actors, procedures, delegations, interpretations, records, and review mechanisms through which that competence is exercised in a particular relational setting.

Authority-pathway reconstruction can expose several forms of divergence. Formal competence may be delegated; delegated competence may be constrained by procedure; procedural discretion may be shaped by institutional guidance; automated systems may structure available choices; and review bodies may alter the practical meaning of an initial decision. These layers are especially relevant when legal authority intersects with economic allocation, licensing, welfare administration, employment, taxation, migration, financial regulation, or platform governance.

Authority also has boundaries. A decision can exceed competence, apply only to specified persons or subjects, depend on a valid delegation, or become effective only after procedural requirements are satisfied. Research should therefore connect authority to jurisdiction, source hierarchy, and institutional interpretation rather than treating legal power as a free-standing actor attribute.

The distinction between authority and influence is equally important. Political, economic, professional, reputational, or technological power may shape a legal decision without itself constituting legal authority. Later GRE analysis of power can examine these interactions, while legal inquiry specifies which actions receive legally recognized competence and consequence.

7.14.5 Legal Relations

The previous subsections provide components for reconstructing legal relations. A legal relation can connect persons, organizations, public bodies, assets, territories, procedures, or legally constituted positions through rights, duties, powers, liabilities, immunities, statuses, permissions, prohibitions, and remedies. The relation can be bilateral, multilateral, nested, institutional, or higher-order. It can also intersect with social, economic, symbolic, technological, or organizational relations that are only partially captured by legal categories.

Hohfeld's framework offers a classic demonstration that legal positions can be analyzed relationally rather than as isolated attributes Hohfeld 1919. The present methodology extends that insight toward empirical reconstruction. A researcher can ask which legal positions exist, which sources establish them, which institutions interpret them, how they are recognized or enforced, and how they interact with the wider relational configuration.

Definition 7.137 (Legal-relation profile)**.** A *legal-relation profile* records the relevant legal positions, relata, authoritative sources, jurisdiction, temporal scope, institutional interpreters, enforcement or remedy pathways, practical enactment, intersecting non-legal relations, and significant uncertainties associated with a legal relation.

This profile is useful when formal legal relation and empirical relation do not align neatly. An employment relation, for example, can contain contractual positions, statutory protections, managerial authority, economic dependence, workplace norms, professional obligations, technological monitoring, and informal expectations. Legal analysis can specify some of these dimensions with considerable precision while leaving others to ethnographic, interview, documentary, quantitative, or institutional inquiry.

Legal relations can also be higher-order. A guarantee can condition a credit relation; corporate law can constitute decision-making positions that organize contractual relations; procedural law can determine how substantive claims are recognized; insolvency rules can reorder relations among multiple creditors; and jurisdictional rules can determine which institution may interpret a disputed relation. Section 7.9 provides a general framework for such relations among relations.

A relational legal map should therefore preserve multiplexity. Collapsing several legal and non-legal relations into a single edge may conceal the mechanism through which law becomes consequential. When simplification is analytically useful, the omitted dimensions can be retained as characterization or configuration remainders for later analysis.

7.14.6 Jurisdiction

Jurisdiction specifies a dimension of legal boundary construction. It concerns the competence of institutions to make, interpret, adjudicate, administer, or enforce legal consequences with respect to persons, territory, subject matter, transactions, or other legally defined connections. Jurisdiction is therefore closely connected to the boundary methodology developed in Section 7.4, while adding a specifically legal account of competence and legal reach.

A jurisdictional analysis can distinguish several dimensions. Territorial jurisdiction concerns legally relevant spatial connections. Personal jurisdiction concerns persons or entities subject to an institution's competence. Subject-matter jurisdiction concerns the kinds of disputes or decisions an institution may address. Temporal jurisdiction concerns when competence applies. Functional jurisdiction can distinguish law-making, adjudication, administration, review, and enforcement. These dimensions can overlap without being identical.

Cross-border and multilevel relations make jurisdiction especially important. A single economic relation may engage contract law, tax law, labor law, corporate law, data regulation, financial regulation, public law, or international legal arrangements across several institutional levels. The applicable legal relation can therefore depend on connecting factors, choice-of-law rules, forum, recognition, enforcement, organizational structure, and the practical location of activities or assets.

Definition 7.138 (Jurisdictional scope profile)**.** A *jurisdictional scope profile* records the institution claiming or exercising competence, the legal basis of that competence, its territorial, personal, subject-matter, temporal, and functional scope, relevant overlaps or conflicts, and the practical conditions of recognition and enforcement.

The profile helps distinguish legal reach from practical reach. A legal order may assert competence while enforcement remains difficult; an organization may structure activity across several jurisdictions; or a transnational relation may be governed through overlapping public and private legal arrangements. The presence of jurisdictional complexity can itself become a relational finding, particularly when actors reorganize transactions, organizational forms, data flows, or contractual positions in response to differences among legal regimes.

Jurisdiction is also scale-sensitive. Local, regional, national, supranational, international, organizational, and contractual ordering can interact. A multiscale study should specify the pathways through which rules and decisions at one level become consequential at another rather than assuming direct transmission.

7.14.7 Institutional Interpretation

Legal materials acquire operative meaning through institutional interpretation. Statutes, regulations, precedents, contracts, administrative guidance, constitutional provisions, and other legal sources can contain ambiguity, open texture, conflicting principles, exceptions, or classification problems. MacCormick's analysis of legal reasoning is useful here because it treats interpretation, precedent, analogy, coherence, consequences, and defeasibility as structured components of legal argument rather than reducing legal judgment to mechanical deduction MacCormick 2005.

For relational inquiry, interpretation matters because a formally stated rule can support several possible applications before an institution resolves or narrows the question. Courts, agencies, arbitrators, administrative officials, corporate counsel, regulators, and other legal actors can develop interpretive practices that condition how categories and relations are realized. These practices may themselves vary across institutional levels, periods, or types of case.

An institutional interpretation should therefore be reconstructed through the source material and argumentative pathway supporting it. Relevant evidence can include authoritative decisions, reasoning, precedent, procedural posture, interpretive guidance, administrative practice, later review, and patterns across cases. A research design should distinguish the researcher's interpretation of a legal source from an interpretation adopted by an institution with legally recognized competence.

Definition 7.139 (Institutional interpretation chain)**.** An *institutional interpretation chain* records the legal materials, interpretive claims, institutional actors, procedural

setting, reasons, precedential or administrative relations, later review, and practical consequences through which a legal meaning becomes operative in a specified context.

This chain is particularly useful when legal interpretation changes incrementally. A formal text can remain stable while accumulated decisions, guidance, enforcement practices, or institutional conventions alter its effective meaning. Longitudinal legal inquiry should therefore track interpretive history alongside textual amendment.

Comparative interpretation requires similar caution. Two institutions may cite similar language while applying different doctrinal tests or evidentiary assumptions. Conversely, different legal vocabularies may produce partially comparable functional outcomes. The methodology should preserve these differences until the basis of comparison is explicit.

AI-assisted legal research can expand retrieval across cases, statutes, regulations, administrative materials, and contracts, and can help identify patterns of citation or interpretation. These tools can also compress contested reasoning into generated summaries, miss jurisdictional hierarchy, conflate current and superseded law, or produce plausible legal propositions without adequate source support. Source-linked verification, temporal validity, jurisdictional scope, and institutional authority therefore remain central when AI-assisted transformations support a legal claim.

7.14.8 Legal Change

Legal relations evolve through legislation, amendment, repeal, judicial interpretation, administrative rulemaking, contractual revision, constitutional change, institutional reorganization, and shifts in recognized practice. Legal change can therefore alter categories, rights, duties, authority, jurisdiction, remedies, and the institutional pathways through which legal positions are realized.

A relational approach distinguishes several temporal moments. A new legal rule can be formally adopted at one time, enter into force at another, receive implementing regulations later, become interpreted through subsequent cases, and produce uneven changes in organizational practice over a longer interval. The date of legal change is therefore often multidimensional. A research design should specify whether it studies enactment, legal effectiveness, institutional interpretation, compliance, organizational adaptation, or broader relational consequences.

Moore's analysis of the semi-autonomous social field provides a useful reminder that formal legal change enters fields that may possess their own rule-making practices, enforcement arrangements, and capacities for adaptation Moore 1973. The empirical effect of a legal reform can therefore depend on how organizations, professional groups, communities, markets, families, or other relational configurations interpret and absorb it. This does not diminish the legal significance of formal reform; it clarifies the additional pathways through which legal change becomes social and economic change.

Definition 7.140 (Legal-change profile)**.** A *legal-change profile* records the formal legal transition, effective dates, transitional rules, affected legal positions, interpretive developments, implementation pathways, organizational adaptation, enforcement

conditions, and observed relational consequences relevant to the research question.

The profile helps distinguish textual continuity from relational continuity and textual change from relational transformation. A new statute may leave some practices largely stable; a reinterpretation of an existing rule may substantially alter institutional behavior; an administrative change may reshape practical access without changing the underlying statutory text. Historical and archival methods from Sections 7.10 and 7.11 can help reconstruct these trajectories.

Legal change also invites scale analysis. A national reform can be implemented differently across organizations or localities, while local institutional innovations can later influence wider legal development. The cross-scale pathways should be demonstrated through evidence rather than inferred from temporal sequence alone.

7.14.9 Law as Relational Infrastructure

The preceding analysis supports a broader methodological use of law within GR and GRE. Law can be investigated as relational infrastructure: a set of categories, statuses, rights, duties, powers, procedures, jurisdictions, remedies, and institutional practices that conditions which relations can be formed, stabilized, transformed, contested, or dissolved. This infrastructural perspective is particularly relevant to economic inquiry because property, contract, corporate organization, employment, finance, taxation, public administration, insolvency, intellectual property, and regulation can structure access, authority, risk, transfer, accountability, and value conversion.

Treating law as relational infrastructure requires two forms of restraint. First, formal legal structure should retain its specificity. Legal categories and institutional decisions can have consequences that should not be translated away into generic social relations. Second, formal law should not be presumed to exhaust the relational field. Moore's semi-autonomous-field analysis illustrates how social fields can develop rulemaking and compliance practices while remaining situated within wider legal and political orders Moore 1973. Ethnographic, interview, documentary, archival, quantitative, and institutional inquiry can therefore complement doctrinal analysis by examining how legal infrastructures are enacted in particular settings.

Proposition 7.141 (Legal-infrastructure reconstruction)**.** *Relational inquiry into law is strengthened when legal categories and authoritative sources are reconstructed together with jurisdiction, institutional interpretation, implementation pathways, practical access, and the wider configuration in which legal positions become consequential.*

Proposition 7.141 does not imply that each legal study requires a full socio-legal reconstruction. The appropriate depth depends on the research question. A doctrinal question may center on authoritative sources and institutional reasoning. An economic or organizational question may require closer attention to implementation, access, enforcement, and informal ordering. A historical question may require reconstruction of changing legal categories and institutional competence. The methodological requirement is correspondence between the claim and the evidential layers on which it depends.

Legal inquiry also provides a strong example of the distinction between relation identification and relation characterization developed in Sections 7.6 and 7.7. A legal

source may establish that a recognized position exists, while its intensity, accessibility, dependence, asymmetry, practical meaning, or interaction with other relations can require additional evidence. Likewise, formal legal continuity can coexist with substantial change in interpretation or enactment, linking legal inquiry to the persistence analysis of Section 7.8.

Contingent encounter and aesthetic judgment can contribute to legal inquiry at the stage of orientation. An unexpected doctrinal distinction, unusual case, jurisdictional mismatch, anomalous administrative pattern, old legal category, or contradiction between formal status and lived practice can make a relational problem salient before its significance is fully understood. Subsequent legal and empirical inquiry can determine whether the encounter reveals a broader structure, a local exception, a transitional artifact, or a misclassification. AI-mediated access may substantially enlarge this encounter surface by making large bodies of legal material searchable and comparable, while the abundance of candidate analogies and generated interpretations increases the importance of source authority, jurisdiction, temporal validity, and responsible judgment.

Legal inquiry therefore contributes a distinctive evidential layer to relational methodology. It can identify institutionally recognized positions with considerable precision while also revealing the procedures through which categories, authority, jurisdiction, and legal change are produced. The next section turns to institutional inquiry, where the analysis broadens from specifically legal ordering toward the rules, routines, authority structures, practices, and organizational conditions through which institutions organize relational fields.

7.15 Institutional Inquiry

Section 7.14 examined legal inquiry through categories, rights, duties, authority, jurisdiction, interpretation, and legal change. The present section broadens the methodological field from specifically legal ordering to institutional inquiry. Its role is to specify how researchers can reconstruct the rules, roles, memberships, authority relations, coordination mechanisms, memories, boundaries, and transformations through which an institution organizes recurrent relations. The objective is methodological rather than definitional: the section does not seek a single universal essence of institution, but develops a research architecture for identifying how institutional order is manifested, enacted, reproduced, contested, and revised in a specified field.

Institutional inquiry sits at the intersection of several traditions. North's account of institutions as humanly devised constraints emphasizes formal rules, informal constraints, enforcement characteristics, and historically consequential institutional change North 1990. Ostrom's work on collective-action institutions demonstrates the importance of reconstructing rules in use, monitoring, participation, and locally organized governance rather than assuming a simple contrast between centralized administration and privatization Ostrom 1990. DiMaggio and Powell show that organizations situated in organizational fields can become more similar through coercive, mimetic, and normative pressures, indicating that institutional organization can extend beyond the internal rule structure of a single organization DiMaggio and Powell

1983. Nelson and Winter's evolutionary analysis further illustrates how routines can carry organizational competence and historical continuity while remaining subject to search and change Nelson and Winter 1982. These traditions differ in object and explanatory emphasis, yet they provide compatible methodological resources for reconstructing institutional relations across formal, informal, organizational, and historical dimensions.

Within the present framework, an institution is approached through ontological suspension. A researcher may reconstruct an institution through rules, roles, routines, expectations, authority, infrastructures, symbols, records, and patterns of coordination without treating one representation as the institution's final ontology. Chapter 4's distinction among ontological, relational, and manifestational reality remains relevant: statutes, policies, organization charts, procedures, meeting records, routines, narratives, access systems, and observed practices provide different manifestations through which institutional relations become researchable. Chapter 5's epistemic discipline likewise remains active. The existence of an institutional document, recurring practice, or recognized role can support a bounded claim while leaving other dimensions of institutional organization unresolved.

Definition 7.142 (Institutional relational inquiry)**.** *Institutional relational inquiry* is the reconstruction of recurrently organized relations through formal and informal rules, roles, membership conditions, authority, coordination mechanisms, memory, boundaries, material and symbolic infrastructures, and processes of reproduction and transformation, with explicit attention to the evidential pathways through which these dimensions become observable.

Definition 7.142 treats institutional order as a configuration that may be partially visible through several kinds of evidence. Documentary and legal sources can identify prescribed rules and formal competence. Ethnographic and interview evidence can reveal rules in use, tacit expectations, informal authority, and practical coordination. Administrative and digital records can disclose recurring sequences, access conditions, and organizational outputs. Historical and archival materials can reconstruct formation, sedimentation, and change. Quantitative and network methods can characterize distributions, positions, flows, and patterned interaction. Institutional inquiry therefore provides a particularly clear case for the methodological pluralism developed in Section 7.2.

Table 7.14 summarizes the principal dimensions developed below.

7.15.1 Formal Rules

Formal rules provide one of the most visible manifestations of institutional order. Constitutions, statutes, regulations, bylaws, policies, contracts, procedural manuals, eligibility criteria, technical standards, and official protocols can specify positions, permissions, obligations, decision pathways, sanctions, and recognized forms of participation. North's institutional analysis gives formal rules a central role while placing them alongside informal constraints and enforcement characteristics North 1990. For relational inquiry, the methodological value of a formal rule lies in the structured relation it specifies and in the institutional processes through which that specification becomes consequential.

Table 7.14: Institutional inquiry dimensions and characteristic evidential questions

Dimension	Relational object	Characteristic evidence	Primary uncertainty
Formal rules	Codified permissions, obligations, procedures, competences	Statutes, policies, contracts, procedures, official guidance	Interpretation, implementation, temporal validity
Informal rules	Expectations, conventions, sanctions, tacit permissions	Observation, interviews, correspondence, recurrent practice	Visibility, contestation, local variation
Organizational roles	Structured positions with differentiated tasks and authority	Role descriptions, workflow, practice, delegation, records	Gap between prescribed and enacted role
Membership	Conditions of inclusion, participation, recognition, and exit	Registers, eligibility criteria, practice, self-identification	Ambiguous status, layered participation, exclusion
Authority relations	Recognized capacities to decide, direct, allocate, interpret, or sanction	Legal sources, delegation, decisions, practice, compliance	Formal competence versus effective authority
Coordination	Mechanisms aligning differentiated activity	Procedures, routines, meetings, technologies, shared standards	Informal repair, hidden work, coordination failure
Institutional memory	Carriers of historically accumulated routines and knowledge	Archives, records, routines, personnel, infrastructures	Loss, selective preservation, reinterpretation
Institutional boundaries	Conditions separating and connecting institutional domains	Jurisdiction, membership, access systems, interfaces, practice	Permeability, overlap, cross-boundary dependence
Institutional change	Change in rules, roles, authority, coordination, memory, or boundaries	Longitudinal documents, decisions, practice, comparative traces	Pace, causation, continuity, uneven implementation

A formal rule can support several distinct claims. It may establish that an institution officially recognizes a category or procedure. It may define a competence or obligation. It may specify a sequence by which decisions are expected to be made. It may condition access to a resource, status, remedy, or organizational position. These claims remain different from claims concerning practical implementation. A written procurement rule can specify who is authorized to approve expenditure while empirical inquiry reveals how approvals are negotiated, delayed, delegated, or informally anticipated. A formal membership rule can identify eligibility while enacted practice determines whether prospective members can enter on comparable terms.

The legal methodology of Section 7.14 is particularly useful for institutions whose formal rules have legal status, yet institutional inquiry often extends further. An organizational policy may lack the status of public law while still shaping access and coordination. A technical standard may influence behavior through procurement, interoperability, certification, or professional expectation. A platform rule may govern participation through software implementation. The evidential question is therefore broader than legal validity: the researcher asks how the rule is authorized, communicated, interpreted, enforced, monitored, modified, and embedded in surrounding relations.

Definition 7.143 (Formal-rule profile)**.** A *formal-rule profile* records the rule's source, authorized issuer, domain of application, targeted positions, permissions or obliga-

tions, implementation pathway, enforcement arrangement, temporal validity, interpretive variation, and relation to observed practice.

The profile supports comparison between prescribed institutional architecture and enacted institutional relations. It also helps with historical inquiry. A rule may persist textually while its interpretation, enforcement, or organizational significance changes. Conversely, practical reorganization may precede later codification. The temporal relation between rule and practice should therefore be reconstructed rather than inferred from publication dates alone.

7.15.2 Informal Rules

Institutional order frequently includes expectations that are weakly codified or absent from formal documentation. Informal rules can concern appropriate conduct, sequencing, reciprocity, deference, acceptable exceptions, trusted intermediaries, reputational consequences, and practical interpretations of formal procedure. North explicitly includes informal constraints within institutional analysis North 1990, while Ostrom's empirical work on collective-action institutions illustrates how rules in use can depend on locally understood arrangements, monitoring practices, and participant knowledge Ostrom 1990.

Methodologically, informal rules are difficult because they can be both consequential and weakly visible. Researchers may infer them from repeated practice, sanctions, correction of newcomers, stable expectations, narrative accounts, or patterned departures from formal procedure. A single observed deviation rarely establishes an informal rule. Repeated coordination around the same expectation, recognition by participants, or recurrent sanction for violation can provide stronger evidence.

Informal rules also vary in explicitness. Participants may articulate a convention when prompted, even though it is absent from written policy. Other expectations may be tacit and become visible mainly when disrupted. A meeting norm, for example, can remain unnoticed until a participant violates expected speaking order. A tacit eligibility criterion may become visible when a formally qualified applicant is repeatedly excluded. Such episodes can create the contingent encounters discussed in Chapter 6: disruption makes a background relation salient, after which ethnographic, interview, documentary, or comparative inquiry can test whether the apparent pattern has wider institutional significance.

Definition 7.144 (Informal-rule reconstruction)**.** An *informal-rule reconstruction* identifies a recurrent expectation or constraint through convergent evidence concerning practice, participant recognition, sanction, correction, coordination, or patterned consequence, while recording the setting and population within which the reconstruction is supported.

Definition 7.144 preserves scope discipline. A convention observed in one team may remain local. A professional norm may travel across organizations. A community practice may interact with state law while retaining partially autonomous enforcement. The researcher should therefore report the relational neighborhood and scale at which the informal rule appears operative.

Formal and informal rules can reinforce, reinterpret, or conflict with one another.

Institutional inquiry benefits from representing these relations explicitly. A formal prohibition can coexist with tolerated exceptions; an informal expectation can make a formally optional practice effectively obligatory; an informal workaround can compensate for a rigid formal procedure. Such configurations are analytically richer than a binary coding of compliance and non-compliance.

7.15.3 Organizational Roles

Roles provide a practical interface between institutional rules and differentiated action. Positions such as director, caseworker, committee chair, reviewer, member, regulator, teacher, analyst, administrator, or volunteer can organize expectations concerning competence, access, responsibility, information, and coordination. A role is therefore more than an individual attribute. It is a relational position whose meaning depends on surrounding rules, counterpart positions, authority arrangements, and institutional purpose.

Institutional inquiry should distinguish the *prescribed role* from the *enacted role*. Job descriptions, statutes, organizational charts, delegation instruments, and workflow documents can specify expected functions. Observation, interviews, correspondence, decision records, and digital traces can reveal how the position operates in practice. Differences between these layers can be substantively important. A formally junior position may coordinate crucial information flows. A nominally supervisory position may exercise limited practical control. A role can acquire brokerage functions that appear nowhere in the organization chart.

Definition 7.145 (Institutional role profile)**.** An *institutional role profile* records a role's formal definition, expected tasks, authority, access rights, counterpart relations, accountability, practical routines, discretionary space, and observed departures from formal specification.

Role reconstruction also supports cross-scale analysis. A role can connect individual action to organizational and institutional structure. A caseworker's discretionary judgment, for example, may be shaped by organizational targets, professional norms, legal rules, information systems, and resource constraints. Treating the role as a bridge across these relations can reveal how institutional conditions become locally enacted without assuming that broad rules determine each local decision.

Roles can persist through personnel turnover, which makes them important for institutional continuity. At the same time, repeated enactment can transform the role itself. New technologies can relocate tasks; reform can alter competence; informal expectations can expand or narrow discretion; crisis can create temporary responsibilities that later become stabilized. Longitudinal inquiry should therefore track role identity and role transformation separately from the identity of individual occupants.

7.15.4 Membership

Membership specifies who is recognized as belonging to, participating in, or being governed through an institutional arrangement. Membership can be formal, contractual, professional, organizational, civic, associative, platform-based, or informally recognized. It can confer access, voice, obligations, protections, identity, eligibility,

and exposure to institutional authority. It can also establish differentiated classes of participation.

A membership relation should be reconstructed through its conditions of entry, recognition, participation, suspension, exit, and exclusion. Formal registers may provide strong evidence of recognized membership, while practical participation can extend beyond the register. Contractors, caregivers, advisers, affiliates, former members, family members, clients, platform users, or affected communities may occupy consequential relational positions without fitting a simple member/non-member division. Institutional boundaries therefore often depend on layered participation rather than a single categorical edge.

Definition 7.146 (Membership profile)**.** A *membership profile* records formal and practical conditions of entry, recognized status, participation rights, obligations, access, voice, exit, suspension, exclusion, and relevant intermediate or affiliated positions.

Membership is also a site of power and epistemic visibility. Institutions frequently know more about recognized members than about peripheral or excluded actors. Administrative systems can therefore reproduce the institution's own membership ontology in research data. Section 7.10's documentary discipline applies directly: the absence of an actor from an institutional register can mean non-membership, incomplete registration, informal participation, exclusion from the record, or a different category of affiliation.

Changes in membership can alter institutional organization. Expansion may require new coordination mechanisms; professionalization may create new eligibility standards; digital participation may blur territorial membership; exclusion can redistribute voice and dependence. For this reason, membership is both an institutional relation and a potential mechanism of institutional transformation.

7.15.5 Authority Relations

Authority relations organize recognized capacities to decide, direct, interpret, allocate, authorize, review, or sanction within an institutional configuration. Section 7.14 examined legal authority through competence and jurisdiction. Institutional inquiry broadens the question to include organizational and informal authority, while preserving the distinction between recognized authority and practical influence.

A formal hierarchy can identify who is authorized to make a decision, yet the effective decision process may involve advisers, technical experts, informal gatekeepers, information holders, or external funders. Conversely, an actor can possess considerable influence without holding recognized authority. Methodological precision therefore benefits from separating *authority*, *influence*, *control over resources*, *expertise*, and *dependence* when the evidence permits.

Definition 7.147 (Institutional authority pathway)**.** An *institutional authority pathway* records the positions through which a decision or directive is authorized, interpreted, communicated, implemented, reviewed, and potentially contested within a specified institutional setting.

This pathway can reveal where authority is transformed as it moves across scales.

A governing body may adopt a policy, a managerial layer may translate it into procedures, frontline actors may interpret those procedures, and participants may encounter the result through local practice. Divergence along the pathway can be analytically significant without implying that one layer alone represents the institution.

Institutional authority can also be distributed. Ostrom's analysis of self-governed arrangements shows that monitoring, rule modification, and collective decision capacities can be organized among participants rather than concentrated in one hierarchical center Ostrom 1990. Distributed authority should therefore be reconstructed through actual decision rights, monitoring relations, revision procedures, and recognized competence rather than inferred from the absence of centralized command.

7.15.6 Coordination

Institutions organize differentiated activity through coordination. Coordination can occur through hierarchy, routines, schedules, standards, markets, committees, professional conventions, shared infrastructures, information systems, interpersonal adjustment, or combinations of these mechanisms. A relational methodology studies how these mechanisms connect actors, tasks, resources, information, and temporal sequences.

Coordination is often easiest to observe when it fails. Delay, duplication, contradictory instruction, missing information, bottlenecks, improvised repair, and recurrent exception handling can reveal dependencies that remain invisible during routine operation. Such breakdowns can therefore function as diagnostic encounters. Their significance should be tested through repeated observation, workflow reconstruction, interviews, records, or comparative cases rather than generalized from a single disruption.

Definition 7.148 (Coordination configuration)**.** A *coordination configuration* records the actors, tasks, resources, information channels, sequencing arrangements, standards, decision points, feedback mechanisms, and repair practices through which differentiated institutional activity is aligned.

The configuration can contain both formal and informal elements. A formal workflow may depend on tacit knowledge about whom to contact when a case does not fit the standard category. A standardized information system may coordinate across departments while creating new dependencies on data quality and technical access. A meeting procedure may allocate speaking turns while actual coordination occurs through pre-meeting negotiation. These layers can be reconstructed jointly without collapsing their evidential differences.

Coordination also connects institutional inquiry to organizational fields. DiMaggio and Powell's account of coercive, mimetic, and normative isomorphism shows how organizational practices can converge through field-level pressures DiMaggio and Powell 1983. Similarity across organizations may therefore arise through shared standards, professional training, regulatory expectations, uncertainty, or inter-organizational dependence. Comparative inquiry should examine the pathway producing similarity before treating convergence as evidence of common efficiency or common causal mechanism.

7.15.7 Institutional Memory

Institutions persist partly through carriers of memory. Records, archives, routines, procedures, personnel, technologies, buildings, classification systems, professional communities, symbols, and recurrent narratives can preserve knowledge about how tasks have been performed, how exceptions have been handled, which distinctions matter, and which historical experiences remain institutionally salient. Nelson and Winter's evolutionary analysis treats routines as important carriers of organizational continuity and change Nelson and Winter 1982; the broader methodological point is that institutional memory can reside in several relational and material forms.

Institutional memory should not be treated as a complete archive of the past. Preservation is selective. Staff turnover can remove tacit knowledge. Data migration can alter records. Reorganization can disconnect routines from their historical rationale. A policy can survive after participants forget why it was introduced. Conversely, narratives about institutional history can remain influential even when their documentary basis is partial or contested. Section 7.11's archival methodology therefore provides an important complement to institutional inquiry.

Definition 7.149 (Institutional memory profile)**.** An *institutional memory profile* identifies the principal carriers of retained knowledge, the practices through which that knowledge is accessed and transmitted, known losses or discontinuities, competing historical interpretations, and the present decisions or routines conditioned by the retained material.

Memory can support stability and adaptation. Stored procedures can reproduce established practice; historical case records can support learning; experienced personnel can interpret ambiguous rules; accumulated technical infrastructure can constrain redesign. Institutional memory can also preserve outdated categories or routines whose original conditions have changed. Methodologically, persistence should therefore be distinguished from continued adequacy.

AI systems increasingly participate in institutional memory through search, summarization, retrieval, workflow assistance, and automated decision support. These systems can enlarge practical access to records while also embedding corpus limitations, metadata structures, retrieval priorities, or outdated materials into present coordination. An AI-mediated memory claim should therefore retain provenance to the underlying institutional records and their temporal status.

7.15.8 Institutional Boundaries

Institutional boundaries specify domains of membership, authority, competence, responsibility, access, and coordination. They can be legal, organizational, territorial, professional, technical, or symbolic. Section 7.4 developed boundary construction as a general methodological problem; institutional inquiry applies that discipline to boundaries that are themselves part of the object under study.

An institution can possess several overlapping boundaries. Legal jurisdiction may exceed organizational membership. Information-system access may be narrower than formal responsibility. A professional community may extend across multiple employers. Funding relationships can connect formally separate organizations. Fam-

ilies, contractors, volunteers, clients, vendors, regulators, or partner institutions may occupy consequential positions at the institutional edge. Granovetter's analysis of embedded economic action provides one influential reminder that organizational and economic activity can be conditioned by ongoing social relations that cross formal organizational boundaries Granovetter 1985.

Definition 7.150 (Institutional boundary profile)**.** An *institutional boundary profile* records the domains of membership, authority, resource access, information access, responsibility, jurisdiction, and practical interaction, together with interfaces and cross-boundary relations that connect the institution to surrounding fields.

Boundary permeability is often consequential. A university, firm, ministry, association, or platform can be formally distinct while depending on external expertise, finance, infrastructure, regulation, labor, or information. Institutional inquiry should therefore distinguish the boundary of formal organization from the boundary of the process being studied. This distinction becomes especially important in economic inquiry, where ownership, control, production, financing, labor, regulation, and value capture can span different organizational boundaries.

Boundary change can itself be an institutional event. Outsourcing moves activities across organizational edges; merger changes membership and authority; digitization creates new technical interfaces; decentralization relocates competence; internationalization introduces overlapping jurisdictions. Longitudinal analysis should record which boundary dimension changed rather than treating institutional expansion or contraction as a single scalar variable.

7.15.9 Institutional Transformation

Institutional transformation concerns change in the organized relations through which an institution persists. Such change can involve formal rules, informal expectations, roles, membership, authority, coordination, memory, boundaries, or combinations of these dimensions. North emphasizes the historical significance of incremental institutional change and the interaction between formal rules, informal constraints, and enforcement North 1990. Evolutionary and field perspectives likewise suggest that institutional change can emerge through adaptation, search, competition, imitation, professionalization, crisis, or altered interdependence Nelson and Winter 1982; DiMaggio and Powell 1983.

A methodological difficulty arises because institutional transformation can be uneven. Formal reform may occur rapidly while routines change slowly. Membership can expand before authority arrangements adapt. New technologies can alter coordination while legal categories remain stable. Informal practice can shift before official policy recognizes the change. Section 7.5's multiscale discipline is useful here: transformation can occur at one scale while continuity remains visible at another.

Definition 7.151 (Institutional transformation profile)**.** An *institutional transformation profile* records the dimensions of institutional organization that change, the temporal sequence of change, principal continuity carriers, relevant triggers and pressures, implementation pathways, cross-scale effects, contested interpretations, and evidence concerning stabilization or further revision.

The profile helps distinguish institutional change from institutional replacement. A relation may preserve historical lineage while roles, authority, routines, and boundaries are substantially reconfigured. Conversely, a renamed organization may retain many of the same institutional relations. The identity analysis developed in Section 7.8 therefore applies directly to institutions: continuity should be argued through specified carriers rather than inferred from labels alone.

Institutional transformation can also produce feedback into the categories through which researchers observe the institution. A reform may change record-keeping systems, membership definitions, reporting units, or organizational boundaries. Apparent longitudinal change can therefore reflect both substantive transformation and changing measurement architecture. Documentary, archival, quantitative, and qualitative evidence should be compared when these effects are plausible.

Proposition 7.152 (Layered institutional reconstruction)**.** *Institutional claims are strengthened when formal rules, informal rules, roles, membership, authority, coordination, memory, boundaries, and historical transformation are reconstructed at the level relevant to the research question, while differences among these evidential layers remain visible.*

Proposition 7.152 provides the section's methodological synthesis. Institutional inquiry does not require maximal reconstruction of each dimension. A study of authority may focus on competence, delegation, decision pathways, and implementation. A study of institutional memory may emphasize archives, routines, personnel, and technical systems. A study of membership may center on entry, voice, exclusion, and exit. The appropriate depth depends on the claim. What matters is that institutional language does not substitute for the relational specification on which the claim depends.

This layered approach also preserves the distinction between institution and organization. An organization can be a formal entity with members, assets, offices, and decision structures, while institutional ordering can extend across organizations through professional standards, legal categories, conventions, infrastructures, or field-level expectations. Conversely, a single organization can contain several institutional orders whose rules and authority relations overlap imperfectly. Institutional inquiry therefore benefits from object, boundary, and scale specification before aggregation.

Contingent encounter and aesthetic judgment remain relevant at the stage of orientation. A surprising procedural exception, informal workaround, inherited routine, unexplained role, boundary-crossing dependency, archival discontinuity, or contradiction between formal rule and practical coordination can make an institutional relation salient before its significance is fully established. Subsequent inquiry can determine whether the encounter reveals a recurrent institutional structure, a local adaptation, a transitional state, or an evidential artifact. AI-mediated search and organizational analytics can enlarge the institutional encounter surface, yet generated summaries and inferred structures still require validation against source records, local meanings, authority relations, and historical context.

Institutional inquiry therefore extends the relational methodology of this chapter from individual relations and legal positions toward recurrently organized fields of action. It provides tools for reconstructing how rules, roles, membership, author-

ity, coordination, memory, and boundaries interact through time. The next section turns to comparative relational inquiry, where these reconstructed objects can be compared across cases, histories, cultures, and institutional configurations while preserving differences in relation type, scale, and evidential access.

7.16 Comparative Relational Inquiry

Section 7.15 reconstructed institutional inquiry through rules, roles, membership, authority, coordination, memory, boundaries, and transformation. The present section develops the comparative operation that follows once relational objects have been specified with sufficient clarity. Its role is to establish how cases, configurations, institutions, histories, and cultural settings can be compared without assuming that similarly named entities instantiate the same relations. The objective is to make comparison sensitive to object specification, boundary, scale, historical sequence, evidential access, and the distinction between relational and functional equivalence. The section proceeds through case selection, most-similar and most-different designs, relational and functional equivalence, historical and cross-cultural comparison, and the limits of comparability.

Comparative inquiry has a long methodological lineage in the social sciences. Przeworski and Teune developed a systematic account of comparative design centered on the relation between observed differences, system-level characteristics, and explanatory variables Przeworski and Teune 1970. Lijphart treated comparison as a distinctive methodological strategy whose inferential power depends partly on selecting sufficiently comparable cases and reducing an otherwise expansive property space Lijphart 1971. Sartori's critique of concept misformation remains especially relevant when categories travel across contexts, because terminological sameness can conceal differences in extension, intension, and institutional meaning Sartori 1970. Ragin's configurational approach further emphasizes that comparative explanation can concern combinations of conditions and case structures through configurational structures and conjunctions of conditions Ragin 1987. These traditions provide useful resources for relational inquiry, although the present framework places additional emphasis on the comparability of relations, configurations, and evidential pathways.

Within the present framework, comparison is an operation performed on already specified research objects that follows explicit specification. Sections 7.3–7.9 established that entities, relations, boundaries, scales, identity conditions, and configurations are analytical constructions constrained by evidence. Comparative inquiry inherits those constraints. Two organizations can share a legal label while differing in authority relations; two households can occupy similar statistical categories while differing in dependency structure; two institutions can perform comparable functions through different rules and memberships; and two historical periods can display similar manifestations produced through different relational architectures. Comparison therefore requires an explicit account of what is being held comparable and at which level.

Definition 7.153 (Comparative relational inquiry)**.** *Comparative relational inquiry* is the systematic comparison of specified relational objects, properties, configurations,

Table 7.15: Comparative relational strategies and characteristic inferential risks

Strategy	Comparative focus	Relational contribution	Characteristic risk
Case selection	Construction of cases relevant to a question	Aligns object, boundary, scale, and evidence before comparison	Selection on manifestations that already encode the expected result
Most-similar comparison	Cases similar on selected conditions and different on focal relations or outcomes	Helps isolate relational differences within a restricted field	Hidden differences in configuration or historical sequence
Most-different comparison	Cases different on many dimensions yet similar on a focal relation, function, or outcome	Tests whether a relational pattern travels across heterogeneous settings	Premature assumption that observed similarity has the same meaning or mechanism
Relational equivalence	Similarity of position, dependency, connection, or configuration	Compares structural location without requiring entity identity	Overlooking semantic, historical, or normative differences
Functional equivalence	Similarity in a specified contribution or consequence	Permits comparison across heterogeneous institutional forms	Inferring broader equivalence from one shared function
Historical comparison	Comparison across periods, sequences, and transformations	Reveals changing relation meanings, continuity carriers, and path dependence	Anachronism and changing evidence regimes
Cross-cultural comparison	Comparison across differently symbolized and institutionalized settings	Tests portability of categories and relational interpretations	Concept stretching, translation loss, and unequal evidential access
Comparability assessment	Evaluation of what comparison can support	Preserves scope, remainder, and uncertainty	Treating partial comparability as either full equivalence or complete incomparability

trajectories, or functions across cases or periods through explicit criteria of case construction, equivalence, boundary, scale, historical context, and evidential adequacy.

Definition 7.153 makes comparison claim-relative. A pair of cases may be comparable for one question and poorly comparable for another. A study of formal jurisdiction may legitimately compare legal competences across institutions, while a study of enacted authority may require ethnographic, documentary, or interview evidence concerning how those competences operate in practice. Likewise, a comparison of relation intensity may require harmonized temporal windows, whereas a comparison of institutional transformation may require historically different periods whose sequence is substantively meaningful.

Table 7.15 summarizes the principal comparative strategies developed below.

7.16.1 Case Selection

Comparative inquiry begins with case construction. A case is rarely a neutral container waiting to be sampled. It may be an organization, institution, community, legal regime, event sequence, relational configuration, historical period, policy field, or other bounded analytical object. Section 7.3 therefore precedes comparison concep-

tually: the researcher first specifies what constitutes the case and then asks which contrasts can illuminate the research question.

Classical comparative methodology emphasizes the inferential consequences of case selection Lijphart 1971; Przeworski and Teune 1970. Relational inquiry adds a further concern. Cases may appear similar because their manifestational surfaces are similar while their relational architectures differ. A pair of organizations can report comparable staffing levels while differing in authority concentration, contracting relations, informal coordination, or external dependency. Conversely, visibly different cases may contain closely related configurations at the level relevant to the question.

Definition 7.154 (Comparative case profile)**.** A *comparative case profile* records the research object, boundary, scale, temporal interval, focal relations or configurations, principal manifestations, relevant contextual conditions, evidential sources, and reasons for inclusion in the comparative design.

The profile makes case selection auditable. It can show whether cases were selected because they instantiate a theoretically relevant contrast, because they provide variation in a focal relational property, because they offer comparable evidence, because they represent a critical historical transition, or because a contingent encounter revealed an analytically promising contrast. These rationales can coexist, although their inferential implications differ.

Selection on readily observable manifestations requires particular care. If researchers select cases because a manifest outcome is already extreme, then relations associated with that manifestation may appear more explanatory than they would in a differently constructed comparison. Selection can also occur through archives, administrative classifications, platform data, or institutional access, producing a sample shaped by visibility conditions whose relation to the wider relational field requires separate assessment. Comparative design should therefore record both substantive selection criteria and access conditions.

Case selection can remain iterative. An initial comparison may reveal that a nominally coherent case contains several relational configurations, or that a proposed contrast disappears after boundary or scale revision. In such situations, revising the case set can improve adequacy without implying methodological failure. The relevant requirement is that the revision pathway remain visible.

7.16.2 Most-Similar Comparison

Most-similar comparison examines cases selected to be similar on several theoretically relevant conditions while differing on a focal relation, configuration, process, or outcome. The strategy has a long association with comparative social inquiry Przeworski and Teune 1970. Its value lies in reducing the field of plausible differences sufficiently to make a focal contrast more interpretable.

In relational inquiry, similarity needs specification at the level on which the comparison operates. Two municipalities may be similar in population, fiscal capacity, statutory competence, and national legal environment while differing in interorganizational coordination. Two laboratories may be similar in disciplinary field and

funding while differing in authority distribution and collaboration topology. Two households may be similar in income yet differ in dependency, care, and decision relations. The analytical leverage comes from specified similarity through declared dimensions of similarity.

Definition 7.155 (Most-similar relational design)**.** A *most-similar relational design* compares cases aligned on a stated set of contextual, boundary, scale, or institutional conditions while examining variation in one or more focal relations, configurations, trajectories, or outcomes.

The phrase "most similar" should therefore be understood relative to a declared property space. Cases can remain different in unmeasured or poorly observed ways. Historical timing is especially important. Two institutions can share formal architecture while occupying different stages of formation, crisis, or consolidation. A similarity judgment that ignores temporal position can conceal differences in the processes generating the observed configuration.

Most-similar comparison can also expose relational mechanisms through divergence. If two cases share a formal rule but display different practical authority patterns, the comparison directs attention toward implementation, informal norms, organizational capacity, external dependency, or other relational conditions. The result is not automatically causal identification, yet it can narrow the set of plausible explanations and guide subsequent process tracing, measurement, or formalization.

7.16.3 Most-Different Comparison

Most-different comparison begins from cases that differ substantially across selected dimensions while sharing a focal outcome, relation, function, or structural feature. Przeworski and Teune's comparative logic provides a classical basis for this strategy Przeworski and Teune 1970. In relational inquiry, the design is useful for asking whether a relational pattern persists across heterogeneous institutional, cultural, economic, or historical settings.

The interpretive burden is substantial because similarity of manifestation can arise through different mechanisms. Two societies may exhibit similar rates of participation through distinct associational structures. Two organizations may achieve similar coordination through hierarchy in one case and peer governance in another. Two legal systems may produce comparable access outcomes through different combinations of rights, procedures, administrative discretion, and informal brokerage. The shared outcome therefore motivates investigation of the underlying relation while leaving equivalence to be established through further relational reconstruction.

Definition 7.156 (Most-different relational design)**.** A *most-different relational design* compares cases that differ across a specified set of contextual or structural conditions while sharing a focal relational property, function, trajectory, or manifestation whose generative or organizational basis is under investigation.

Such designs can reveal robustness at one level and heterogeneity at another. A relational pattern may recur while its meaning differs. A common function may be achieved through different configurations. A similar outcome may emerge from dis-

tinct historical sequences. The design therefore benefits from the distinction among relational equivalence, functional equivalence, and manifestational similarity developed in the following subsections.

Most-different comparisons can also identify domain limits. A relation that appears portable across several contexts may fail to appear when a particular institutional condition changes. This absence can help specify the conditions under which the relation is sustained. The interpretation remains proportionate to the selected cases and available evidence.

7.16.4 Relational Equivalence

Relational equivalence concerns similarity in relational position, connection, dependency, role structure, or configuration. It differs from entity equivalence. Two entities can be materially, culturally, or institutionally different while occupying comparable relational positions relative to a specified structure. Likewise, two entities with similar observable attributes can occupy very different positions in networks of authority, dependence, exchange, care, or information.

Section 106 introduced scale-relative entityhood and local functional equivalence at the ontological level, while Sections 7.7 and 7.9 developed multidimensional relation characterization and configuration reconstruction. Comparative relational inquiry uses these earlier commitments to specify the dimensions along which equivalence is claimed. Position within a hierarchy, brokerage between groups, exposure to a common dependency, reciprocal obligation, or membership in a similar higher-order configuration can each ground a local comparison.

Definition 7.157 (Relational equivalence)**.** Two research objects are *relationally equivalent with respect to a specified criterion* when their positions, dependencies, connections, or configurations preserve the relational properties relevant to that criterion within the declared boundary, scale, and temporal scope.

The phrase “with respect to a specified criterion” is central. Relational equivalence at one level does not imply semantic, functional, normative, causal, or ontological identity. A broker in a labor market and a broker in a humanitarian coordination network may share a structural position while differing sharply in authority, accountability, meaning, and consequence. A creditor relation and a patronage relation may exhibit asymmetric dependence while remaining institutionally and normatively distinct.

Sartori’s concern with concept misformation is relevant here because comparison can become misleading when a category travels farther than its defining properties support Sartori 1970. Relational inquiry responds by making the preserved property explicit. Researchers can then ask whether the same relation type is being compared, whether only structural position is shared, or whether the apparent equivalence arises from a coarse representation.

Proposition 7.158 (Criterion-local equivalence)**.** *A comparative claim of equivalence gains clarity when it identifies the relational properties preserved by the comparison and keeps unpreserved semantic, historical, normative, and causal properties available as comparative remainders.*

Proposition 7.158 guards against premature synthesis. Two cases can be usefully comparable even when substantial differences remain. Those differences need not invalidate the comparison; they can define its scope and later become objects of inquiry.

7.16.5 Functional Equivalence

Functional equivalence concerns similarity in a specified contribution, role, or consequence within a system. It is especially useful when different institutional forms solve comparable coordination problems or when heterogeneous structures generate similar practical capacities. A formal regulatory agency, professional association, technical standard, and platform protocol could, under some conditions, perform comparable gatekeeping functions while remaining distinct in authority, membership, legitimacy, and enforcement.

Definition 7.159 (Functional equivalence)**.** Research objects are *functionally equivalent relative to a specified function* when sufficiently supported evidence indicates that they contribute to the same analytically defined system-level or relational function within the scope relevant to the comparison, despite possible differences in form, mechanism, history, or meaning.

Functional equivalence is therefore weaker than general equivalence. It should identify both the function and the level at which the function is evaluated. A household arrangement and a public institution may both provide care, yet they can differ in authority, reciprocity, duration, financing, emotional meaning, legal status, and distributive consequence. Treating them as equivalent for one function can be analytically useful while preserving those differences.

Functional comparison also interacts with multiple realization. Similar capacities can emerge through heterogeneous relational architectures. The comparative task is then twofold: establish that the function is sufficiently comparable and reconstruct the different relations through which it is realized. This approach is well suited to GRE because economic coordination, allocation, security, knowledge transmission, trust, and value conversion can occur through diverse institutional forms.

Aesthetic resemblance can sometimes orient functional comparison. Researchers may notice that two very different arrangements possess an unexpectedly similar pattern of coordination or failure. Such recognition can motivate a comparison, while evidential analysis still determines whether the similarity is functionally substantive or only superficial.

7.16.6 Historical Comparison

Historical comparison introduces temporal heterogeneity into comparative design. Cases can be separated by periods, sequences, institutional eras, crises, technological regimes, or generational conditions. The aim is often to reconstruct how relations form, persist, transform, dissolve, or reappear under changing historical circumstances.

Historical comparison requires care with changing categories. A category such as worker, household, firm, citizen, profession, market, platform, or public authority

can change in institutional meaning across periods. Sartori's warning about concept travel therefore applies temporally as well as spatially Sartori 1970. The researcher should determine which features of a concept remain comparable and which have transformed.

Definition 7.160 (Historical comparison profile)**.** A *historical comparison profile* records the periods or sequences compared, continuity and discontinuity criteria, changing category meanings, relevant institutional and technological conditions, evidential regimes, relation identities, and the inferential purpose of the temporal contrast.

The evidential regime itself can change historically. Earlier periods may leave administrative ledgers and correspondence, while later periods generate digital traces and standardized indicators. Apparent increases in interaction, visibility, or organizational activity can partly reflect changes in recording infrastructure. Section 7.11's archival discipline therefore becomes part of comparative design.

Historical comparison can be synchronic across several cases at similar times, diachronic within one case, or combined across cases and periods. The latter design can reveal whether a transition occurs through comparable sequences or whether similar institutional outcomes arise from different histories. Ragin's configurational orientation is relevant because historical outcomes can depend on conjunctions and sequences of conditions through configurations and sequences of conditions Ragin 1987.

Temporal comparison also supports multiscale analysis. Individual practices may change rapidly, organizational routines more slowly, and institutional categories over longer intervals. Comparing periods at one temporal resolution can therefore miss transformation occurring at another. The scale discipline of Section 7.5 should remain active in historical comparison.

7.16.7 Cross-Cultural Comparison

Cross-cultural comparison examines relational objects across settings in which language, symbolic classifications, norms, institutional forms, histories, and practical meanings may differ substantially. The methodological opportunity is significant because cross-cultural variation can expose assumptions that remain invisible within a single setting. The methodological risk is equally significant because a category developed in one context can travel into another while losing or changing the relations that gave it meaning.

The first task is therefore translation at several levels. Linguistic translation concerns words and expressions. Conceptual translation concerns the categories through which phenomena are distinguished. Institutional translation concerns the relation between categories and organized practices. Evidential translation concerns whether the same form of record, interview response, or administrative indicator supports a comparable inference across contexts. These levels can diverge.

Definition 7.161 (Cross-cultural comparison profile)**.** A *cross-cultural comparison profile* records the concepts, relational objects, translation procedures, institutional meanings, local categories, evidential sources, researcher positions, and unresolved

remainders relevant to comparison across culturally or linguistically heterogeneous settings.

A shared translated term can conceal different relational meanings. "Family," "community," "employment," "ownership," "trust," or "authority" can be instantiated through different obligations, memberships, dependencies, legal forms, and symbolic expectations. Relational specification helps by asking which ties, roles, sanctions, permissions, histories, and meanings constitute the local object before comparison is attempted.

Cross-cultural inquiry also raises questions of epistemic position and justice. Unequal access to archives, language competence, local scholarship, participants, or institutional networks can produce asymmetry in evidential depth between cases. A comparison can appear balanced at the level of published variables while one case is reconstructed through far richer sources than another. The comparative record should therefore make access differences visible when they affect interpretation.

Contingent encounter can play a productive role here. A researcher may first notice an unexpected similarity or difference through language, practice, spatial organization, ritual, institutional routine, or an apparently minor discrepancy in translation. Aesthetic judgment can orient attention toward that contrast. Comparative warrant then depends on reconstructing the local relational meanings and testing whether the initial resemblance survives deeper inquiry.

7.16.8 Limits of Comparability

Comparability has limits because relational objects can differ in category meaning, boundary, scale, historical formation, evidential visibility, institutional realization, and normative significance. These limits need not terminate comparison. They can specify which claims remain defensible and which forms of equivalence are too strong for the available evidence.

Lijphart's account of comparative methodology emphasizes the difficulty of drawing inference from a restricted number of cases across a large property space Lijphart 1971. Sartori adds a complementary problem: concepts can stretch across cases until the shared category loses analytical precision Sartori 1970. Relational inquiry treats these as part of a broader comparability problem. Even when concepts are carefully defined, relations can differ in meaning, temporal structure, institutional embedding, and available traces.

Definition 7.162 (Comparability profile)**.** A *comparability profile* records the dimensions on which cases are sufficiently aligned for the focal claim, the dimensions that remain heterogeneous, differences in evidence and access, relevant translation choices, alternative comparison criteria, and the principal remainders limiting broader equivalence.

This profile supports graded comparison. Two cases may be strongly comparable with respect to formal authority, moderately comparable with respect to enacted coordination, and weakly comparable with respect to symbolic meaning. A historical comparison may support continuity of function while leaving relation identity uncertain. A cross-cultural comparison may preserve relational position while leaving

participant meaning only partially translatable. Reporting these differentiated judgments is more informative than forcing the comparison into a binary category of comparable or incomparable.

Proposition 7.163 (Comparative remainder)**.** *A comparison can remain analytically useful when unresolved differences are preserved as explicit remainders and the inferential claim is restricted to the properties for which comparability has been adequately established.*

Proposition 7.163 parallels the boundary and scale remainders developed in Sections 7.4 and 7.5. A remainder records what the current comparison leaves unresolved without making those differences disappear. This is especially important for cumulative research because later evidence may transform a remainder into the central object of a new study.

Comparative inquiry also remains sensitive to representation. Quantitative harmonization, coding schemes, typologies, embeddings, and AI-assisted similarity measures can make heterogeneous cases appear commensurable by projecting them into a shared representational space. Such tools can be valuable for discovery and screening, yet the induced similarity belongs first to the representation. Researchers should still examine whether the relational properties relevant to the claim are preserved outside that representation.

The same point applies to AI-assisted comparative research. Large models and retrieval systems can rapidly propose analogies across legal systems, institutions, histories, literatures, and cultural settings. This greatly expands the comparative encounter surface. It can also generate persuasive correspondences whose local meanings, historical sequences, or evidential bases differ. Contingent comparison and aesthetic recognition therefore remain productive sources of research orientation, while relational specification, source verification, and scope discipline determine whether the proposed comparison survives scrutiny.

Comparative relational inquiry consequently serves as a bridge between the object-specific methods developed in Sections 7.10–7.15 and the broader methodological traditions examined next. It supplies a disciplined language for comparing cases without converting similarity into identity, and for preserving difference without treating heterogeneity as a barrier to inquiry. Section 183 now turns to mainstream historical-interpretive social science methods, locating case studies, comparative-historical analysis, process tracing, archival research, interviews, ethnography, discourse analysis, legal interpretation, conceptual history, genealogy, and thick description within the relational methodology developed so far.

7.17 Mainstream Historical-Interpretive Social Science Methods

Sections 7.10–7.16 developed several concrete modes of relational inquiry and then established a comparative discipline for moving among cases, periods, institutions, and cultural settings. The present section locates those techniques within a wider family of historical-interpretive social science methods. Its role is classificatory and methodological: it identifies the principal epistemic work performed by case study,

comparative-historical analysis, historical institutionalism, process tracing, archival and documentary research, interviews, ethnography, discourse analysis, legal and institutional interpretation, conceptual history, genealogy, thick description, and contextual comparison. The objective is to clarify how these methods can contribute to relational inquiry while preserving their differences in evidential access, inferential ambition, temporal organization, and interpretive commitments. The discussion therefore treats historical-interpretive inquiry as a plural methodological family rather than a single epistemology.

Case study research illustrates this plurality particularly well. Gerring emphasizes that case study design is not defined by one form of evidence and can incorporate qualitative, quantitative, ethnographic, textual, historical, experimental, and mixed materials depending on the research objective Gerring 2007. Comparative-historical research likewise contains multiple strategies for reconstructing sequence, causal processes, configurations, and historical variation Mahoney and Rueschemeyer 2003. Historical institutionalism adds explicit attention to institutional development and temporality Hall and Taylor 1996; Pierson 2000, while process tracing concentrates more directly on within-case evidence concerning hypothesized mechanisms Beach and Pedersen 2019. Interpretive traditions extend this repertoire through situated meaning, discourse, conceptual transformation, genealogy, and thick description Fairclough 2003; Koselleck 2004; Foucault 1977; Geertz 1973.

These traditions intersect with the ontology and epistemology developed in Chapters 4 and 5. Historical-interpretive evidence is encountered through manifestations whose production, preservation, classification, and interpretation are themselves relationally organized. A document, interview, legal category, institutional routine, concept, discourse, or archival trace therefore provides a mode of access whose relation to the target object requires reconstruction. Historical-interpretive methods can be especially strong where sequence, contextual meaning, changing categories, institutional mediation, and heterogeneous forms of evidence are central to the research question. Their warrant still depends on explicit boundaries, scale, provenance, inferential bridges, competing interpretations, and revision conditions.

Definition 7.164 (Historical-interpretive relational inquiry)**.** *Historical-interpretive relational inquiry* is a family of research strategies that reconstructs relations, configurations, meanings, institutions, and trajectories through temporally and contextually situated evidence, with explicit attention to sequence, interpretation, provenance, category formation, and the conditions under which evidence becomes available.

Definition 7.164 gives the family a common methodological orientation without requiring methodological identity. Process tracing may pursue a relatively focused causal-mechanism claim. Thick description may pursue a densely contextual interpretation of meaning. Conceptual history can reconstruct changing semantic fields, while genealogy can examine contingent descent and emergence. Archival inquiry can foreground preservation and custody, and legal interpretation can foreground authoritative texts, institutional reasoning, and recognized legal positions. Relational methodology benefits from this plurality when each method states what it is designed to disclose and what remains outside its evidential reach.

Table 7.16 summarizes the principal methods discussed below.

Table 7.16: Historical-interpretive methods and their principal relational contributions

Method	Primary access	Relational contribution	Characteristic caution
Case study	Intensive evidence concerning a bounded case	Integrates heterogeneous evidence around a specified relational object	Case construction and transfer beyond the case require separate justification
Comparative-historical analysis	Cases and sequences across time	Reconstructs conjunctures, trajectories, and historically differentiated configurations	Category meanings and evidence regimes can change across periods
Historical institutionalism	Institutions across temporal sequences	Examines path dependence, timing, institutional reproduction, and transformation	Persistence can be overstated when internal relations change
Process tracing	Within-case sequential evidence	Tests hypothesized mechanisms and intermediate relational steps	Dense sequence alone does not establish the proposed mechanism
Archival and documentary inquiry	Preserved records and documentary infrastructures	Reconstructs traces, provenance, classification, institutional memory, and silence	Record survival and documentary production are selective
Interviews and ethnography	Situated accounts and observed practice	Reconstructs lived meaning, tacit practice, interaction, and relational experience	Access and researcher position shape the evidential field
Discourse analysis	Text, speech, genres, and representational practice	Examines how categories, identities, and relations are represented and reproduced	Discursive evidence requires care when claims extend to material or institutional consequences
Legal and institutional interpretation	Rules, decisions, practices, roles, and authority	Reconstructs formal positions, enacted ordering, and interpretive pathways	Formal validity and practical realization can diverge
Conceptual history and genealogy	Changing concepts, categories, descent, and emergence	Reconstructs historical semantics, discontinuity, contingency, and power-laden formation	Present categories can distort earlier relational worlds
Thick description and contextual comparison	Dense contextual evidence across settings	Preserves situated meaning while supporting scoped comparison	Context can become too expansive unless analytically bounded

7.17.1 Case Study

Case study research provides an intensive mode of inquiry into a specified case and its relevant context. Gerring's methodological treatment emphasizes that the case study can draw on varied evidence and can serve descriptive, interpretive, exploratory, and causal purposes depending on design Gerring 2007. For relational inquiry, its distinctive value lies in the possibility of reconstructing a case as an internally differentiated

relational configuration rather than treating the case as a single observation with a fixed list of attributes.

A case can be an individual, household, organization, institution, event, policy episode, community, legal dispute, platform, historical transition, or relational field. Section 7.3 established that the object specification precedes the evidential claim. Case study therefore begins by defining what makes the case analytically coherent, which relations are focal, which surrounding relations belong to context, and which temporal interval supports the intended inference. These choices affect what counts as within-case evidence.

Definition 7.165 (Relational case study)**.** A *relational case study* is an intensive inquiry into a bounded case that reconstructs the relations, configurations, meanings, institutional conditions, and temporal sequences relevant to a stated research question through one or more evidential modes.

The definition permits methodological combination. A study of one organization might combine archival records, interviews, legal documents, administrative data, network reconstruction, and ethnographic observation. The contribution of the case study then comes from the coordinated interpretation of these materials within a shared object specification. Evidence need not be homogenized. Documentary evidence may establish formal sequence, interviews may reconstruct participant experience, and quantitative records may show the distribution or frequency of observed manifestations.

Case studies are also useful for identifying relations that remain weakly represented in standardized data. An intensive investigation can reveal informal brokerage, tacit coordination, historical obligations, or institutional dependencies that become visible only when several sources are read together. This strength creates a corresponding discipline: transferring a finding beyond the case requires an additional argument about scope, comparability, mechanism, or relational equivalence. Intensive knowledge of one case can be strong within its stated domain while supporting only a more modest claim about a broader population.

7.17.2 Comparative-Historical Analysis

Comparative-historical analysis studies cases through historically ordered comparison. Mahoney and Rueschemeyer describe a broad tradition concerned with large-scale historical processes, comparative cases, causal analysis, and methodological problems arising from temporally extended evidence Mahoney and Rueschemeyer 2003. Relational inquiry can use this tradition to examine how similar outcomes emerge through different configurations, how similar configurations generate divergent trajectories, and how institutions or relations change under different historical sequences.

The temporal ordering of evidence is substantive. Two cases may contain similar components yet differ because a resource arrived before institutional consolidation in one case and after it in another, because a legal change preceded organizational restructuring in one setting and followed it in another, or because a crisis occurred during different phases of relational development. Comparative-historical inquiry therefore treats sequence as part of the explanatory object rather than a neutral or-

dering of observations.

Definition 7.166 (Comparative-historical profile)**.** A *comparative-historical profile* records the cases, periods, focal relations, temporal sequences, category meanings, institutional conditions, evidential regimes, and comparison criteria used to support a historical relational claim.

This profile helps prevent two recurrent losses. The first is temporal compression, in which historically separated processes are collapsed into a contemporaneous variable set. The second is contextual equivalence, in which the same indicator is assumed to carry an unchanged relational meaning across periods. The methods developed in Sections 7.8, 7.11, and 7.16 provide safeguards through identity criteria, archival provenance, and graded comparability.

Comparative-historical analysis can incorporate quantitative evidence, event counts, demographic records, financial series, or network measures alongside documentary and interpretive materials. The relevant distinction is therefore less about data type than about the inferential role of historical sequence and contextual reconstruction.

7.17.3 Historical Institutionalism

Historical institutionalism studies institutional development through temporally situated structures, sequences, and processes. Hall and Taylor locate it among several major institutionalist traditions and emphasize its concern with institutional organization and historical development Hall and Taylor 1996. Pierson's analysis of increasing returns and path dependence further illustrates how timing, sequence, and self-reinforcing processes can shape political trajectories under specified mechanisms Pierson 2000.

Within relational methodology, historical institutionalism is useful for examining how rules, roles, authority, membership, coordination, and institutional memory become stabilized and how that stabilization affects later possibilities. Section 7.15 reconstructed institutions as layered relational arrangements. Historical institutionalism adds a temporal question: how did the arrangement acquire its current form, which elements reproduce it, and which events or gradual transformations alter its trajectory?

Path dependence should be specified with care. Persistence alone provides limited evidence of self-reinforcement. A durable institution may persist because of legal continuity, sunk infrastructure, coordination advantages, identity commitments, network dependence, strategic interests, administrative routines, or combinations of these conditions. A relational account therefore asks which carriers reproduce the institution and at which scale.

Historical institutional analysis also benefits from the distinction between formal persistence and relational transformation. A legal name, office, or organizational boundary may remain stable while authority, dependence, membership, or practical coordination changes substantially. The identity criteria from Section 7.8 help make that divergence visible.

7.17.4 Process Tracing

Process tracing examines within-case evidence concerning the processes that connect a proposed cause, condition, or configuration with an outcome. Beach and Pedersen develop process tracing as a family of approaches to causal mechanisms and within-case inference, with different variants suited to different research purposes Beach and Pedersen 2019. In relational inquiry, process tracing can be used to reconstruct a sequence of interactions, institutional decisions, transmissions, responses, and intermediate changes through which a relational mechanism is proposed to operate.

A relational mechanism requires more than chronological adjacency. If an institutional rule is proposed to change an organizational practice, and that practice is proposed to alter an interpersonal relation, the evidential chain should address the intermediate translations. The formal rule may be interpreted differently by organizational actors; implementation can be uneven; affected participants can adapt strategically; and downstream manifestations may arise through several pathways. Process tracing helps make these mediating steps explicit.

Definition 7.167 (Relational process trace)**.** A *relational process trace* is a temporally ordered evidential reconstruction of the intermediate relations, actions, interpretations, institutional steps, and state changes through which a hypothesized mechanism is proposed to connect specified conditions with a target outcome.

The trace should preserve alternative pathways where evidence permits more than one reconstruction. An observed sequence can be consistent with several mechanisms, and missing evidence at a critical step can materially limit attribution. This is especially important when archives or administrative systems preserve outcomes more reliably than informal interactions. Process tracing therefore benefits from the evidential plurality developed earlier in the chapter.

7.17.5 Archival Research

Archival research provides access to historically preserved traces through infrastructures of custody, appraisal, arrangement, description, access, and retrieval. Section 7.11 developed this mode of inquiry in detail. Within the present methodological map, archival research contributes historical depth, provenance, sequence reconstruction, institutional memory, and evidence concerning categories or practices that later records may transform or obscure.

The archive also has a relational history. Producers, custodians, institutions, technologies, appraisal practices, access regimes, and digitization systems shape which traces survive and how they can be encountered. A historical relation that appears richly documented may partly reflect the administrative importance assigned to it by the record-producing institution. A weakly documented relation may have been informal, stigmatized, peripheral to administrative purpose, or carried through media that were poorly preserved.

Archival research consequently supports two simultaneous objects of inquiry. Researchers may reconstruct a historical configuration from preserved traces, and they may reconstruct the archival configuration that conditioned survival and visibility. Keeping these objects distinct reduces the risk of treating archival abundance as a

direct measure of historical prevalence.

The expansion of digitized archives and AI-assisted retrieval enlarges the archival encounter surface. It also makes search infrastructure part of provenance. A retrieved cluster may reflect semantic embeddings, metadata standards, digitization priorities, or language coverage. Source-level verification and reconstruction of archival context remain important after computational discovery.

7.17.6 Documentary Analysis

Documentary analysis examines records, texts, forms, correspondence, reports, registers, and digital traces as produced evidence. Section 7.10 distinguished the documentary record from the relation it records and from the institutional process that produced the record. That distinction remains central within historical-interpretive inquiry.

A document can carry several evidential functions. It may record a transaction, prescribe a procedure, classify an actor, authorize a status, communicate an interpretation, justify a decision, or preserve an organizational memory. The evidential question depends on which of these functions supports the research claim. An employment contract can provide strong evidence of formal legal obligations while offering limited evidence about everyday supervision. A meeting minute may establish that an issue entered institutional deliberation while leaving the informal negotiation preceding the meeting less visible.

Documentary analysis therefore benefits from a claim-relative provenance chain. Researchers should know, where relevant, who produced the record, for which purpose, under which classification scheme, through which custodial pathway, and with which subsequent transformations. Such information allows the document to be interpreted as a situated manifestation rather than an unmediated report of the underlying relation.

Documentary silence is similarly structured. Non-observation in a document collection may arise through non-recording, destruction, access restriction, poor indexing, incompatible categories, or weak retrieval. The negative-relations discipline of Section 7.6 therefore applies directly to documentary inference.

7.17.7 Interviews

Interviews provide situated accounts of experience, interpretation, memory, practice, and relational meaning. Section 7.13 treated interview evidence as jointly produced through participant, interviewer, question design, setting, timing, and the wider relational context of the interview. This makes interviews especially valuable for relations whose practical meaning or tacit organization is weakly recorded elsewhere.

Historical-interpretive interview research can reconstruct how participants understood an event, institution, obligation, conflict, transition, or relation at a particular time. Retrospective accounts can also reveal later reinterpretation. The difference between contemporaneous understanding and retrospective reconstruction may itself be analytically relevant, especially where institutional narratives evolve after crisis or reform.

Contradictory testimony deserves preservation. Participants occupying different relational positions can have access to different parts of a process and can experience the same institutional arrangement differently. Divergence can therefore indicate positional structure, changing memory, conflicting interests, differing temporal reference points, or ordinary error. Comparative interviewing becomes stronger when these alternatives remain visible.

Interview evidence also interacts productively with documentary and archival evidence. A record can anchor dates and formal actions; an interview can reveal interpretation, tacit practice, or perceived constraint; later comparison can identify convergence and disagreement without presuming that one source type automatically overrides another.

7.17.8 Ethnography

Ethnography provides situated access to practice, interaction, embodied routines, informal norms, and the everyday reproduction of relations. Section 7.12 developed a relational ethnographic approach in which field position and access are treated as part of the evidential configuration. Geertz's interpretive emphasis on thick description remains an influential precedent for connecting observed action with culturally situated meaning Geertz 1973.

For relational inquiry, ethnography is particularly useful where formal rules and enacted relations diverge. Observation can disclose informal brokerage, tacit coordination, avoidance, repair, waiting, emotional labor, boundary work, or practical hierarchy that remains only partially visible in official documents. Repeated presence can also reveal how relations change across routine and exceptional situations.

The researcher's participation creates both access and limitation. Trust can deepen disclosure while changing interaction; organizational sponsorship can open one field position while closing another; language competence and social identity can influence which relations become visible. Reflexive reporting therefore concerns evidential conditions rather than autobiography alone.

Ethnography can also generate research orientation through contingent encounter. An unexpected interaction, silence, spatial arrangement, workaround, or repeated minor practice can become salient before its analytical significance is clear. Aesthetic judgment may orient attention toward the pattern. Subsequent observation, comparison, and triangulation determine whether the pattern warrants a relational claim.

7.17.9 Discourse Analysis

Discourse analysis examines how language, textual forms, categories, genres, representations, and styles participate in social practice. Fairclough's approach connects textual analysis with social events, practices, representations, identities, genres, and evaluative forms Fairclough 2003. Within relational inquiry, discourse analysis can investigate how relations are named, classified, legitimized, contested, obscured, or made available for institutional action.

The distinction between representation and represented relation remains important. A discourse about dependence can exist without accurately describing the ma-

terial dependency structure of the actors concerned. At the same time, discourse can become causally consequential when classifications influence eligibility, legitimacy, authority, identity, policy, or organizational practice. Section 7.6's distinction between symbolized relations and other relation forms therefore provides a useful bridge.

Definition 7.168 (Discourse–relation interface)**.** A *discourse–relation interface* specifies how a discourse represents, classifies, evaluates, authorizes, or contests a target relation and identifies the institutional or practical pathways through which that representation may become relationally consequential.

This interface discourages a rapid move from textual frequency to social causation. A category may circulate widely yet have weak institutional effect, while a rarely stated classification can carry substantial authority if embedded in legal or administrative procedures. Researchers should therefore examine circulation, audience, institutional position, uptake, and practical consequence where the claim extends beyond discourse itself.

AI-assisted text analysis can expand the scale of discourse inquiry through retrieval, clustering, classification, and semantic comparison. These tools create useful candidate patterns. Their categories and similarity structures remain representations that require validation against the historical and institutional meanings relevant to the study.

7.17.10 Legal and Institutional Interpretation

Legal and institutional interpretation reconstructs rules, statuses, authority, recognized positions, institutional reasoning, informal norms, and practical enactment. Sections 7.14 and 7.15 developed these domains separately because legal validity, institutional interpretation, and enacted practice can diverge. Historical-interpretive social science often needs to move among these layers while keeping their evidential status visible.

Legal texts can establish formal competences, duties, powers, procedures, and jurisdiction. Institutional records and observed practices can show how those positions are interpreted and enacted. Interviews can reveal tacit norms and practical expectations. Historical sources can reconstruct how a legal or institutional category acquired its present meaning. The resulting analysis is strongest when each inferential transition is explicit.

Institutional interpretation also depends on organizational position. The same rule may be read differently by administrators, regulated actors, courts, professional communities, or participants affected by the institution. Divergent interpretations can become evidence about authority, ambiguity, discretion, and the distribution of practical knowledge.

Historical analysis is particularly valuable during periods of institutional transition. A formal reform may precede practical change, follow an already developing informal transformation, or coexist with older routines. Mapping these temporal relations helps distinguish legal enactment from institutional reorganization and from changes in lived experience.

7.17.11 Conceptual History

Conceptual history examines the historical transformation of politically, socially, or economically consequential concepts and the temporal experiences carried through their changing use. Koselleck's work provides a major reference point for analyzing historical time through transformations in political and social semantics Koselleck 2004. Relational methodology draws on this tradition because research categories can change along with the relations they are used to describe.

Concepts such as "market," "citizen," "worker," "family," "development," "security," "public," "platform," or "intelligence" can acquire different extensions, normative associations, temporal horizons, and institutional uses across periods. A longitudinal dataset that applies one contemporary definition retrospectively may therefore generate an appearance of continuity unsupported by historical category meaning.

Definition 7.169 (Conceptual trajectory)**.** A *conceptual trajectory* records historically situated uses, semantic fields, institutional locations, contested meanings, related categories, and practical consequences through which a concept changes across a specified temporal interval.

Conceptual history can contribute to relational inquiry in at least three ways. It can identify when the language available for naming a relation changes; it can show how institutional categories reorganize visibility and classification; and it can reveal when the researcher's own vocabulary would create an anachronistic description of earlier relations. These contributions are especially relevant to the historical identity problem developed in Section 7.8.

Conceptual change also need not correspond one-to-one with relational change. A new category can emerge before practices transform, or relations can change substantially while older vocabulary persists. Researchers should therefore examine conceptual and relational trajectories as linked but distinguishable objects.

7.17.12 Genealogy

Genealogical inquiry examines contingent descent, emergence, discontinuity, and the historical conditions through which practices, categories, subjects, and regimes of knowledge acquire recognizable form. Foucault's "Nietzsche, Genealogy, History" is a canonical statement of this orientation and appears in *Language, Counter-Memory, Practice* Foucault 1977. For relational methodology, genealogy is useful when a present arrangement appears natural, necessary, or timeless yet can be reconstructed through historically contingent sequences of classification, discipline, conflict, institutionalization, and knowledge production.

Genealogy differs from a search for a single origin. Its analytical force often comes from tracing heterogeneous antecedents and showing how later coherence can emerge from historically dispersed practices. This orientation fits the book's broader resistance to treating stabilized categories as timeless ontology. A currently durable relation can be causally real while still having a contingent history.

Definition 7.170 (Genealogical relational reconstruction)**.** A *genealogical relational reconstruction* traces the heterogeneous practices, classifications, institutions, conflicts, knowledge forms, and contingent events through which a present relational

object or category acquired its historically recognizable configuration.

Genealogical inquiry should also preserve evidential discipline. A discontinuity inferred from a change in vocabulary may require corroboration from institutional practice, legal form, material infrastructure, or participant accounts. Conversely, apparent continuity of vocabulary can obscure transformation in the relations carried by that vocabulary. Genealogy therefore benefits from the same provenance and identity disciplines developed elsewhere in Chapter 7.

The method is especially useful for reflexive research. Scientific categories, evaluation standards, and methodological conventions can themselves become genealogical objects. This supports Chapter 6's treatment of methods and theories as historically evolving components of research praxis.

7.17.13 Thick Description

Thick description provides a way of connecting observable action with the layered meanings, conventions, histories, and social contexts through which that action becomes intelligible. Geertz's interpretive anthropology is a canonical source for this methodological orientation Geertz 1973. Relational inquiry can use thick description to avoid treating similar manifestations as evidence of identical relations.

A gesture, payment, silence, queue, meeting, gift, refusal, title, ritual, or routine can carry different relational meanings across contexts. Description becomes analytically "thick" when it reconstructs enough of the surrounding symbolic and practical configuration to distinguish these meanings. The goal is not maximal contextual detail. Context becomes useful when it changes the interpretation of the focal relation or clarifies which alternatives remain plausible.

Proposition 7.171 (Context-preserving interpretation)**.** *When the meaning of an observed manifestation depends materially on surrounding symbolic, institutional, historical, or practical relations, interpretation gains warrant by preserving the contextual relations necessary to distinguish among plausible relational meanings.*

Proposition 7.171 makes thick description compatible with scope discipline. A research report can be richly contextual while remaining selective. The relevant question is which contextual relations alter the interpretation, mechanism, or identity claim under examination.

Thick description can also be combined with quantitative or formal methods. A qualitative reconstruction may clarify what a coded interaction represents, while a quantitative analysis can test how widely a reconstructed pattern appears across cases. The methods remain partially irreducible because contextual meaning and distributional prevalence answer different questions.

7.17.14 Contextual Comparison

Contextual comparison compares cases while retaining the relational conditions required to interpret each case on its own terms. It therefore extends Section 7.16's graded comparability by treating context as a structured relational configuration rather than an undifferentiated residual category.

The method begins by identifying which contextual dimensions are relevant to the focal claim. These may include legal regimes, organizational forms, historical sequences, language, technological infrastructures, market structures, kinship relations, professional norms, ecological conditions, or prior institutional events. Contextual comparison then examines whether an apparent similarity persists after these dimensions are reconstructed.

Definition 7.172 (Contextual comparison profile)**.** A *contextual comparison profile* records the focal relational object, comparison criterion, contextual relations necessary for interpretation, relevant historical and institutional differences, translation choices, evidence asymmetries, and remainders that limit broader equivalence.

This approach helps distinguish portability from superficial resemblance. A policy instrument can have similar formal design in two settings while operating through different administrative capacities and authority structures. A concept can share a translation while carrying different historical associations. A network position can appear structurally equivalent while being embedded in different legal or symbolic relations. Contextual comparison keeps these differences available for interpretation.

The method is also compatible with multiscale analysis. Context at one scale can be a focal object at another. National regulation can form part of the context for an organizational study; organizational routines can become the object of a meso-level comparison; individual experience can reveal whether the institutional difference has practical consequences. The relevant scale should therefore remain explicit rather than being absorbed into the word "context."

7.17.15 Limits of Historical-Interpretive Inference

Historical-interpretive inquiry encounters characteristic limits arising from source survival, access, retrospective reconstruction, interpretive plurality, historical category change, case selection, positionality, and the difficulty of separating sequence from mechanism. These limits constrain particular claims without converting historical or interpretive evidence into weak evidence by definition.

The first limit concerns evidential survival. Historical inquiry often works with traces produced for purposes different from the later research question. Archives can be incomplete, institutions can preserve records selectively, and marginalized relations can leave weak documentary traces. The resulting evidence can support careful reconstruction while leaving some relations underdetermined.

The second limit concerns interpretation. Texts, actions, and categories can sustain several plausible readings, especially when participant meanings are contested or when the researcher works across temporal and cultural distance. Interpretive plurality can sometimes be reduced through triangulation, contextual reconstruction, or comparison. In other cases, preserving several live interpretations is more accurate than forcing premature closure.

The third limit concerns causal attribution. Sequence and contextual fit can provide important mechanism evidence, yet a temporally coherent narrative can still omit alternative pathways or common causes. Process tracing, comparison, quantita-

tive evidence, formal modeling, or counterfactual analysis can sometimes strengthen attribution. Method selection should follow the inferential problem rather than a hierarchy of traditions.

Definition 7.173 (Historical-interpretive inference profile)**.** A *historical-interpretive inference profile* records the focal claim, temporal and contextual scope, source types, provenance, interpretive transformations, comparison structure, alternative interpretations, missing evidence, researcher access conditions, and the principal limits on transfer or causal attribution.

This profile supports epistemic humility. A historically situated interpretation can be well warranted within a bounded domain while leaving population prevalence, causal magnitude, future stability, or cross-context portability unresolved. A process trace can strongly support an intermediate mechanism while leaving its frequency across a wider population uncertain. An ethnographic reconstruction can disclose tacit practice with considerable local depth while broader distribution requires additional evidence.

Historical-interpretive methods therefore enter relational methodology as complementary modes of access whose strengths depend on the research object and inferential purpose. Their particular contribution lies in preserving sequence, context, meaning, institutional mediation, category history, and the production conditions of evidence. Their remainders can be carried forward into quantitative, formal, network, spatial, temporal, or mixed inquiry without requiring complete methodological translation.

AI-assisted research changes the practical conditions under which these methods are conducted. Large-scale retrieval, transcription, translation, entity linking, semantic search, document comparison, and text synthesis can expand the quantity of historical and interpretive material brought into view. The resulting abundance increases the importance of provenance, source criticism, contextual competence, and judgment concerning which similarities or anomalies deserve sustained inquiry. Contingent encounter remains relevant because an unexpected archival phrase, conceptual discontinuity, contradictory testimony, or unusual institutional juxtaposition can open a new research trajectory whose significance was not specified in advance.

The historical-interpretive family thus provides relational inquiry with a substantial repertoire for reconstructing how relations are experienced, represented, institutionalized, contested, remembered, and transformed through time. The next section turns to mainstream quantitative-empirical social science methods, where measurement, sampling, statistical inference, experimental and quasi-experimental design, and population-level estimation provide a different set of epistemic affordances and limitations.

7.18 Mainstream Quantitative-Empirical Social Science Methods

Section 7.17 mapped a family of historical-interpretive methods whose principal strengths lie in reconstructing sequence, context, meaning, institutional mediation, and historically situated evidence. The present section develops the quantitative-

empirical counterpart. Its role is methodological and integrative: it reviews sampling, survey design, descriptive statistics, regression, generalized linear models, panel and time-series methods, multilevel models, experimental and quasi-experimental designs, matching and weighting, measurement, missing-data methods, and robustness analysis. The objective is to clarify the kinds of claims these methods can support within relational inquiry, the assumptions that connect numerical manifestations to relational objects, and the limits that arise when measurement, dependence, interference, boundary selection, or historical change are consequential. The discussion therefore treats quantitative-empirical inquiry as a family of design and inference practices rather than a single technique or epistemology.

Canonical treatments of survey sampling and survey methodology emphasize that quantitative evidence begins before estimation, with the definition of target populations, sampling frames, modes of observation, questionnaires, response processes, and nonresponse Lohr 2021; Groves et al. 2009. Regression and panel-data methods provide flexible approaches to conditional comparison across cross-sectional and longitudinal data Wooldridge 2010; generalized linear models extend this logic to outcome distributions whose structure differs from the Gaussian linear model McCullagh and Nelder 1989; multilevel models allow variation and partial pooling across nested or grouped units Gelman and Hill 2007; and time-series methods represent temporal dependence, persistence, shocks, and changing dynamics Hamilton 1994. Experimental and quasi-experimental traditions then shift attention toward assignment mechanisms and research designs that support causal contrasts under stated assumptions Imbens and Rubin 2015; Angrist and Pischke 2009.

Within the ontology and epistemology developed in Chapters 4 and 5, these methods operate on manifestations that have already passed through measurement, classification, recording, and sampling processes. A variable can therefore be statistically well defined while remaining only one representation of a relational object. A coefficient can be precisely estimated while its substantive meaning still depends on boundary, scale, temporal scope, measurement validity, model specification, and the relation between observed units. Quantitative rigor is strengthened when these representational choices and identifying assumptions are made explicit.

Definition 7.174 (Quantitative-empirical relational inquiry)**.** *Quantitative-empirical relational inquiry* is a family of research strategies that uses structured measurement, sampling, statistical comparison, experimental or quasi-experimental design, and uncertainty quantification to characterize distributions, associations, contrasts, temporal patterns, multilevel variation, and causal effects relevant to relational objects and configurations.

Definition 7.174 leaves room for several inferential purposes. Some studies estimate population quantities. Some describe covariation. Some model conditional distributions. Some estimate treatment effects under an assignment design. Some reconstruct temporal dynamics or multilevel heterogeneity. Relational methodology benefits when the inferential target is stated before a preferred estimator is selected.

Table 7.17 summarizes the principal methodological families developed below.

Table 7.17: Quantitative-empirical methods and their principal relational contributions

Method family	Principal contribution	Relational caution
Sampling and surveys	Population representation, prevalence, distributions, reported states, repeated measurement	Frames, response processes, and question formats can selectively expose relations
Regression and GLMs	Conditional association, adjustment, prediction, modeled contrasts	Coefficients inherit measurement, functional-form, dependence, and specification assumptions
Panel and time-series methods	Repeated observation, temporal dependence, within-unit change, dynamic patterns	Persistence, anticipation, feedback, and changing regimes can complicate temporal interpretation
Multilevel models	Nested variation, partial pooling, cross-level heterogeneity	Statistical levels need substantive correspondence to relational scales
Experiments	Designed assignment and treatment contrasts	Interference and treatment diffusion can make relations part of the assignment process
Quasi-experiments	Causal contrasts from institutional or historical assignment structures	Identification depends on design-specific assumptions that can be relationally generated
Matching and weighting	Covariate balance and reweighted comparisons	Balance on observed variables does not resolve omitted relational structure
Measurement and scales	Structured representation of latent or composite constructs	Reliability and numerical coherence do not by themselves establish relational validity
Missing-data methods	Explicit treatment of incomplete observation	Missingness can be produced by access, exclusion, institutions, and relational position
Robustness and sensitivity	Evaluation of dependence on modeling and identifying choices	Robustness remains indexed to the set of alternatives actually examined

7.18.1 Sampling

Sampling determines which units and relations become available for quantitative inference. Probability sampling connects observed units to a defined target population through a design that supports design-based uncertainty statements; stratification, clustering, unequal selection probabilities, and complex survey structures can then be incorporated into estimation Lohr 2021. Relational inquiry adds a prior question: what is the sampling unit, and how does that unit relate to the object whose properties are being estimated?

A household survey can sample persons while the focal process is organized through households. A firm survey can sample registered enterprises while informal subcontractors participate in the economic configuration. A school sample can contain students nested within classrooms and schools, with peer relations crossing the boundaries of a nominal sampling unit. Sampling therefore inherits the object,

boundary, and scale choices developed in Sections 7.3–7.5.

Definition 7.175 (Relational sampling frame)**.** A *relational sampling frame* records the target population, sampling units, inclusion mechanism, relevant relational memberships or dependencies, coverage limitations, and the relation between sampled units and the relational object for which inference is intended.

A relational sampling frame is especially useful when inclusion probabilities are related to network position, institutional membership, mobility, documentation status, digital visibility, or organizational access. Undercoverage can then be substantively patterned. Sampling error and relational invisibility should remain distinct: a sample can have formally calculable sampling variance while the frame itself excludes actors whose relational positions matter to the research question.

Nonprobability samples can still support valuable empirical work when their selection process, coverage limits, and target of inference are stated carefully. The inferential burden then shifts toward modeling, calibration, comparison with external benchmarks, or explicitly bounded descriptive claims. The relevant discipline is correspondence between the sampling mechanism and the scope of the claim.

7.18.2 Survey Design

Survey design transforms questions about relations, states, expectations, experiences, and institutions into structured response opportunities. Survey methodology therefore includes sampling frames, questionnaire construction, response modes, interviewer effects, nonresponse, post-collection processing, and quality control Groves et al. 2009. Within GR, the survey instrument is an evidential interface: it creates a standardized manifestation whose relation to the target object requires interpretation.

Questions about trust, dependence, authority, access, discrimination, obligation, or institutional experience can be sensitive to wording, reference period, response scale, social desirability, translation, and the participant's understanding of the relational domain. A question such as whether a person "trusts" an institution can index competence, benevolence, predictability, legitimacy, familiarity, or strategic reliance. Quantitative comparability therefore benefits from prior semantic and contextual work.

Survey design can also encode relational structure directly. Roster questions, name generators, household relationship matrices, organizational affiliation questions, repeated-contact measures, and event histories can represent ties or configurations rather than isolated individual attributes. These designs connect naturally to the network and relational-data methods developed later in this chapter.

Proposition 7.176 (Survey manifestation discipline)**.** *When a survey item is used as evidence for a relational construct, the inferential claim gains clarity by specifying the construct, response process, reference domain, temporal frame, and plausible alternative meanings of the recorded answer.*

Proposition 7.176 keeps standardized measurement compatible with epistemic humility. Standardization improves comparability under shared response conditions; its substantive value depends on whether the standardized interface preserves the

differences relevant to the research object.

7.18.3 Descriptive Statistics

Descriptive statistics summarize distributions, frequencies, central tendencies, dispersion, cross-tabulations, transitions, and other empirical patterns before stronger explanatory claims are introduced. Their apparent simplicity makes them methodologically important. A mean, rate, proportion, quantile, or variance already presupposes a population, measurement rule, observation window, weighting scheme, and aggregation level.

Relational analysis should therefore ask what variation is preserved and what variation is compressed. Aggregate improvement can coexist with deterioration for a subgroup; a stable mean can coexist with widening dispersion; a national rate can conceal organizational or geographic clustering. These possibilities connect descriptive statistics to the scale-induced distortion discussed in Section 7.5.

Descriptive work also provides a first diagnostic for relational heterogeneity. Stratification by role, institutional membership, network position, region, organizational unit, or temporal regime can reveal whether a seemingly homogeneous population contains substantively distinct relational configurations. Such stratification should be motivated by the research object rather than proliferated mechanically.

A useful descriptive practice is to report denominators and observation rules alongside summary quantities. Changes in who is observed, who remains eligible, how a category is defined, or how repeated units are counted can create apparent trends that originate in the measurement system. Descriptive transparency therefore supports later causal and relational inference.

7.18.4 Regression

Regression provides a flexible language for modeling conditional relationships between an outcome and a set of predictors, controls, interactions, or group indicators. In social-science practice it can be descriptive, predictive, associational, or part of a causal design. These uses should remain distinguishable. Wooldridge provides a broad treatment of cross-sectional and panel regression under explicit assumptions concerning data generation and estimation Wooldridge 2010.

For relational inquiry, regression coefficients are properties of a statistical specification and data-generating representation. Their substantive interpretation depends on the definition of variables, functional form, included and omitted covariates, dependence among observations, and the scale at which the model is estimated. A coefficient linking institutional membership with an outcome, for example, does not by itself identify the mechanism through which membership becomes consequential.

Interactions and nonlinear terms can represent conditional heterogeneity, yet they should be connected to a substantive relational hypothesis. A statistical interaction may correspond to different institutional regimes, dependence structures, or joint conditions; it can also arise from scale choices or model form. Relational interpretation therefore requires a bridge from statistical contrast to the configuration being theorized.

Regression can be especially useful as part of triangulation. Historical or qualitative evidence can identify plausible mechanisms and confounders; regression can estimate distributional patterns or conditional contrasts; later process or network analysis can examine whether the proposed relational pathway is present. The methods perform different epistemic functions without requiring one to validate the others mechanically.

7.18.5 Generalized Linear Models

Generalized linear models extend linear-model reasoning to outcomes with different distributional structures and link functions, including binary outcomes, counts, proportions, and related response forms McCullagh and Nelder 1989. Their methodological contribution is to align the statistical model more closely with the support and variance structure of the observed outcome.

Relational phenomena frequently produce outcomes that are discrete or bounded: entry into an institution, occurrence of an interaction, number of exchanges, presence of an event, or category of organizational status. Appropriate outcome models can improve statistical representation, while the interpretation still depends on how the event or category was generated and recorded.

The distinction between the link-scale parameter and substantive relational meaning deserves attention. A log-odds coefficient, rate ratio, or modeled probability difference is a statistical contrast. Its relational significance depends on the baseline conditions, units of change, relevant population, and mechanism under study. Presenting predicted probabilities or substantively scaled contrasts can sometimes make this interpretation more transparent than reporting model coefficients alone.

Model diagnostics remain important because a distributional family or link function can fit some aspects of a dataset while missing others. Overdispersion, zero inflation, clustering, repeated observations, or unmodeled heterogeneity can signal that the data structure requires a richer representation. Such signals can motivate revision of the statistical model or reconsideration of the relational object itself.

7.18.6 Panel Data Methods

Panel data repeatedly observe units across time and thereby allow researchers to study change, persistence, unit heterogeneity, and temporal ordering more directly than a single cross-section. Fixed-effects, random-effects, dynamic, and nonlinear panel methods provide different ways of representing repeated-unit variation and unobserved heterogeneity Wooldridge 2010.

Within relational inquiry, the meaning of a repeated "unit" should remain historically and institutionally stable enough for the intended comparison. Section 7.8 showed that relational identity can persist with transformation, become interrupted, or be reconstituted. A panel identifier can remain numerically constant while the organization, household, role, jurisdiction, or institutional relation represented by that identifier changes substantially.

Panel methods are particularly valuable for separating within-unit change from cross-unit differences. Yet within-unit estimation does not automatically isolate a re-

lational mechanism. Time-varying confounding, anticipation, feedback, treatment diffusion, and changing measurement systems can remain consequential. A study of institutional reform, for example, may observe repeated organizations while the reform itself changes their boundaries, reporting incentives, or membership composition.

A relational panel design should therefore record identity conditions, observation intervals, entry and exit, exposure histories, and possible cross-unit dependence. Attrition can also be relationally generated: units may leave the panel because of organizational closure, migration, exclusion, conflict, or changes in institutional access. Missingness then carries substantive information that later sections should preserve.

7.18.7 Time-Series Analysis

Time-series analysis focuses on ordered observations of one or several quantities and examines persistence, temporal dependence, shocks, trends, cycles, changing variance, and dynamic interaction. Hamilton's treatment includes autoregressive and multivariate dynamics, unit roots, spectral methods, time-varying variance, nonlinear models, and state-space approaches Hamilton 1994. These tools are relevant to relational inquiry when the timing and temporal organization of a process are central to the claim.

The first methodological question concerns temporal resolution. Daily, monthly, annual, and generational observations can reveal different dynamics. Aggregation can smooth short disturbances while fine temporal sampling can obscure slow institutional or structural change. The multiscale considerations of Section 7.5 therefore apply in the temporal domain as well.

Temporal dependence can reflect several relational processes: delayed response, institutional memory, habit formation, contractual duration, network diffusion, expectations, feedback, or shared exposure to an external condition. Statistical autocorrelation identifies dependence in the observed series; relational interpretation requires evidence concerning the mechanism that sustains it.

Regime changes create an additional challenge. A model fitted across a long historical interval may combine periods with different institutions, classifications, technologies, or policy rules. Structural breaks and changing parameters can therefore indicate historical transformation rather than mere statistical inconvenience. Time-series analysis becomes stronger when such changes are interpreted together with documentary, institutional, or historical evidence.

7.18.8 Multilevel Models

Multilevel or hierarchical models represent data in which observations are grouped, nested, or partially pooled across contexts. Gelman and Hill develop these models as extensions of regression that allow varying intercepts, varying slopes, and group-level predictors while sharing information across groups Gelman and Hill 2007. They are especially relevant to the multiscale architecture developed in Section 7.5.

A statistical hierarchy, however, should correspond to a substantively meaningful scale structure. Students can be nested within classrooms and schools, workers

within organizations, municipalities within regions, or repeated observations within persons. Yet many relational systems are cross-classified, overlapping, networked, or institutionally permeable. A person may belong to several organizations; an organization may operate across jurisdictions; a community may be connected through migration or digital infrastructure. Hierarchical models can be extended to some of these structures, while the substantive mapping should remain explicit.

Proposition 7.177 (Scale-model correspondence)**.** *A multilevel statistical model supports a multiscale relational claim most clearly when its modeled levels correspond to substantively justified relational scales and when cross-level pathways are specified independently of the statistical nesting itself.*

Proposition 7.177 prevents statistical hierarchy from becoming an ontological hierarchy. Variation attributed to a school, organization, region, or institution can be empirically informative while still requiring explanation of the relations through which the contextual effect is generated.

7.18.9 Experimental Design

Experimental design uses an assignment mechanism controlled or structured by the researcher to create comparisons between treatment conditions. Randomization can support causal inference by balancing potential confounders in expectation and by grounding uncertainty in the assignment process Imbens and Rubin 2015. Experiments therefore provide a particularly explicit relation between design, assignment, treatment, outcome, and estimand.

Relational inquiry adds several considerations. Treatment may be delivered through relationships rather than to isolated units. Information can diffuse among participants. Peers can respond to one another's treatment status. Organizational practices can change when a subset of members is treated. A policy intervention can alter the field in which control units operate. These forms of interference make the relational structure part of the experiment rather than a nuisance external to it.

Treatment itself can also be heterogeneous. A nominal intervention can be implemented differently across organizations, mediated by different authorities, or interpreted differently by participants. Recording treatment implementation, exposure, contact, and institutional context can therefore strengthen the link between experimental assignment and the relational process being studied.

Experiments can be especially informative when combined with qualitative or process evidence. Randomization can identify an average contrast under a specified design; interviews, observation, administrative data, or mechanism-focused measures can help reconstruct why the contrast emerged and whether it reflects the generative relation of interest.

7.18.10 Quasi-Experimental Design

Quasi-experimental designs use institutional rules, policy changes, thresholds, timing, natural variation, or other assignment structures to construct causal comparisons without researcher-controlled randomization. Applied econometrics has developed a substantial repertoire around these designs Angrist and Pischke 2009. Their

evidential strength arises from the design logic connecting observed variation to a counterfactual contrast.

The identifying assumption is therefore part of the substantive argument. Institutional assignment rules can be manipulated, anticipated, selectively enforced, or experienced differently across relational positions. Policy exposure can spill across jurisdictions. Eligibility can depend on administrative classification whose meaning changes over time. A plausible quasi-experimental design should reconstruct these relations sufficiently to assess whether the statistical comparison corresponds to the intended assignment mechanism.

Definition 7.178 (Relational identification profile)**.** A *relational identification profile* records the causal estimand, assignment or exposure mechanism, relevant units and relations, temporal ordering, interference pathways, identifying assumptions, diagnostics, alternative mechanisms, and the population or relational domain to which the estimate is intended to apply.

This profile will remain useful across difference-in-differences, instrumental variables, regression discontinuity, matching, and related designs. It makes the design's relational dependencies visible before the resulting estimate is interpreted as evidence about a broader process.

7.18.11 Difference-in-Differences

Difference-in-differences designs compare changes over time between groups with different exposure to an intervention or event. Their appeal lies in using pre/post and between-group contrasts to remove stable group differences under an appropriate counterfactual trend assumption. Applied econometric treatments place the design among the central tools for policy evaluation Angrist and Pischke 2009, while Bertrand, Duflo, and Mullainathan show why serial correlation can materially affect uncertainty assessment in common applications Bertrand et al. 2004.

For relational inquiry, the parallel-trends argument should be considered together with institutional and historical comparability. Groups can face common macro conditions while occupying different relational positions. Anticipation can begin before the formal intervention date. Treatment can diffuse through markets, migration, information, organizations, or neighboring jurisdictions. Composition can also change if the intervention alters who remains observable in each group.

Pre-treatment trajectories, event-time patterns, alternative control groups, composition checks, and historically informed placebo periods can help assess design plausibility. These diagnostics do not transform the identifying assumption into an observed fact; they provide evidence concerning whether the counterfactual comparison is credible within the specified domain.

Difference-in-differences is especially compatible with GRE when institutional change occurs at a recognizable time while economic relations evolve before and after that change. Quantitative estimates can identify patterned changes, while process and institutional evidence can examine how the policy entered organizational routines, allocation practices, or value-generation relations.

7.18.12 Instrumental Variables

Instrumental-variable methods use variation in an instrument to isolate a component of treatment or exposure that can support a causal contrast under design-specific assumptions Angrist and Pischke 2009; Wooldridge 2010. The substantive difficulty often lies less in the estimator than in the credibility of the instrument's relational pathway.

Relevance requires that the instrument changes exposure. Exclusion requires a defensible account of why the instrument affects the outcome through the specified treatment pathway within the relevant domain. Institutional rules, distance measures, assignment procedures, prices, timing, or policy shocks can create candidate instruments, yet each can also participate in additional relations that reach the outcome.

A relational analysis of an instrument therefore maps the instrument's connections to treatment, outcome, mediators, institutions, and populations. This makes the exclusion restriction a substantive pathway claim. Historical and institutional knowledge can be central because the same instrument can operate differently across periods, organizations, or jurisdictions.

Instrumental-variable estimates can also identify a local or subgroup-specific causal effect under particular conditions. Interpretation should therefore preserve the population whose treatment status is shifted by the instrument rather than automatically generalizing the estimate to broader populations or relations.

7.18.13 Regression Discontinuity

Regression-discontinuity designs use a threshold in an observed assignment variable to estimate a local treatment contrast when treatment probability changes discontinuously at the cutoff Imbens and Lemieux 2008. The design can provide strong local identification when units near the threshold are comparable under the relevant assignment process.

Relational inquiry should reconstruct the institution that creates and enforces the threshold. A score cutoff, age rule, income criterion, geographic boundary, or administrative ranking can be implemented with varying discretion. Actors may manipulate the running variable, anticipate the threshold, or receive additional services linked to the same cutoff. The formal rule and enacted assignment process therefore require joint examination.

The resulting causal estimand is usually local to observations near the threshold. This locality can be an advantage because it makes the comparison precise; it also places a boundary on broader transfer. Relations among units near the cutoff may differ from those farther away, especially when thresholds determine entry into institutions, programs, or status categories.

Visual inspection, density checks, alternative bandwidths, polynomial choices, covariate continuity, and institutional evidence can contribute to design assessment. These checks serve different purposes and should be interpreted in relation to the assignment mechanism rather than combined into a single ritual of robustness.

7.18.14 Matching and Weighting

Matching and weighting create comparisons between treated and untreated observations with more similar distributions of observed covariates. Rosenbaum and Rubin's propensity-score framework formalizes one influential approach to balancing observed covariates through matching, subclassification, or related adjustment Rosenbaum and Rubin 1983. These methods can improve comparability when the relevant confounding information is observed and adequately represented.

The relational challenge concerns what enters the covariate set. Institutional membership, network position, prior exposure, neighborhood context, household structure, and access to resources can influence both treatment and outcome. If such features are omitted or poorly measured, covariate balance on the recorded variables can coexist with substantive imbalance in the relational configuration.

Balance diagnostics should therefore be interpreted together with measurement adequacy and the temporal ordering of covariates. Variables affected by treatment require different treatment from genuine pre-exposure characteristics. High-dimensional data can expand the available adjustment set, yet automated selection does not remove the need to understand which variables represent confounders, mediators, colliders, or proxies within the substantive process.

Weighting also creates a new analytic population. Large weights can make inference depend strongly on a small set of observations, and limited overlap can signal that the desired comparison is weakly supported by observed cases. Relational inquiry can treat such overlap problems as evidence about segmentation in the underlying population rather than merely as a computational inconvenience.

7.18.15 Measurement and Scale Construction

Measurement converts theoretical or substantive distinctions into observable indicators, indices, categories, scores, or scales. Scale-development methodology emphasizes item construction, reliability, validity, and the relation between indicators and the construct they are intended to represent DeVellis and Thorpe 2021. In GR, measurement is a transformation between an analytical object and a manifestational representation.

A high internal-consistency coefficient can show that items covary in a regular way; it does not by itself establish that the resulting scale captures the intended relational construct. Trust, power, dependence, generativity, institutional access, or perceived constraint can contain dimensions that are only partially commensurable. Collapsing them into one score can be useful for a specific inferential task while leaving a measurement remainder.

Definition 7.179 (Measurement transformation profile)**.** A *measurement transformation profile* records the target construct, indicators, coding or scaling operation, unit of observation, temporal reference, assumptions of comparability, validation evidence, uncertainty, and substantive dimensions that are compressed or left outside the resulting measure.

Measurement invariance across groups or time is especially important for comparative and longitudinal research. A response category can shift meaning across

languages, institutions, cohorts, or historical periods. A monetary measure can preserve numerical units while its practical purchasing or relational meaning changes. Measurement therefore connects quantitative analysis back to conceptual history, interview interpretation, and institutional inquiry.

Scale construction can also be explicitly relational. Measures can be derived from dyadic reports, network positions, institutional roles, transaction patterns, or cross-level configurations. In such cases the unit of measurement should correspond to the relational object rather than being forced into an individual-level format for convenience.

7.18.16 Missing-Data Methods

Missing-data methods address incomplete observation by modeling, weighting, imputing, or otherwise accounting for the process through which values become unavailable. Little and Rubin provide a comprehensive framework for analyzing missingness mechanisms and statistical inference with incomplete data Little and Rubin 2019. Relational inquiry adds a substantive question: which relations produce the missingness?

Nonresponse can follow mistrust, institutional exclusion, language barriers, migration, digital disconnection, conflict, organizational closure, survey fatigue, administrative classification, or legal restrictions. Record linkage can fail more often for actors with unstable identities or fragmented documentation. Transaction data can omit informal exchange. Network surveys can miss weak, stigmatized, or cross-boundary ties. Missingness can therefore be socially and institutionally patterned.

A missing-data strategy should distinguish the statistical assumptions required for estimation from the substantive explanation of missingness. Multiple imputation or weighting can provide useful uncertainty propagation under specified models, while qualitative or institutional evidence can inform whether those models are plausible. Sometimes the distribution of missingness is itself an empirical finding about access, visibility, or institutional participation.

Preserving missingness provenance also supports future re-epistemization. Researchers should record whether data were unavailable at source, lost in processing, suppressed for privacy, excluded by design, unmatched during linkage, or absent because a participant did not respond. These pathways can have different implications for inference and later reuse.

7.18.17 Robustness and Sensitivity Analysis

Robustness and sensitivity analysis examine how conclusions change under alternative modeling, measurement, sampling, boundary, or identifying choices. Their role is to expose dependence on assumptions that might otherwise remain hidden. In relational inquiry, this includes sensitivity to case inclusion, temporal windows, scale, clustering, exposure definitions, weighting, missing-data models, and alternative operationalizations of the focal relation.

A robustness result is indexed to the alternatives examined. Stability across sev-

eral regression specifications provides evidence against sensitivity to those particular specifications; it does not establish invariance to unexamined measurement error, interference, historical regime change, or omitted relational structure. Sensitivity analysis should therefore be organized around substantively plausible failure modes rather than around the number of alternative models produced.

Boundary and scale sensitivity deserve special attention. A result can be stable within one institutional boundary yet change when cross-boundary actors are included. An individual-level association can reverse or weaken after organizational structure is modeled. A treatment effect can vary across time because the surrounding field has changed. These shifts can reveal relational organization rather than merely model fragility.

AI-assisted workflows can generate very large specification spaces. This increases the practical value of preregistered design logic, transparent model families, held-out validation where appropriate, and explicit criteria for interpreting variation across specifications. Abundance of estimates can otherwise obscure the conceptual choices that produced them.

7.18.18 Limits of Quantitative Identification

Quantitative-empirical methods provide powerful tools for population description, uncertainty quantification, conditional comparison, causal estimation, dynamic modeling, and multilevel analysis. Their limits arise where identification depends on weakly supported measurement assumptions, incomplete assignment information, interference, unstable unit identity, limited overlap, changing institutions, selective observation, or model structures that compress consequential relational heterogeneity.

The first limit concerns representation. Statistical variables are constructed manifestations. A precise estimate of a poorly specified construct can remain substantively ambiguous. Measurement validity, classification history, and scale therefore precede interpretation of precision.

The second limit concerns dependence. Many social-science estimators become simpler when observations can be treated as conditionally independent or when dependence has a tractable structure. Relational systems can contain spillovers, shared institutions, network diffusion, strategic response, common shocks, and feedback. These structures can sometimes be modeled directly; in other cases they place boundaries on the estimand or uncertainty statement.

The third limit concerns identification. Experimental and quasi-experimental designs support causal claims through design-specific assumptions. Randomization, parallel trends, exclusion, threshold continuity, overlap, and related conditions carry substantive content. Their plausibility depends partly on institutional and relational knowledge. Statistical diagnostics can provide evidence about some implications of these assumptions, while historical, qualitative, legal, or organizational inquiry can illuminate the processes that generate them.

The fourth limit concerns transfer. A locally identified effect can be well warranted for a defined population, threshold neighborhood, period, or assignment mechanism

while broader portability remains open. GRE is especially interested in generative consequences that unfold through changing relations, institutions, and scales. A treatment effect estimated at one stage of a trajectory may therefore require additional evidence before being treated as a stable property of the system.

Proposition 7.180 (Quantitative warrant)**.** *The warrant of a quantitative-empirical claim is strengthened when its estimand, measurement system, sampling or assignment process, dependence structure, identifying assumptions, uncertainty model, and transfer scope are stated in the research design.*

Proposition 7.180 connects quantitative practice with the epistemic humility established in Chapter 6. The objective is disciplined strength rather than rhetorical caution: a tightly identified local effect, a carefully estimated population quantity, or a well-supported temporal pattern can be stated clearly when the design justifies it. Broader relational or generative interpretations then require additional inferential steps.

Quantitative-empirical methods also interact productively with contingent encounter and aesthetic judgment. Unexpected residuals, subgroup divergences, threshold discontinuities, temporal breaks, missingness patterns, unstable coefficients, or anomalous distributions can make a previously unnoticed relation salient. Statistical anomaly does not determine significance; it creates a candidate encounter whose interpretation can be pursued through revised measurement, historical reconstruction, institutional analysis, qualitative inquiry, or new quantitative design.

AI further changes this environment by reducing the cost of model fitting, variable construction, simulation, code generation, and specification search. The resulting methodological abundance increases the importance of design provenance, inferential purpose, source verification, multiplicity control, and judgment about which contrasts correspond to meaningful relational questions. Quantitative capacity therefore complements rather than displaces the earlier methodological requirements concerning object specification, boundary construction, scale selection, relation identification, and relational meaning.

The quantitative-empirical family thus contributes a substantial repertoire for estimating prevalence, distributions, contrasts, dynamic patterns, hierarchical variation, and causal effects under explicit designs. Its strongest integration with relational inquiry occurs when numerical representation remains connected to the relational conditions through which units are sampled, variables are measured, treatments are assigned, outcomes are generated, and observations become dependent. The next section turns to network analysis, where relations themselves become primary data structures and where the construction of nodes, edges, direction, weights, dynamics, multiplexity, community structure, and centrality requires a further set of methodological disciplines.

7.19 Network Analysis

The preceding sections developed quantitative-empirical methods while retaining the relational conditions through which units, measurements, exposures, and dependencies are produced. The present section turns to network analysis, where relations

become primary components of the analytical representation. Its role is to specify how nodes and edges are constructed, how direction and weight alter relational interpretation, how temporal and multiplex networks extend static single-layer representations, how community structure and centrality can be used with substantive discipline, how network uncertainty should be preserved, and where graph representations reach their analytical limits. The discussion treats network methods as a powerful family of relational representations while keeping their ontological status provisional and their evidential interpretation connected to the identification, characterization, boundary, scale, and configuration procedures developed earlier in this chapter.

Social network analysis has long emphasized patterned relations among social entities rather than limiting explanation to independently measured attributes Wellman 1983; Wasserman and Faust 1994. Contemporary network science extends this structural vocabulary across social, technological, biological, and other systems Newman 2003. For Generative Relational Theory, this family of methods is especially useful because it can represent dependence, reachability, brokerage, clustering, path structure, positional organization, and changing connectivity in forms that are often difficult to recover from variable-centered summaries alone. At the same time, a graph does not arrive directly from relational reality. A researcher constructs a graph by specifying which objects become nodes, which manifestations warrant edges, which relation types are preserved, how time is represented, and which parts of the surrounding field remain outside the network boundary.

Definition 7.181 (Network specification)**.** A *network specification* is a question-relative and revisable representation consisting of a node set, one or more edge relations, boundary and scale conditions, temporal scope, direction and weight conventions where relevant, provenance for the underlying observations, and an account of the substantive meaning assigned to the resulting graph properties.

Definition 7.181 places graph construction within the broader methodology developed in Sections 169–175. A network can be formally precise while remaining substantively weak if its nodes combine unlike objects, its edges conflate different relations, or its boundary excludes relations central to the target claim. Conversely, a comparatively simple graph can be highly informative when node identity, edge semantics, and scope are well aligned with the research question.

Table 7.18 summarizes the principal network representations discussed below. The table organizes analytical choices rather than a progression toward increasingly complete models. A research project can combine several forms when the evidence and target inference support doing so.

7.19.1 Nodes as Analytical Constructions

A network representation begins with a node set. Nodes can represent people, households, organizations, institutions, jurisdictions, documents, technologies, places, events, concepts, or other analytically specified positions. Their apparent simplicity can conceal substantial methodological work. Section 169 showed that research objects require provisional individuation; node construction is one formal implementation of that problem.

Table 7.18: Network representations and characteristic methodological questions

Form	Primary analytical contribution	Specification requirement	Characteristic risk
Node set	Defines the represented positions or units	Individuation, identity, boundary, scale, inclusion rule	Analytical units are treated as naturally given
Edge set	Encodes the represented relation	Relation semantics, evidence, temporal scope, threshold or coding rule	Different relations are compressed into a single tie
Directed network	Preserves asymmetric relational orientation	Meaning of source and target, reciprocal-edge interpretation	Direction is inferred from data format rather than substantive relation
Weighted network	Preserves valued variation among edges	Meaning, unit, scale, sign, and transformation of weights	Weight is interpreted as generic tie strength
Dynamic network	Represents changing relational structure	Time stamps or intervals, node persistence, event ordering, observation window	Temporal aggregation creates spurious simultaneity or continuity
Multiplex network	Separates several relation types or layers	Layer semantics, interlayer correspondence, node-layer identity	Layers are combined before their differences are examined
Community structure	Identifies clustered or modular organization	Algorithm, resolution, relation type, stability, substantive interpretation	Detected clusters are reified as natural communities
Centrality	Describes selected forms of structural position	Measure, network type, edge semantics, direction, weight, scale	Numerical prominence is interpreted as generic power or importance
Uncertain network	Preserves ambiguity in nodes, edges, boundaries, or observations	Error model, alternative graphs, provenance, sensitivity procedure	One convenient graph is treated as settled structure

The relevant question is therefore not only which entities are present in the source material, but which distinctions among them need to be preserved for the target analysis. An organization can be represented as one node when interorganizational exchange is the focus, while the same organization can be decomposed into departments, roles, or individuals when internal coordination matters. A household can function as one node for some resource-flow questions and as a configuration of differentiated members for questions concerning intra-household allocation. A digital account can be a technically stable identifier while remaining an uncertain representation of a person, collective, automated agent, or shared device.

Node identity is also temporal. Mergers, renaming, migration, reorganization, account replacement, role succession, and institutional transformation can make longitudinal node matching difficult. The relational identity principles developed in Section 174 therefore apply directly to dynamic network construction. A persistent identifier provides one continuity carrier; it does not by itself settle whether the represented relational position has remained substantively continuous.

Node construction also has distributive consequences for visibility. Aggregating several actors into one node can suppress internal inequality, disagreement, or differentiated access. Splitting a collective actor into many nodes can weaken the representation of coordinated capacity. Excluding actors because they lack standardized identifiers can remove precisely those positions whose institutional marginality makes them important to the study. These choices should therefore be documented as part of the network specification.

Definition 7.182 (Node specification profile)**.** A *node specification profile* records the analytical object represented by a node, the individuation and inclusion rules,

boundary and scale, temporal identity criteria, relevant aggregation or decomposition choices, and uncertainties concerning whether the node corresponds adequately to the relational position required by the research question.

The profile makes node construction comparable across datasets and research designs. It also facilitates later revision when evidence indicates that a node should be split, merged, reclassified, or represented at another scale.

7.19.2 Edges as Analytical Constructions

Edges encode relations among nodes. Network analysis gains much of its analytical power by making these relations explicit, yet an edge remains a methodological construction supported by a relation-identification procedure. A message, transaction, citation, contract, co-membership, geographic adjacency, reported friendship, legal obligation, shared ownership, or observed interaction can each generate an edge under a suitable design. Their evidential meanings differ substantially.

The edge definition should specify what relational claim the edge represents. A communication edge can mean that at least one message was sent during a period, that communication exceeded a threshold, that reciprocal exchange occurred, or that a participant named another actor as a routine contact. A financial edge can represent a single transfer, cumulative flow, contractual exposure, ownership, credit dependence, or a recurrent exchange relation. These definitions can produce different network topologies from the same underlying archive.

Thresholding deserves particular care. Converting valued observations into binary edges can be useful for questions concerned with presence, reachability, or connectivity, while the chosen threshold may create or remove components, bridges, communities, and central positions. The threshold should therefore follow a substantive or measurement rationale where possible, and sensitivity to plausible alternatives can be examined when the choice remains uncertain.

Edge meaning can also vary across nodes or periods. The same administrative code can correspond to different practical relations in different institutions. A platform-defined “connection” can involve very different degrees of interaction. A legal relationship can remain formally present during periods of little enactment. Edge construction therefore benefits from the relation-characterization profile developed in Section 173, especially when direction, dependence, meaning, or institutional status is central to later interpretation.

Definition 7.183 (Edge semantics profile)**.** An *edge semantics profile* records the substantive relation represented by an edge, the manifestations and inferential bridge supporting its identification, coding or threshold rules, temporal reference, direction and value conventions where relevant, and uncertainty concerning the relation’s presence or meaning.

This profile helps prevent computational convenience from silently determining relational ontology. It also supports reproducibility when several plausible edge definitions can be constructed from the same source material.

7.19.3 Directed Networks

Directed networks preserve orientation between source and target positions. Graph theory and social network analysis distinguish directed from undirected relations because the direction of an edge changes reachability, path structure, degree, reciprocity, centrality, and many other structural quantities Wasserman and Faust 1994; Newman 2003. Direction can correspond to flows of information, resources, authority, nominations, obligations, citations, referrals, commands, or other oriented relations.

The substantive meaning of direction should be stated explicitly. A payment from one actor to another, an order issued by one office to another, and a citation from one document to another are directed, yet their direction represents different processes. For some relations, direction describes an event while the underlying relationship is reciprocal or mutually constituted. A request can move from one actor to another while the institutional relation that makes the request consequential extends in both directions through rights and obligations.

Reciprocal directed edges also require interpretation. Two opposing edges can indicate mutual exchange, sequential response, independent obligations, conflict, or simply two recorded events. The reciprocity of observed edges should therefore be distinguished from the reciprocity of the substantive relation discussed in Section 173. The network representation can preserve both directions while later interpretation examines whether they amount to balanced exchange, mutual recognition, asymmetric dependence, or another configuration.

Direction can become uncertain when data systems record origin and destination for technical reasons that do not map cleanly onto substantive relational orientation. A database may assign sender and receiver while both actors participate in a jointly constituted transaction. A co-authorship event has no natural direction unless the research design introduces one through contribution, sequence, or another criterion. Retaining an undirected representation can therefore be methodologically preferable when the substantive relation lacks a justified orientation.

Directed networks are particularly important for GRE because economic and institutional relations frequently involve asymmetric flows. Resources, authority, obligations, information, risk, and value can move differently across the same pair of positions. A directed representation can preserve these asymmetries before later analysis examines how they interact with dependence, return, capture, or generative consequence.

7.19.4 Weighted Networks

Weighted networks attach a numerical value to an edge. The value can represent frequency, volume, duration, probability, capacity, monetary amount, similarity, distance, exposure, confidence, or another measured quantity. Weighted network methods can preserve information that a binary representation would compress, and centrality measures can be generalized to incorporate both tie number and tie weight Opsahl et al. 2010.

A weight acquires meaning through its measurement model. Ten messages, ten

million yen, ten hours of interaction, and a probability of 0.10 are numerically comparable only after a transformation chosen for a specific analytical purpose. Even within one data type, larger values can mean stronger connection, greater distance, higher cost, greater uncertainty, or weaker similarity. Algorithms that treat larger weights as shorter or stronger links can therefore require transformation before substantive interpretation.

The weight can also combine several processes. Transaction volume can increase because a relation is important, because prices changed, because reporting improved, or because one large event occurred. Interaction frequency can rise while trust declines. A survey rating can represent perceived closeness rather than observed exchange. The intensity dimensions discussed in Section 173 therefore remain distinct from network weight unless the measurement design justifies their alignment.

Signed or otherwise typed values can further complicate interpretation. Positive and negative evaluations, gains and losses, support and opposition, or credit and debt can carry qualitatively different meanings that are poorly represented as points on one generic strength scale. In these cases, separate layers, typed edges, or a richer relational representation may preserve more of the relevant structure.

Weighted-network sensitivity analysis should examine whether substantive conclusions depend on a small number of extreme edges, transformations of the weight scale, missing observations, or the conversion between valued and binary representations. This is especially important when centrality, community structure, or shortest-path calculations are highly responsive to the weight convention.

7.19.5 Dynamic Networks

Dynamic network analysis represents change in relational structure through time. Temporal-network methods emphasize that the timing and ordering of edges can alter reachability, diffusion, coordination, and other processes that a time-aggregated graph can conceal Holme and Saramäki 2012. A relation appearing before another can create a feasible pathway, while the same two edges occurring in the reverse order may not.

Several temporal representations are available. Snapshot networks divide time into intervals and compare graph structure across those intervals. Event-based representations preserve edge times more finely. Interval-based representations record relations with duration. Dynamic models can estimate processes through which edges appear, persist, or dissolve. The choice should reflect the temporal resolution of both the evidence and the research question.

Temporal aggregation is therefore a methodological choice. A yearly collaboration network can represent durable patterns while concealing monthly turnover. A daily communication network can reveal rapid response while obscuring long-term institutional structure. The relevant temporal window can also differ across scales: interpersonal exchange may vary over hours or days, organizational partnerships over years, and institutional relations over decades. The multiscale considerations of Section 171 therefore interact with temporal network design.

Node identity and edge identity both require longitudinal discipline. An edge ob-

served in two adjacent periods can represent persistence, repeated formation, or two events produced by a stable institutional rule. A missing edge can represent dissolution, dormancy, non-observation, or a temporary recording gap. The persistence criteria developed in Section 174 and the network uncertainty methods developed below help distinguish these possibilities.

Dynamic networks also prepare the way for generative analysis in Chapter 8. Structural change can be studied descriptively within the present chapter without yet attributing a generative mechanism. Later inquiry can ask how network position, feedback, institutional change, or cross-scale coupling contributes to the formation and transformation of relational structure.

7.19.6 Multiplex Networks

Multiplex and multilayer network representations preserve several types of relations, contexts, or layers within one analytical framework. Kivelä and colleagues review multilayer-network formalisms for systems containing multiple connectivity layers and interlayer relations Kivelä et al. 2014. These representations are particularly relevant when the same positions participate simultaneously in communication, exchange, authority, trust, ownership, mobility, care, legal obligation, or other relation types.

The methodological advantage is preservation of relational heterogeneity. Two organizations can be weakly connected financially and strongly connected through personnel exchange. Two individuals can communicate frequently while occupying an asymmetric authority relation. Two jurisdictions can compete economically while sharing infrastructure. Collapsing these relations into one edge can produce a topology whose substantive meaning is difficult to recover.

Layer construction nevertheless requires its own specification. A layer can represent a relation type, communication channel, institutional setting, temporal regime, geographic domain, or another analytical distinction. These are different uses of multilayer representation. The researcher should therefore state why the layers are separated, how node identity is maintained across them, what interlayer relations mean, and whether weights are comparable across layers.

Multiplexity can also generate second-order questions. A relation in one layer can enable, constrain, substitute for, or reinforce a relation in another. Formal authority can enable information access; trust can support credit; shared infrastructure can create interdependence despite weak direct exchange. These relations among relations connect multiplex analysis to the second-order configurations introduced in Section 175 and to the higher-order analysis of Section 186.

A multilayer representation can increase descriptive fidelity while also increasing analytical complexity. Layer selection should therefore remain question-relative. Additional layers are valuable when they preserve differences that materially affect the target inference. A highly elaborate multilayer model can become difficult to identify or interpret when the evidence supporting interlayer structure is weak.

7.19.7 Community Structure

Community structure refers to clustered or modular organization in a network. Many methods seek groups of nodes with relatively dense internal connection, comparatively sparse external connection, similar connectivity profiles, or another algorithmically specified form of cohesion. Fortunato's review documents the breadth of community-detection approaches and the continuing methodological difficulties involved in defining and detecting graph communities Fortunato 2010.

The first discipline concerns interpretation. An algorithmic community is a partition or grouping induced by a criterion applied to the specified graph. It can correspond to a meaningful social group, organizational division, functional subsystem, market cluster, or knowledge community, while such correspondence requires substantive evidence. A modularity-based cluster in transaction data, for example, does not by itself establish shared identity, common norms, or institutional cohesion.

The second discipline concerns resolution. Large-scale partitions can conceal smaller cohesive structures, while highly resolved algorithms can fragment broader organizational units. Different algorithms can return different partitions from the same graph because they optimize different objectives or encode different assumptions. Community analysis should therefore report the method, relevant resolution parameters, treatment of direction and weights, and the degree to which the resulting grouping remains stable under plausible alternatives.

The third discipline concerns boundary and scale. A community can appear cohesive because important external relations were excluded from the network boundary. A local cluster can be strongly dependent on an external infrastructure or gatekeeper. Aggregation can create apparent cohesion among units whose internal relations are heterogeneous. Community structure should therefore be interpreted together with boundary sensitivity and multiscale analysis.

Community detection can also be used comparatively without reifying communities. Researchers can ask whether a network becomes more modular over time, whether bridging relations shift, whether certain relation types cluster differently, or whether an institutional change alters the stability of partitions. These claims concern the specified representation and become stronger when they are connected to historical, qualitative, organizational, or economic evidence about the corresponding relational processes.

7.19.8 Centrality

Centrality describes selected forms of structural position. Freeman's classic clarification distinguishes several conceptions of centrality rather than treating centrality as one generic property Freeman 1978. Degree-based measures concern direct connection, closeness-based measures concern path distance under specified assumptions, and betweenness-based measures concern the frequency with which positions lie on selected paths between others. Other network settings motivate eigenvector, flow, brokerage, random-walk, or layer-specific measures.

The choice of centrality measure should therefore follow the substantive question. A node with many direct contacts can differ from a node connecting otherwise sep-

arated regions. A position close to many others under a path metric can differ from one embedded in a prestigious neighborhood. Weighted and directed networks further alter the interpretation, and weighted centrality can depend on how tie number and tie strength are combined Opsahl et al. 2010.

Definition 7.184 (Centrality interpretation profile)**.** A *centrality interpretation profile* records the structural concept represented by a centrality measure, the network specification on which it is computed, the role of direction and weight, the assumed meaning of paths or walks, the boundary and scale, and the substantive claim that the resulting score is intended to support.

This profile helps separate structural position from broader evaluative concepts. A central position in a communication network can indicate visibility or brokerage while providing limited evidence about formal authority. A central position in a payment network can reflect transaction volume while revealing little about profitability or dependence. High betweenness can create brokerage opportunities in one institutional context and operational burden in another. Structural centrality can therefore contribute to analyses of power, access, vulnerability, or coordination when the mechanism connecting position to those outcomes is separately supported.

Centrality is also boundary-sensitive. Adding previously omitted nodes or cross-boundary edges can substantially change rankings and path-based measures. Scale matters as well: a local hub can be peripheral in a national network, while a globally central institution can be only weakly connected within a specialized local field. Longitudinal centrality can change because relations change, node identity changes, or observation coverage changes. Centrality claims should therefore retain the network specification with which the score was generated.

7.19.9 Network Uncertainty

Network uncertainty arises because nodes, edges, weights, directions, times, layers, and boundaries can be imperfectly observed or ambiguously specified. Social-network research has long confronted measurement error and informant inaccuracy; Butts develops a Bayesian approach that jointly models social structure and informant accuracy in the presence of error and missing data Butts 2003. The broader methodological lesson is that a network can be treated as an uncertain reconstruction rather than a fully observed object.

Edge uncertainty is one component. A reported relation can be forgotten, strategically concealed, misclassified, or recorded by only one participant. Digital logs can omit interactions outside the platform. Administrative data can contain linkage failures. Historical networks can depend on incomplete archives. Inferred edges can carry model uncertainty. A binary graph constructed after these processes can conceal substantial variation in evidential confidence.

Node uncertainty can be equally consequential. Entity-resolution errors can merge distinct actors or split one actor into several identifiers. Hidden, anonymous, informal, or poorly documented participants can be absent from the node set. Historical actors can change names or organizational forms. Boundary uncertainty can determine whether peripheral or cross-system relations appear in the represented network.

Uncertainty can be propagated through analysis in several ways. Researchers can estimate probabilistic networks, compare alternative graph reconstructions, perturb uncertain edges, vary thresholds and boundaries, or report intervals and distributions for derived statistics. The appropriate strategy depends on the source of uncertainty and the claim being made. A centrality ranking that changes under a few plausible edge corrections deserves a different interpretation from a robust component structure that persists across many alternative reconstructions.

Definition 7.185 (Network uncertainty envelope)**.** A *network uncertainty envelope* is the set of substantively plausible network reconstructions generated by uncertainty in node identity, edge presence or type, direction, weight, timing, layer assignment, boundary, or measurement, together with the graph-level conclusions that remain stable or change across those reconstructions.

The envelope extends the configuration uncertainty profile from Section 175 into computational network analysis. It is particularly useful when visually persuasive network maps could otherwise create a stronger impression of certainty than the underlying evidence supports.

AI-assisted network construction makes this issue increasingly important. Automated entity linking, relation extraction, graph completion, community detection, and embedding-based similarity can generate large candidate networks rapidly. These tools can enlarge the encounter surface of inquiry by exposing unexpected paths or clusters, while model-generated edges and representations require provenance and independent validation. A predicted relation should remain distinguishable from an observed, reported, legally established, historically reconstructed, or experimentally inferred relation.

7.19.10 Limits of Graph Representation

Graph representations provide a powerful language for pairwise relational structure, paths, connectivity, position, clustering, and change. Their analytical limits become visible when the target phenomenon depends on information that the chosen graph does not preserve. These limits are representation-specific rather than a general objection to network analysis.

The first limit concerns pairwise reduction. Some relations are jointly constituted by several positions. Committee decisions, team production, coalitions, multilateral obligations, and group interactions can lose important structure when projected onto dyadic edges. Higher-order network methods using hypergraphs, simplicial structures, and related representations address part of this problem, and the next section develops these approaches directly. Research on networks beyond pairwise interactions shows that higher-order structure can support dynamical behavior that pairwise descriptions fail to preserve Battiston et al. 2020.

The second limit concerns semantics. Two graphs can be topologically identical while representing substantively different relations. A path of legal authority, a path of friendship, and a path of financial exposure can share the same formal shape while implying different mechanisms, risks, and normative meanings. Graph isomorphism therefore does not establish substantive equivalence.

The third limit concerns field conditions and diffuse constraints. Prices, legal regimes, cultural expectations, technological standards, ecological conditions, or monetary systems can influence many positions without appearing naturally as pairwise edges. Some of these conditions can be represented through additional nodes, layers, or attributes; others may be better handled through field, institutional, spatial, or dynamical representations. Forcing each distributed condition into an edge can reduce interpretability.

The fourth limit concerns event and process structure. Static graphs can summarize relational architecture while concealing sequence, duration, negotiation, interpretation, and transformation. Temporal networks address part of this limitation, yet some processes require narrative, process-tracing, ethnographic, legal, or dynamical descriptions that preserve more than connectivity.

The fifth limit concerns ontological reification. Network visualizations can make analytical constructions appear concrete. A node's position, an edge's presence, or a community boundary can look self-evident once rendered graphically. The methodological response is to retain the network specification, provenance, alternative representations, and interpretation profile alongside the visual or numerical output.

Proposition 7.186 (Graph-representation discipline)**.** *A network claim becomes more accountable when the node and edge constructions, boundary and scale, temporal representation, relation semantics, uncertainty, and mapping from graph property to substantive interpretation remain explicit and revisable.*

Proposition 7.186 aligns network analysis with the ontology, epistemology, and research praxis developed earlier in the book. The graph is treated as a formal representation whose usefulness depends on the relation between its construction and the target phenomenon. Strong topological evidence can therefore coexist with epistemic humility about what that topology means beyond the specified representation.

Network analysis also illustrates the continuing role of contingent encounter and aesthetic judgment. A visualization, unusual bridge, isolated component, temporal rupture, multiplex mismatch, or unstable community can make a relational pattern salient before its significance is understood. Subsequent inquiry can test whether the pattern reflects substantive organization, measurement artifacts, boundary choice, data-generating infrastructure, or chance. AI can increase the number of candidate patterns available for inspection, making disciplined selection and verification increasingly important.

The network methods developed here provide a substantial toolkit for representing pairwise relational structure while preserving direction, value, time, layers, clustered organization, positional structure, and uncertainty. Their limits also identify the next methodological step. Section 186 turns to higher-order relational analysis, where hypergraphs, simplicial structures, multilateral relations, collective relations, relations among relations, and higher-order dependence are used to represent configurations whose relevant structure is only partially preserved by pairwise graphs.

7.20 Higher-Order Relational Analysis

Section 185 developed network analysis as a disciplined representation of pairwise relational structure and ended at a representational boundary: some empirical configurations derive their meaning or consequence from joint participation by three or more positions, while others involve relations that condition, authorize, compose with, or otherwise take other relations as their analytical objects. The present section develops methods for these cases. Its role is to distinguish higher-arity relations from relations among relations, to specify when hypergraphs and simplicial structures preserve information lost under dyadic projection, to reconstruct multilateral and collective relations, to characterize higher-order dependence, and to establish measurement and reduction criteria. The discussion treats higher-order representations as question-relative analytical instruments. Their usefulness depends on whether the additional structure corresponds to a substantively warranted feature of the research object and preserves information relevant to the target inference.

Research on networks beyond pairwise interactions has developed several mathematical languages for representing interactions involving groups of units and for studying dynamics whose behavior can differ from pairwise approximations Battiston et al. 2020; Bick et al. 2023. These methods are relevant to Generative Relational Theory because many institutional, economic, legal, organizational, and epistemic processes involve jointly constituted conditions. A committee decision can depend on a quorum; a guarantee can involve debtor, creditor, and guarantor positions; a research team can produce an output through a jointly organized task; a multilateral agreement can establish obligations whose operation depends on several parties; and an institutional authorization can condition relations among actors without being reducible to an additional interpersonal tie. Higher-order analysis provides ways to preserve these structures when pairwise projections would alter their interpretation.

Two uses of the term *higher-order* require separation at the outset. The first concerns *arity*: a relation involves several positions jointly. The second concerns *relational order*: a relation takes another relation, or a configuration of relations, as part of its object. A three-party contract illustrates higher arity. A regulatory relation that authorizes, limits, or invalidates a contractual relation illustrates a relation among relations. Some empirical cases combine both forms, while their analytical requirements remain distinguishable.

Definition 7.187 (Higher-order relational representation)**.** A *higher-order relational representation* is a question-relative representation that preserves either a jointly constituted relation among several positions, a relation whose object includes another relation or relational configuration, or both, together with the evidential, temporal, boundary, scale, and semantic conditions required to interpret that structure.

Definition 7.187 places higher-order analysis within the methodological architecture already developed in this chapter. Object specification from Section 169 determines what the participating positions represent. Boundary and scale from Sections 170–171 determine which surrounding relations enter the analytical domain. Relation identification and characterization from Sections 172–173 establish what kind of relation is being represented. Configuration reconstruction from Section 175 determines whether joint organization adds information beyond the constituent ties.

Table 7.19: Higher-order relational forms and methodological requirements

Form	Structure preserved	Evidential requirement	Characteristic risk
Hypergraph	Joint membership in a relation involving several positions	Evidence that the relevant interaction or relation exists at group level	Co-membership is mistaken for joint interaction
Simplicial structure	Higher-order relation together with a justified closure across lower-dimensional faces	Evidence supporting the substantive meaning of the closure relation	Mathematical closure is interpreted as empirical closure
Multilateral relation	Role-differentiated relation among several parties	Party roles, joint conditions, obligations, temporal scope, institutional basis	A multilateral arrangement is flattened into homogeneous pairwise ties
Collective relation	Relation constituted through a group acting, deciding, producing, or bearing status collectively	Evidence of joint capacity, procedure, recognition, or coordinated enactment	Aggregation is mistaken for collective agency
Relation among relations	Dependence, authorization, composition, guarantee, constraint, or translation between relations	Evidence linking the focal relations and specifying the second-order condition	Relational complexity is described without an identifiable second-order pathway
Higher-order dependence	Outcome or state depends on a joint relational configuration	Evidence that the joint configuration contributes information beyond lower-order components	Statistical interaction is treated as a substantive higher-order mechanism by default
Higher-order measurement	Observation captures group events, joint states, or relational order	Measurement process preserves participation, roles, timing, and uncertainty	Data collection projects a richer relation into pairwise records
Pairwise projection	Lower-order representation used as an approximation of a higher-order object	Explicit assessment of which higher-order properties are preserved or lost	Projection creates ties, paths, or strengths absent from the original relation

Table 7.19 summarizes the principal higher-order forms developed below. The table emphasizes the structure preserved by each form, the evidential requirement for using it, and the characteristic error that can arise when the formal representation outruns the substantive relation.

7.20.1 Hypergraphs

A hypergraph extends the pairwise graph by allowing one relational element to connect a set of several nodes. If the node set is denoted by V, a hyperedge can be represented as a subset $e \subseteq V$ containing the positions that participate jointly in the represented relation. This simple extension changes the analytical object substantially. A three-person meeting recorded as one hyperedge differs from three pairwise communication edges because the hyperedge preserves the fact that the interaction occurred jointly. A project consortium represented by a hyperedge differs from a clique among member organizations because the clique introduces pairwise ties whose direct evidential support may be weak or absent.

The methodological question is therefore whether the target relation is substantively group-constituted. Co-membership in a category, attendance at the same event, joint signature, co-production, shared liability, participation in a household, and coordinated decision-making can each generate higher-arity data, yet their relational meanings differ. A hyperedge should encode the relation relevant to the research question and distinguish substantive joint participation from incidental co-occurrence in the same record.

Hyperedges can carry additional structure. They may be directed when roles

differ between sources and recipients; weighted when the measurement has a substantively defined magnitude; typed when several group relations coexist; and time-indexed when joint participation forms, changes, or dissolves. An aid allocation, for example, might involve a donor, intermediary, implementing organization, and beneficiary group with differentiated roles. A representation that records only common membership would preserve arity while losing role structure. A typed or role-aware higher-order representation would preserve more of the relation.

Definition 7.188 (Hyperedge semantics profile)**.** A *hyperedge semantics profile* records the jointly represented relation, participating positions and their roles, evidential basis, arity, direction or role ordering where relevant, weight or value semantics, temporal scope, boundary and scale, and uncertainty concerning membership or joint constitution.

This profile parallels the edge semantics profile developed in Section 185. It also prevents one common projection error: a source record containing several names can be converted computationally into a hyperedge with little effort, while the substantive relation among those names may range from genuine joint action to incidental co-occurrence. Higher-order representation therefore places additional weight on semantic validation.

Hypergraphs are especially useful when the presence of the group as a group affects possible action. Quorum requirements, team production, multi-party approval, joint financing, household allocation, standards consortia, and collaborative authorship can possess properties that depend on a set of positions being present together. The hypergraph representation preserves that joint set so that later analysis can examine overlap, participation, group size, higher-order paths, or dynamics without first manufacturing pairwise ties.

7.20.2 Simplicial Structures

Simplicial structures provide a related higher-order representation with an additional closure property. Informally, a simplex involving several nodes includes lower-dimensional faces among its participating subsets. This property can be analytically valuable when the substantive object supports such nested inclusion. It can also become misleading when mathematical closure exceeds what the empirical relation supports. Higher-order network surveys therefore distinguish hypergraphs, which permit arbitrary sets of hyperedges, from simplicial complexes, whose structure includes downward closure Battiston et al. 2020; Bick et al. 2023.

The methodological importance of this distinction can be illustrated through collaboration. Suppose four researchers jointly produce one paper. A hypergraph can represent the four-author collaboration directly. A simplicial representation may additionally encode the faces associated with subsets of those authors. Such a representation is appropriate when those lower-order relations have substantive meaning for the inquiry. If the available evidence establishes only one four-person event, inferring each smaller collaborative relation from mathematical closure can exceed the evidence.

Simplicial representations become particularly informative when the research object genuinely contains nested group structure. Deliberative bodies with subcom-

mittees, scientific collaborations built from overlapping teams, institutional arrangements in which larger coalitions contain active smaller coalitions, or collective practices that persist across several nested participation sets may justify this structure. The representation can then support analysis of holes, boundaries, connected higher-order components, and the way group structures fit together.

Definition 7.189 (Simplicial representation profile)**.** A *simplicial representation profile* records the higher-order relation represented by each simplex, the substantive justification for including lower-dimensional faces, the evidential status of those faces, the temporal and boundary conditions of the complex, and the analytical properties for which simplicial structure is being used.

The profile protects against a subtle form of reification. Once data are encoded as a simplicial complex, closure appears as part of the object. Methodologically, closure remains an analytical commitment whose empirical status should be recoverable. The distinction matters particularly in social and economic settings where joint participation can coexist with weak, contested, or absent pairwise relations among some members.

Simplicial structures can also support multiscale reasoning. Faces and simplices of different dimensions provide a formal vocabulary for different orders of participation. This vocabulary should remain separate from the broader concept of analytical scale developed in Section 171. A simplex with more participating nodes does not automatically correspond to a macro-level phenomenon. Arity and scale are different dimensions: a large group relation may occur within a local organization, while a dyadic legal relation can connect transnational institutions.

7.20.3 Multilateral Relations

Multilateral relations arise when several parties participate in one relational arrangement whose meaning depends on their joint roles or joint conditions. Treaties, syndicated lending, consortium agreements, multi-party contracts, supply arrangements involving certifiers and intermediaries, coordinated humanitarian operations, and joint regulatory procedures provide examples. The analytical challenge lies in preserving differentiated participation across the multilateral arrangement.

A multilateral agreement can establish obligations that activate only under specified combinations of parties, events, or institutional conditions. A guarantee arrangement can involve a principal obligation together with a third-party commitment that changes the creditor's exposure. A procurement process can connect purchaser, supplier, auditor, regulator, and financing institution through role-specific relations whose joint operation defines the practical arrangement. Pairwise decomposition can represent some components, yet the multilateral condition may be the feature that makes the arrangement intelligible.

Multilateral analysis therefore benefits from explicit role specification. Participants can occupy initiating, authorizing, guaranteeing, implementing, receiving, monitoring, adjudicating, or other roles. Role labels should be grounded in the evidence and institutional context with evidence from the institutional context and source material. Legal inquiry from Section 180 is especially relevant because formal multilateral relations often contain precisely specified powers, duties, liabilities, and

jurisdictional conditions. Institutional inquiry from Section 181 complements the formal account by showing how the arrangement is enacted in practice.

Definition 7.190 (Multilateral relation profile)**.** A *multilateral relation profile* records the participating parties, differentiated roles, joint conditions, relevant bilateral subrelations, institutional or legal basis, temporal activation conditions, mechanisms of entry and exit, and uncertainties concerning how the arrangement is enacted.

The profile allows a study to retain both higher-order and lower-order structure. A multilateral relation can contain consequential dyads while remaining analytically distinct from their sum. The purpose of higher-order representation is therefore preservation of joint structure, not replacement of dyadic analysis.

Historical comparison also matters. Multilateral arrangements can persist nominally while membership, voting rules, enforcement, financing, or practical authority changes. The relational identity principles from Section 174 apply to the multilateral object itself. A stable treaty name, consortium label, or committee title can coexist with substantial transformation in the relation it denotes.

7.20.4 Collective Relations

Collective relations concern cases in which a plurality participates in a relation through some form of joint capacity, recognized collective status, coordinated procedure, or shared production. The analytical problem differs from ordinary aggregation. A collection of individuals with similar attributes is not thereby a collective actor, and repeated pairwise coordination does not by itself establish that the group bears a relation collectively. Evidence of joint constitution is therefore central.

Collective relations can be produced through several pathways. Formal institutions can authorize a body to decide or act in its own name. Organizations can coordinate members through routines and delegated roles. Informal groups can generate collective capacity through repeated practice, shared expectations, and mutual recognition. Households, teams, committees, communities, cooperatives, movements, and research collaborations can each exhibit different combinations of these pathways. Their collective status should be reconstructed for the specific relation under study.

A collective can also participate in external relations while containing internal disagreement. An organization may sign a contract, a committee may issue a decision, or a household may be classified as a unit for benefit eligibility. The external relation can be genuinely collective for a specified institutional purpose even when the internal configuration contains asymmetry, contestation, or differentiated benefit. This is one reason scale selection matters: treating the collective as one analytical node can be adequate for one question and obscure internal distributive relations for another.

Definition 7.191 (Collective relation specification)**.** A *collective relation specification* identifies the plurality represented collectively, the basis of joint capacity or recognition, decision or coordination procedures, relation-specific boundaries, internal differentiation relevant to the claim, external counterpart positions, and the evidence supporting treatment of the plurality as a collective relational participant.

Collective relations connect naturally with Generative Relational Economics. Productive capacity, bargaining capacity, knowledge generation, resource stewardship,

institutional representation, and generative return can be organized collectively. Later economic analysis will therefore require care in distinguishing value generated by a collective configuration from value attributable to one member, one dyad, or one institutional position.

Collective relation analysis also preserves the possibility that collective capacity is historically generated. A group may develop routines, trust, memory, standards, symbolic identity, or infrastructures that enable forms of action unavailable to its members when considered separately. Describing this as a higher-order relation does not establish the causal process by which the capacity emerged; it specifies the object whose formation can later be investigated through generative methods.

7.20.5 Relations among Relations

Higher-order relational analysis also includes cases in which the focal relation concerns other relations. Section 175 introduced this possibility through examples such as guarantees, legal authorization, confidentiality constraints, and governance arrangements. The present subsection develops it as a distinct methodological object. The central question is which relation changes the status, operation, interpretation, or possible trajectory of another relation.

Several forms can be distinguished. An authorization relation can establish who has standing to create another relation. A guarantee relation can condition the risk of an underlying obligation. A regulatory relation can constrain a market or contractual relation. A translation relation can connect classifications across institutions. A governance relation can determine how another relation is revised or terminated. A trust relation can affect whether an informational or exchange relation becomes actionable. These examples differ in substance while sharing the property that one relation conditions another.

Representing such structures requires more than drawing additional edges among the same actors. Suppose a regulator relates to a firm, and the firm relates contractually to a client. A simple three-node graph records both pairwise ties. It does not yet represent the claim that the regulatory relation constrains the contractual relation. That claim concerns the relation between relations and therefore requires a second-order specification.

Definition 7.192 (Second-order relation profile)**.** A *second-order relation profile* identifies the focal relations, the conditioning relation between them, the direction and type of conditioning, evidential basis, temporal ordering, boundary and scale, and the observable consequences through which the second-order relation can be assessed.

Second-order relations can themselves be institutionalized. Legal systems, accounting standards, organizational governance, platform rules, professional accreditation, and scientific review procedures can establish repeatable rules governing other relations. Their effects may therefore extend across many local interactions. This creates a bridge between higher-order analysis and field-based analysis later in the chapter: some distributed conditions can be represented through repeated relations among relations, while others are more adequately represented as field conditions.

Relations among relations are also relevant to methodological reflexivity. A measurement relation can alter the relation being measured; publication can change reputational relations; a classification relation can condition access relations. Research therefore can enter the higher-order configuration it studies. The reflexive analysis developed in Chapter 6 provides the praxis-level discipline for such cases.

7.20.6 Higher-Order Dependence

Higher-order dependence arises when a state, outcome, capacity, or transition depends on a relational configuration in a way that is inadequately represented by separate lower-order components. The relevant issue is joint dependence at the level of the research object. Several relations can each contribute information while their conjunction, ordering, or configuration carries additional explanatory significance.

An institutional approval may require several authorizations jointly. A collective project may proceed only when finance, technical capacity, legal permission, and organizational coordination are simultaneously available. An individual's access to a profession can depend jointly on credentialing, employer recognition, jurisdictional authorization, and network access. A financial arrangement can remain stable while several counterparties maintain commitments whose joint failure would produce a qualitatively different state. These are candidate higher-order dependencies because the configuration matters to the analytical target.

Formal models can represent such dependence through interaction terms, hypergraph dynamics, threshold rules, logical conditions, multilinear forms, or other structures. Higher-order network research demonstrates that group interactions can support collective dynamics that differ from pairwise approximations Battiston et al. 2020; Bick et al. 2023. Methodologically, the presence of a statistical interaction or nonlinear term is still insufficient to establish a substantive higher-order mechanism. The representation should be connected to an identified joint condition in the research object.

Definition 7.193 (Higher-order dependence profile)**.** A *higher-order dependence profile* records the lower-order relations involved, the proposed joint condition, the target state or outcome, temporal ordering, evidence that the joint configuration adds substantively relevant information, plausible lower-order alternatives, and uncertainty concerning the order of dependence.

The profile supports comparison between structural and statistical accounts. A regression interaction can indicate conditional covariation. A historical reconstruction can show that several institutional relations became jointly necessary after a reform. An experiment can vary combinations of relational conditions. A simulation can test whether a specified higher-order rule generates observed macroscopic behavior. These methods perform different epistemic work and can be triangulated without being treated as equivalent evidence.

Higher-order dependence also connects to multiscale analysis. A jointly constituted local relation can generate organizational effects, while field-level conditions can determine whether the local configuration becomes consequential. The order of interaction and the scale of manifestation should therefore be specified separately. A three-party relation is higher in arity without necessarily being higher in scale.

7.20.7 Higher-Order Measurement

Higher-order analysis depends on measurement systems capable of preserving the relevant joint structure. Many data infrastructures are designed around rows, dyads, transactions, or sender–receiver events. Group interactions can therefore be projected into pairwise records during data production, before the researcher receives the data. Reconstructing higher-order structure requires attention to this measurement pathway.

Some sources preserve group structure directly. Meeting records identify a set of participants; contracts identify several parties and roles; authorship records preserve co-production groups; committee minutes link decisions to a deliberative body; project databases can identify consortia; household surveys can preserve household membership; and digital systems can log group conversations or multi-user events. Other sources preserve only pairwise traces from which a higher-order relation is inferred. The evidential status of these cases differs.

Measurement also faces an arity problem. A recorded group may contain peripheral attendees, observers, inactive members, or automated accounts. Conversely, a nominally dyadic record can be generated by a wider institutional arrangement. Participation should therefore be characterized according to the relation of interest, with presence in a group record treated as one evidential component.

Role differentiation creates another measurement problem. A dataset that preserves the participant set but discards roles can erase the difference between guarantor and debtor, regulator and regulated party, donor and recipient, chair and member, or platform administrator and ordinary user. Higher-order measurement should retain role information when role structure contributes to the claim.

Definition 7.194 (Higher-order measurement profile)**.** A *higher-order measurement profile* records the source manifestation, rule by which joint participation is inferred or observed, participant and role definitions, temporal resolution, representation of repeated or nested group events, missingness and uncertainty, and transformations applied before the higher-order object enters analysis.

Projection should be documented as one such transformation. Turning an n-participant event into pairwise edges can be analytically useful for selected questions, while the projected graph acquires ties and path structure whose meaning derives from the projection rule. The original higher-order record should remain recoverable when later interpretation depends on joint participation.

AI-assisted extraction can increase the availability of higher-order data. Language models and information-extraction systems can identify candidate multi-party relations in contracts, correspondence, institutional documents, meeting records, or scientific texts. They can also infer relation types among several entities. These outputs enlarge the encounter surface of inquiry while adding model-mediated uncertainty. A machine-extracted hyperedge should therefore remain distinguishable from a directly recorded joint event, a participant-reported collective relation, or a legally constituted multilateral relation.

7.20.8 Limits of Pairwise Reduction

Pairwise reduction converts a higher-order object into dyadic relations. This transformation is often useful. Graph methods are mature, interpretable, and computationally efficient; many research questions concern reachability, brokerage, pairwise exposure, or diffusion pathways for which a projected graph can provide an adequate representation. The methodological issue is therefore the adequacy of the reduction for the specific claim.

Information loss occurs when the higher-order object contains a property that the projection does not preserve. A group event projected into a clique no longer distinguishes whether pairwise interactions occurred separately or only through the group. Two different hypergraphs can produce the same pairwise projection while containing different group structures. Role-differentiated multilateral relations can become symmetric-looking ties. Collective decisions can become a dense network that obscures procedural rules. Relations among relations can disappear when conditioning structure is represented only as additional actor-to-actor edges.

Pairwise projection can also create information. A four-party event converted into a clique produces six pairwise edges. Those edges are computationally real in the projected graph, yet their substantive interpretation derives from co-participation in one event while the six pairwise edges are induced by projection. Path counts, clustering, centrality, and community structure computed from the projection can therefore reflect the projection rule as well as the empirical configuration.

A reduction can still be appropriate when the target property is preserved. If the question concerns whether two participants shared at least one group event, a co-participation graph can be directly relevant. If the question concerns the joint decision rule of the group, the same graph may be insufficient. Adequacy should therefore be evaluated against the inferential target and the information it requires.

Definition 7.195 (Pairwise reduction audit)**.** A *pairwise reduction audit* records the higher-order object, projection rule, properties preserved, properties lost or newly induced, sensitivity of substantive conclusions to alternative projections, and the claims for which the reduced representation remains adequate.

Proposition 7.196 (Higher-order preservation principle)**.** *When a substantive claim depends on joint participation, role-differentiated multilateral structure, a relation among relations, or another identifiable higher-order condition, the analytical representation should preserve that condition through the stage at which the claim is evaluated.*

Proposition 7.196 does not require maximal representational complexity. It requires preservation of the structure on which the claim depends. A later projection, summary, or visualization can remain useful when its relation to the higher-order object is documented and when the information relevant to the inference remains recoverable.

Higher-order analysis also illustrates the role of contingent encounter and aesthetic judgment in methodological development. A recurring triad, unusual co-occurrence, collective failure, unexpected group boundary, or mismatch between a pairwise graph and observed practice can make a higher-order structure salient before its significance is established. Subsequent inquiry can ask whether the pat-

tern reflects a genuine joint relation, a measurement artifact, a boundary choice, an institutional rule, or chance. AI can generate many candidate higher-order patterns rapidly, which increases the value of preserving provenance, relation semantics, alternative representations, and explicit reduction audits.

The section therefore extends relational inquiry beyond pairwise graphs while retaining the same epistemic discipline developed throughout Chapter 7. Hypergraphs and simplicial structures preserve selected forms of joint interaction; multilateral and collective relations retain role and group constitution; second-order profiles represent relations among relations; dependence profiles connect joint structure to outcomes; and measurement profiles preserve the transformations through which higher-order objects become observable. Section 187 turns from these representational questions to statistical relational analysis, where dependence, covariation, hierarchy, longitudinal structure, latent relational models, and uncertainty become the primary analytical concerns.

7.21 Statistical Relational Analysis

Sections 7.18–7.20 developed three adjacent methodological layers: mainstream quantitative-empirical inference, pairwise network representation, and higher-order relational representation. The present section brings these layers together by asking how statistical inference changes when the observations themselves are relationally organized. Its role is to develop statistical treatment of relational data, dependence structures, relational covariation, hierarchical and longitudinal organization, latent relational models, uncertainty quantification, and limits of statistical identification. The objective is narrower than a general survey of quantitative methods. The concern here is the inferential consequence of the fact that dyads, repeated relations, network ties, group memberships, and relational configurations often violate the independence structures presupposed by simpler unit-centered analyses.

Statistical relational analysis therefore begins with the data-generating relation rather than with a preferred estimator. A dyadic observation involving positions i and j can share one position with observations involving i and k or j and k; reciprocal observations can couple i–j and j–i; triadic closure can connect the probability of one relation to surrounding relations; repeated observations can preserve dyad-specific history; and institutional or spatial organization can introduce dependence among many observations at once. Network methodology has long emphasized that relational data contain dependence structures that differ from independent-row data Wasserman and Faust 1994. Krackhardt's treatment of regression on dyadic data illustrates the inferential consequences of structural autocorrelation and the use of permutation procedures adapted to such dependence Krackhardt 1988. These examples motivate a broader principle: statistical models should represent the dependence structure that is relevant to the relational claim rather than treat dependence as a nuisance to be removed mechanically.

Within the ontology and epistemology developed earlier in the book, statistical relational models remain representations of manifestations. A fitted model can provide disciplined estimates of association, dependence, heterogeneity, persistence, or

Table 7.20: Components of statistical relational analysis

Component	Primary inferential task	Relational dependence represented	Characteristic caution
Relational data	Define the statistical observation and relational unit	Shared actors, dyads, group events, repeated relations	Row format can hide the relation that generated the observation
Dependence structures	Represent non-independent observations	Reciprocity, shared positions, triads, clustering, common institutions	Misspecified dependence can distort uncertainty and coefficient interpretation
Relational covariation	Estimate association between relational variables or matrices	Dyadic autocorrelation and common structural exposure	Covariation can arise from shared composition or third structures
Hierarchical models	Partition and partially pool heterogeneous relational variation	Sender, receiver, dyad, group, institutional, and cross-level variation	Statistical levels need substantive correspondence to relational scales
Longitudinal models	Characterize persistence and relational change through time	Repeated dyads, evolving ties, changing configurations	Temporal aggregation can alter the apparent sequence and mechanism
Latent relational models	Represent unobserved structure that organizes observed relations	Latent positions, classes, factors, or equivalence patterns	Latent variables remain model-dependent representations
Uncertainty quantification	Propagate inferential and measurement uncertainty	Parameter, edge, model, boundary, scale, and latent-structure uncertainty	Narrow parameter intervals can coexist with broad representational uncertainty
Statistical identification	Specify what the observed distribution and assumptions identify	Model-specific contrasts and relational parameters	Statistical identification does not settle substantive ontology or causality

latent structure while leaving the underlying ontology underdetermined. A latent position is a model-based object; a random effect summarizes modeled heterogeneity; a dependence parameter captures a specified statistical pattern. These quantities can be substantively illuminating when their inferential bridge is explicit, yet their mathematical precision does not by itself establish the existence of a corresponding hidden social object.

Definition 7.197 (Statistical relational inquiry)**.** *Statistical relational inquiry* is a family of inferential strategies in which observations, parameters, or uncertainty structures are specified with explicit attention to relations among units, shared positions, repeated ties, relational configurations, temporal dependence, or latent relational structure.

Definition 7.197 allows relational statistics to include permutation methods, multilevel and crossed-effects models, longitudinal relational models, latent-space approaches, Bayesian or likelihood-based network models, and other designs whose inferential structure reflects relational dependence. The relevant criterion is not whether a method carries the label “network statistics,” but whether the model and uncertainty calculation correspond adequately to the relational organization of the data.

Table 7.20 summarizes the principal components developed below.

7.21.1 Relational Data

Relational data are generated when the observation refers to a relation, interaction, joint event, or relationally indexed state rather than to an isolated unit. A dyadic dataset may record communication from one person to another, trade between orga-

nizations, legal obligations between parties, citations between documents, migration between places, or evaluations made by one actor of another. Higher-order data can record meetings, teams, committees, households, contracts involving several parties, or jointly produced outputs. Longitudinal relational data add repeated observations of these structures through time.

The physical storage format can obscure this organization. A rectangular table may contain one row per dyad or event and therefore resemble ordinary independent-row data, yet rows sharing a sender, receiver, organization, group, or time period remain relationally connected. Conversely, an adjacency matrix can visually foreground relational structure while still hiding uncertainty about how the underlying relation was measured. Statistical relational analysis therefore distinguishes *data format* from *relational observation structure*.

Definition 7.198 (Relational observation profile)**.** A *relational observation profile* records the statistical unit of observation, participating positions, direction and role structure, relation type, temporal index, boundary and scale, repeated-observation structure, measurement source, missingness process, and known forms of dependence with other observations.

This profile extends the edge and higher-order measurement profiles developed in Sections 7.19–7.20. It is especially useful when one empirical relation produces several statistical records. A directed relation can yield two ordered dyads. A long-standing relation can produce monthly observations. A group interaction can generate several projected dyads. The number of records can therefore exceed the number of substantively distinct relations.

Relational data can also combine unit attributes and relational attributes. A study of interorganizational exchange might include organizational size as a node-level variable, geographic distance as a dyadic variable, contract value as a relational variable, and institutional regime as a contextual variable. These levels of information should remain distinguished because their variation and dependence differ. A coefficient on geographic distance answers a different question from a coefficient on organizational size even when both enter the same statistical model.

The sampling process matters as well. Relational data can be censored by roster boundaries, missing actors, institutional access, digital-platform coverage, thresholding, or selective reporting. Butts demonstrates that uncertainty about informant accuracy and network measurement can be represented statistically rather than ignored Butts 2003. The broader methodological point is that relational statistics inherit the measurement and missingness problems developed in Sections 176, 185, and later Section 193. Statistical sophistication downstream does not erase uncertainty introduced during relational observation.

7.21.2 Dependence Structures

Dependence is a defining statistical feature of many relational datasets. Two dyadic observations can share one participant. Reciprocal relations can couple observations in opposite directions. Ties can be correlated because they occur within the same organization, locality, institutional regime, or higher-order event. Network structure can create dependence through reciprocity, triadic closure, clustering, brokerage, or

repeated exposure. Longitudinal observations can also depend on their own relational history.

The inferential consequence is straightforward: standard errors and tests derived under independent observations can be poorly calibrated when the relevant dependence is substantial. Krackhardt's analysis of dyadic regression develops a permutation approach designed for this setting and illustrates how structural autocorrelation can make ordinary least squares tests misleading for network matrices Krackhardt 1988. The specific procedure is one option among several; the more general lesson is that the null distribution should respect the exchangeability or dependence structure justified by the research design.

Dependence should also be interpreted substantively. Reciprocity can indicate mutual response, but reciprocal statistical dependence does not establish shared meaning. Triadic dependence can reflect closure, institutional rules, common environments, or measurement artifacts. Shared-node dependence can arise because actors differ in general activity, popularity, authority, or opportunity. Statistical dependence therefore identifies a patterned relation among observations; explanation requires an additional bridge.

Proposition 7.199 (Relational dependence discipline)**.** *When observations share actors, dyads, groups, institutions, time periods, or relational configurations, uncertainty estimation and model interpretation gain credibility when the analysis specifies which forms of dependence are represented, which are left in the residual structure, and why that division is appropriate to the research question.*

Proposition 7.199 is intentionally broader than a requirement for one model family. Dependence can be addressed through permutation schemes, cluster-robust procedures, random effects, autoregressive structures, explicit network models, Bayesian hierarchical models, block resampling, or design-specific methods. The relevant choice depends on the source and form of dependence.

A further issue concerns dependence induced by preprocessing. Projecting a group event into dyads, aggregating repeated interactions, imputing missing ties, or thresholding a continuous relation can create or alter statistical dependence. Dependence diagnostics should therefore be interpreted in relation to the transformation chain that produced the analyzed data.

7.21.3 Relational Covariation

Relational covariation concerns association between relational variables. One matrix can record communication and another resource exchange; one dyadic variable can record geographic distance and another collaboration; one relation can record authority while another records advice seeking. The statistical question is whether variation in one relational structure is associated with variation in another under a stated comparison and dependence model.

Matrix correlation and dyadic regression can provide useful descriptive or conditional summaries. The difficulty is that dyadic entries commonly violate the exchangeability conditions assumed by unit-level regression. Quadratic assignment procedures address one version of this problem by permuting actor labels in a way

that preserves substantial portions of the matrix dependence structure while generating a reference distribution for the association Krackhardt 1988. The interpretation remains design-dependent: a permutation result indicates that the observed covariation is unusual under the selected permutation scheme, not that one relation generates the other.

Relational covariation can arise through several pathways. Two relations can share a mechanism. One relation can condition another. Both can reflect actor composition, organizational membership, spatial proximity, or institutional rules. Measurement systems can also create common variation when two relational variables are derived from the same source. A high association between two matrices therefore warrants a question about common structure before a stronger substantive interpretation is adopted.

Definition 7.200 (Relational covariation profile)**.** A *relational covariation profile* records the relational variables compared, the unit and direction of comparison, boundary and scale, shared actors or contexts, temporal alignment, dependence-preserving inferential procedure, plausible common structures, and the scope of the association claim.

This profile is especially important when relation types have different time scales. Communication can vary daily while ownership changes rarely. Trust can adjust after repeated encounters while contractual status changes at discrete institutional moments. Aggregating these variables to the same time window can make them statistically comparable while obscuring their distinct dynamics. Temporal alignment should therefore be justified substantively as well as computationally.

Covariation analysis can also support exploratory discovery. An unexpected alignment between two relational structures can make a candidate mechanism or configuration salient. Consistent with the chapter's treatment of contingent encounter, that salience can guide subsequent inquiry without settling the meaning of the association. Documentary, historical, ethnographic, legal, or causal analysis may then determine whether the observed covariation corresponds to a substantive relational pathway.

7.21.4 Hierarchical Models

Relational datasets often contain several overlapping sources of heterogeneity. Some actors initiate relations frequently; some receive them frequently; some dyads have persistent histories; some organizations create common environments; some regions or institutional regimes shape several relations at once. Hierarchical and multilevel models provide one way to represent these variations and to partially pool estimates across related units Gelman and Hill 2007.

A relational model can include sender effects, receiver effects, dyad effects, organizational effects, regional effects, or time effects, depending on the research object. In directed relational data, sender and receiver heterogeneity should generally remain distinguishable when their substantive meanings differ. An actor that initiates many requests can occupy a different position from one that receives many requests. In repeated dyadic data, a dyad-specific component can represent persistent affinity or friction that is not captured by the separate attributes of the two participants.

Crossed structures can be more appropriate than simple nesting. Employees can interact across teams; organizations can operate in several jurisdictions; researchers can belong to overlapping collaborations; suppliers can serve several firms. A model that forces these relations into one hierarchy may simplify computation while altering the relational structure. The hierarchy should therefore follow the data-generating organization rather than a preference for tidy levels.

Definition 7.201 (Relational hierarchical specification)**.** A *relational hierarchical specification* records the sources of grouped or crossed variation represented in the model, their substantive interpretation, the relations connecting statistical levels, the pooling assumptions, and the residual dependence expected after those components are included.

This definition connects directly to Section 171. Statistical levels are analytical devices; they need not correspond one-to-one with ontological scales. An organization-level random effect can summarize shared statistical variation without proving the existence of a unitary organizational mechanism. Conversely, a substantively important organizational relation can remain poorly represented by one random intercept. Scale-model correspondence should therefore be assessed rather than presumed.

Hierarchical models can also support partial pooling of sparse relational estimates. If some organizations or dyads are observed only a few times, estimates can borrow information through a population distribution while retaining local variation. This can improve estimation under the model while making the pooling assumption part of the inferential claim. Researchers should distinguish empirical stability gained through partial pooling from direct evidence that heterogeneous cases share the same underlying process.

7.21.5 Longitudinal Models

Longitudinal relational analysis studies persistence, formation, dissolution, reactivation, and transformation through time. The object can be a repeated dyad, an evolving network, a sequence of group events, or a time-indexed relational configuration. This connects statistical modeling to the identity and persistence questions developed in Section 174.

Panel-style relational models can include lagged relation states, time-varying covariates, unit or dyad effects, and changing institutional conditions. Time-series methods provide tools for dependence, persistence, structural change, and state evolution Hamilton 1994. Network-specific longitudinal models go further by representing tie change as dependent on current network structure and actor or dyadic characteristics. Stochastic actor-based models, for example, model directed-network evolution through stochastic opportunities for tie change and can incorporate reciprocity, transitivity, actor covariates, dyadic covariates, and coevolving behavior Snijders et al. 2010.

The substantive value of longitudinal models depends on temporal resolution. Annual data can represent institutional persistence while missing short-lived interactions. High-frequency event data can capture bursts and ordering while making slow institutional change appear nearly fixed. Section 171's multiscale principle therefore extends to time: the observation interval should correspond to the dynamics relevant

to the research question.

Longitudinal dependence can also create ambiguity between persistence and repeated reconstitution. A tie recorded in consecutive periods can represent one continuous relation, repeated independent transactions, or a relation that has changed meaning while retaining the same identifier. Statistical persistence should therefore be connected to the relational identity profile from Section 174 when identity itself matters to the claim.

Definition 7.202 (Relational longitudinal profile)**.** A *relational longitudinal profile* records the temporal unit, observation intervals, identity criteria for repeated relations, formation and dissolution rules, lag structure, time-varying covariates, institutional or historical regime changes, and the distinction between persistence of records and persistence of the substantive relation.

Dynamic models can support prediction and mechanism-oriented hypotheses, yet observed temporal order remains only one part of causal inference. Feedback, anticipation, common shocks, selective tie formation, and changing measurement systems can produce dynamic associations. Section 188 will address causal relational analysis more directly; the present section keeps longitudinal statistical dependence analytically distinct from causal identification.

7.21.6 Latent Relational Models

Observed relations can exhibit regularities that are parsimoniously represented through latent positions, classes, factors, or stochastic equivalence structures. Latent relational models introduce unobserved variables whose estimated configuration helps account for patterns in observed ties. Hoff, Raftery, and Handcock's latent-space model represents tie probabilities through positions in an unobserved social space and allows uncertainty about those positions to be estimated Hoff et al. 2002.

Latent representations can serve several purposes. They can summarize similarity in relational patterns, improve prediction, visualize modeled proximity, capture residual dependence, or suggest clusters and dimensions that deserve substantive investigation. Their inferential value is especially strong when the model is treated as a representation whose empirical consequences can be checked.

The principal epistemic caution is ontological. A latent coordinate, factor, or class is identified through the statistical model and the observed data. It need not correspond to a hidden entity that exists independently in the form specified by the model. Rotations, reflections, label switching, alternative dimensionalities, or different latent-model families can yield substantively similar fits while assigning different internal representations. The latent object therefore requires interpretive validation before it is given a strong social or institutional meaning.

Caution 7.203 (Latent relational representation)*.* A latent relational variable can provide a useful statistical representation of patterned dependence while leaving the substantive ontology of the underlying relation underdetermined. Interpretation should therefore distinguish model-based latent structure from independently warranted social, institutional, psychological, or economic entities.

Caution 7.203 parallels the ontological suspension developed in Chapter 4. Latent

relational models can be used productively without requiring premature metaphysical commitment. External evidence, historical interpretation, participant accounts, institutional records, or predictive behavior can then strengthen or weaken candidate substantive interpretations.

AI-assisted analysis can make latent modeling and representation search considerably cheaper. Many embeddings, clusterings, latent dimensions, and graph representations can be generated quickly. This abundance raises a model-selection problem: visually compelling latent spaces can invite interpretation before stability, identifiability, or external validity has been examined. Aesthetic judgment may make a latent pattern worth investigating, while statistical and substantive validation remain separate tasks.

7.21.7 Uncertainty Quantification

Uncertainty in statistical relational analysis extends beyond parameter standard errors. At least several layers can matter: uncertainty about measured relations, uncertainty about model parameters, uncertainty about dependence structure, uncertainty about boundary and scale, uncertainty about temporal identity, uncertainty about missing relations, and uncertainty about latent structure. Butts's Bayesian treatment of network measurement error provides one example in which uncertainty about observed ties and informant accuracy enters the inferential model directly Butts 2003.

Parameter uncertainty remains important. Likelihood, Bayesian posterior distributions, permutation distributions, bootstrap procedures, or design-based calculations can quantify uncertainty under their respective assumptions. The difficulty arises when a narrow interval is interpreted as if it covered upstream uncertainty about the research object. A coefficient can be estimated precisely conditional on a particular network boundary while the coefficient changes substantially under another plausible boundary. A latent position can have a concentrated posterior within one model while its substantive interpretation remains uncertain across model families.

Definition 7.204 (Relational uncertainty envelope)**.** A *relational uncertainty envelope* records inferential uncertainty conditional on the fitted model together with substantively important uncertainty concerning measurement, missing relations, boundary, scale, temporal identity, dependence specification, latent representation, and alternative model structures when these materially affect the claim.

The envelope need not place heterogeneous uncertainty sources into one probability distribution. Some uncertainties are statistical; others are structural, historical, or interpretive. The methodological aim is visibility rather than forced commensurability. A study can report parameter intervals, sensitivity across boundaries, alternative latent solutions, and qualitative uncertainty about relation meaning in separate forms.

Uncertainty can also be relationally distributed. Some actors are measured more accurately than others; some organizations maintain richer records; some ties are visible because they pass through formal infrastructures; some populations remain weakly documented. Unequal measurement precision can therefore mirror institutional power or infrastructural access. Quantification should avoid allowing highly

documented positions to dominate merely because their records are statistically convenient.

7.21.8 Limits of Statistical Identification

Statistical identification asks whether the probability model and its assumptions determine the parameter or contrast of interest from the distribution of observed data. This is a precise and valuable concept, but its scope should remain visible. A statistically identified parameter is identified relative to a model, observation process, boundary, measurement system, and set of assumptions. Substantive relational identification involves additional questions about what the parameter represents in the empirical field.

Several limits follow from this distinction. Different relational mechanisms can generate similar observed distributions. Unmeasured higher-order structure can appear as dyadic dependence. Boundary truncation can alter degree distributions and covariation. Latent models can provide alternative representations with comparable empirical fit. Time aggregation can make different sequences observationally similar. Measurement error and missingness can change apparent reciprocity, clustering, or persistence. Statistical fit therefore constrains interpretation without uniquely determining the relational ontology.

The same point applies to coefficients. A sender effect can capture general activity, access to opportunities, institutional authority, measurement visibility, or a mixture of these. A dyad effect can summarize persistent affinity while leaving its substantive source unresolved. A latent coordinate can predict ties without telling us whether the underlying mechanism is social similarity, geography, institutional sorting, or another process. Statistical relational analysis is strongest when these quantities are treated as well-defined inferential objects whose substantive interpretation remains open to triangulation.

Definition 7.205 (Statistical relational warrant profile)**.** A *statistical relational warrant profile* records the relational estimand or parameter, observation structure, dependence assumptions, measurement process, boundary and scale, temporal scope, model family, uncertainty procedure, alternative specifications, and the inferential bridge connecting the statistical quantity to the substantive relational claim.

Proposition 7.206 (Statistical relational identification principle)**.** *A statistically well-identified relational parameter supports the substantive claim most clearly when the observation process, dependence structure, measurement semantics, boundary, scale, and interpretive bridge are sufficiently aligned with the relation the parameter is intended to represent.*

Proposition 7.206 preserves both the strength and the limits of statistical inference. Statistical modeling can distinguish patterns that informal inspection misses, quantify uncertainty, compare competing structures, and test whether observed regularities are compatible with explicit models. Its contribution becomes more reliable when the relation between mathematical object and empirical relation remains reconstructable.

This discipline becomes increasingly important under AI-assisted model genera-

tion. Automated systems can fit many dependence structures, latent representations, hierarchical specifications, and temporal models with low marginal cost. That abundance can improve exploratory reach while increasing multiplicity and interpretive flexibility. Provenance, held-out validation, sensitivity analysis, theory-guided specification, and explicit relational warrant profiles become correspondingly important. Contingent anomalies in residuals or model instability can still generate valuable questions; aesthetic recognition can orient attention toward an unusual relational pattern; subsequent inquiry determines whether that pattern is robust, substantively meaningful, or an artifact of representation.

Statistical relational analysis therefore provides a bridge between quantitative inference and relational structure without reducing one to the other. Relational data define the observation, dependence structures shape uncertainty, covariation maps patterned association, hierarchical models represent distributed heterogeneity, longitudinal models reconstruct change, latent models summarize unobserved structure, and uncertainty envelopes keep several forms of incompleteness visible. Section 188 turns from statistical relational dependence to causal relational analysis, where interference, mediation, network exposure, relational treatment, selection into relations, and causal transport require a more demanding set of identifying assumptions.

7.22 Causal Relational Analysis

Sections 7.18 and 7.21 established two adjacent foundations for causal relational inquiry. The first situated causal identification within the wider family of quantitative-empirical designs; the second showed how statistical inference changes when observations are relationally dependent. The present section develops the more demanding case in which causality itself is relationally structured. Treatments can be assigned to relations, groups, institutions, or network positions; outcomes can concern relations and configurations; one position's treatment can alter another position's exposure or outcome; tie formation can be jointly related to treatment and outcome; and the relevant counterfactual may depend on a configuration of assignments rather than on one isolated unit. The section therefore examines relational treatments, relational outcomes, interference, spillover, network confounding, relational counterfactuals, causal graphs, and the limits of isolated-unit causal representations.

Causal relational analysis does not require a presumption that social causality is universally networked or that unit-centered causal designs are generally inadequate. A unit-centered estimand can be highly informative when cross-unit pathways are substantively negligible, controlled by design, or outside the defined claim. The methodological issue is alignment: the causal estimand, treatment definition, outcome definition, interference structure, boundary, scale, and assignment process should correspond sufficiently to the relational pathways through which the proposed effect could arise. This extends the claim-specific causal discipline developed in Section 7.18 into settings where treatments and outcomes are embedded in relational configurations.

The potential-outcomes tradition provides a disciplined vocabulary for treatment contrasts and assignment mechanisms Imbens and Rubin 2015. Interference com-

Table 7.21: Components of causal relational analysis

Component	Primary causal task	Relational feature	Characteristic caution
Relational treatment	Define the intervention and exposure domain	Treatment of ties, groups, positions, institutions, or relational opportunities	Similar labels can conceal different treatment versions and reach
Relational outcome	Define the causal response	Individual, dyadic, group, network, institutional, or cross-scale change	Unit-level outcomes can omit relational restructuring
Interference	Represent cross-position treatment–outcome pathways	One position's assignment contributes to another position's outcome	Exposure structure needs substantive and design-based justification
Spillover	Estimate effects transmitted beyond direct treatment	Relational reach, exposure intensity, pathway, and timing	Proximity or adjacency alone does not establish spillover
Network confounding	Separate exposure effects from selection and common causes	Homophily, shared context, tie formation, correlated histories	Observational similarity can be compatible with several causal processes
Relational counterfactual	Specify comparison worlds for relational exposure	Joint assignments, alternative ties, group configurations, institutional states	Counterfactuals depend on which surrounding relations are held fixed
Causal graph	Encode causal assumptions and identification pathways	Causal relations among treatments, exposures, outcomes, mediators, and selection	A social-network graph and a causal graph answer different questions
Isolated-unit approximation	Determine when unit-centered causality is adequate	Magnitude and relevance of cross-unit pathways relative to the estimand	Convenience of analysis is weaker evidence than pathway assessment

plicates the familiar isolated-unit representation because the potential outcome for one position may depend on assignments received elsewhere. Hudgens and Halloran develop direct, indirect, total, and overall effects under interference in grouped settings Hudgens and Halloran 2008; Aronow and Samii formulate exposure mappings and estimands under more general interference Aronow and Samii 2017. Causal diagrams provide a complementary representation for distinguishing direct, contagion-mediated, and allocational forms of interference Ogburn and VanderWeele 2014. Together, these approaches support a relational causal framework in which the causal target is specified through pathways and exposure conditions rather than inferred from adjacency alone.

Definition 7.207 (Causal relational inquiry)**.** *Causal relational inquiry* is a family of research designs in which treatment, exposure, outcome, assignment, confounding, mediation, interference, or transport is specified partly through relations among positions, relational configurations, or cross-position pathways relevant to the causal claim.

Definition 7.207 is intentionally broad. It includes randomized designs with spillovers, observational studies of relational exposure, interventions directed at dyads or groups, causal analysis of tie formation or dissolution, institutional interventions transmitted through organizational relations, and analyses in which a network or higher-order configuration mediates treatment effects. It also accommodates designs in which relational pathways are examined and found to be sufficiently weak for an isolated-unit approximation to remain useful.

Table 7.21 summarizes the principal components developed below.

7.22.1 Relational Treatments

A treatment becomes relational when its definition, assignment, delivery, or substantive effect depends on a relation or relational position. The familiar individual treatment indicator remains useful in many settings, yet several common interventions have a wider relational architecture. A contract changes obligations between parties; a mentoring program creates or modifies a dyadic relation; a team intervention changes coordination among several participants; an institutional reform changes authority or access across roles; a platform policy changes the opportunities through which users can encounter one another; and a resource allocation can alter dependence, bargaining, or exchange relations beyond the direct recipient.

This variety makes treatment specification a substantive operation. A label such as "training," "subsidy," "information," or "regulation" can hide differences in who receives the intervention, who observes it, which relations are altered, whether treatment changes opportunities for interaction, and whether the intervention is delivered through an existing relation. The causal estimand inherits those distinctions.

Definition 7.208 (Relational treatment specification)**.** A *relational treatment specification* records the intervention object, treated positions or relations, assignment mechanism, delivery relation, treatment versions, temporal onset and duration, potential reach beyond directly assigned positions, boundary and scale, and the relational pathways through which exposure can occur.

The specification is especially important when the intervention modifies the network or institutional configuration through which later outcomes are measured. Consider an intervention intended to improve information access. Treatment can affect the content received by a focal participant, the participant's propensity to communicate, the set of available communication partners, and the salience of certain ties. Treating the intervention as a single scalar exposure may remain appropriate for a narrowly defined direct effect, while broader claims about relational transformation require additional variables or representations.

Treatment can also be directed at a relation rather than at either endpoint separately. Mediation services, joint contracts, couple-based interventions, interorganizational agreements, collaborative grants, and bilateral regulatory arrangements are examples. Assigning the treatment to one endpoint for data-management convenience can obscure the joint condition constituting the intervention. The higher-order preservation discipline developed in Section 7.20 applies when several parties jointly instantiate the treatment.

Relational treatment definitions should therefore preserve the intervention feature that carries the causal claim. The resulting design can still be simple. A binary treatment can be sufficient when treatment versions and relational reach are substantively stable within the intended domain. Greater detail becomes useful when the same treatment indicator corresponds to materially different relational exposures.

7.22.2 Relational Outcomes

Relational causal inquiry also broadens the outcome domain. Many studies retain an individual outcome even when the causal pathway is relational: health, income,

learning, trust, behavior, or well-being may change partly through relations with others. Other research questions concern relations directly. An intervention may affect whether a tie forms, whether a contract persists, the reciprocity of exchange, the dependence of one organization on another, the distribution of authority, group cohesion, network fragmentation, or an institution's coordination structure.

The distinction matters because a stable individual outcome can coexist with substantial relational change. A workplace intervention might leave average productivity nearly unchanged while changing dependence, communication centralization, workload distribution, or the distribution of access to decision-makers. Conversely, a change in individual outcomes can occur with little evidence that the focal relation itself changed. The causal response should therefore be defined at the level relevant to the substantive question.

Definition 7.209 (Relational outcome profile)**.** A *relational outcome profile* records the outcome object, participating positions, relational property or configuration measured, temporal horizon, boundary, scale, measurement interface, aggregation rule where applicable, and the distinction between focal outcome change and surrounding relational change.

Relational outcomes can be dyadic, higher-order, network-level, institutional, or cross-scale. A dyadic outcome might concern duration of collaboration. A higher-order outcome might concern formation of a functioning team. A network outcome might concern fragmentation, reachability, or concentration. An institutional outcome might concern the practical realization of authority or access. Cross-scale outcomes can connect local changes with organizational or field-level consequences, provided the mediating pathways are specified rather than inferred from simultaneous movement across levels.

Outcome definition also interacts with measurement timing. An intervention can produce an early change in interaction frequency, a later change in trust, and a still later organizational reconfiguration. Choosing one observation window can therefore privilege one layer of effect. The temporal methods developed later in this chapter provide tools for reconstructing such heterogeneity; causal relational analysis first requires that the relevant outcome horizon be stated.

7.22.3 Interference

Interference is present when the treatment assigned to one position contributes to the potential outcome of another position. In potential-outcomes notation, the outcome for position i can then depend on a vector of assignments $\mathbf{Z}$ rather than only on Z_i. This dependence changes both the estimand and the design. Hudgens and Halloran show how direct and indirect effects can be defined under grouped interference Hudgens and Halloran 2008; Aronow and Samii generalize the design logic through exposure mappings that translate an assignment vector into the exposure condition relevant to each unit Aronow and Samii 2017.

The relational interpretation of interference requires more than detecting correlated outcomes among connected positions. The researcher needs a proposed pathway through which one assignment reaches another outcome. That pathway can involve direct interaction, shared resources, competition, communication, institu-

tional rules, common group membership, contagion, congestion, or changes in available partners. Ogburn and VanderWeele distinguish direct interference, interference through contagion, and allocational interference, illustrating how different pathways imply different causal structures and identification requirements Ogburn and VanderWeele 2014.

Definition 7.210 (Interference pathway profile)**.** An *interference pathway profile* records the source assignment, affected position, mediating relation or configuration, exposure mapping, temporal order, plausible reach, competing pathways, and the evidence supporting the proposed cross-position treatment–outcome connection.

This profile prevents interference from becoming a generic synonym for dependence. Statistical dependence can arise through shared causes without a treatment-mediated pathway. Interference is a causal claim about how assignment at one position contributes to an outcome elsewhere. The distinction parallels Section 7.21: statistical relational dependence can motivate causal inquiry while remaining compatible with several causal explanations.

Interference can also be scale-specific. A policy assigned at the institutional level may affect organizations, dyads, and individuals through different channels. An individual-level treatment may aggregate into group norms only after sufficient adoption. A local treatment can alter field-level competition when treated positions occupy strategically consequential locations. These cross-scale effects require bridge mechanisms of the kind introduced in Section 7.5; the existence of several scales does not itself establish interference across them.

Proposition 7.211 (Interference specification discipline)**.** *A causal claim involving interference is most clearly interpretable when the assignment mechanism, exposure mapping, relational pathway, temporal order, and causal contrast are specified together.*

Proposition 7.211 places the exposure mapping inside the substantive theory of the intervention. Different mappings—for example, presence of a treated neighbor, proportion of treated collaborators, weighted exposure through repeated interaction, or group-level treatment saturation—encode different causal questions. Their usefulness depends on the relations through which treatment can plausibly matter.

7.22.4 Spillover

Spillover refers to treatment effects that extend beyond the directly treated position or treatment object. In relational settings, spillover can travel through observed ties, shared institutions, spatial proximity, higher-order membership, resource competition, information diffusion, or other pathways. The concept is therefore broader than contagion and narrower than generic correlation. A spillover claim identifies a causal effect transmitted through a specified exposure relation or configuration.

The distinction between direct and spillover effects becomes especially useful when the intervention affects both the treated position and its surroundings. A scholarship can change one student's resources and also alter study collaboration; a subsidy to one firm can affect suppliers or competitors; a local infrastructure investment can change mobility and access for neighboring communities; an organizational reform can alter the workload of untreated roles. These effects can reinforce,

attenuate, or reverse the directly measured effect depending on the configuration.

Aronow and Samii's exposure-mapping framework makes this issue explicit by linking assignment, exposure conditions, and estimands under interference Aronow and Samii 2017. From a relational perspective, the exposure mapping is also a representation of hypothesized causal reach. A binary indicator of having at least one treated neighbor preserves a different causal feature from a weighted measure of exposure, a threshold measure, or a group-saturation measure.

Definition 7.212 (Spillover profile)**.** A *spillover profile* records the directly treated object, indirectly exposed positions, transmission relation, exposure intensity or threshold, temporal lag, boundary and scale, competing exposure pathways, and the estimand used to distinguish direct from indirect causal response.

Spillover can be beneficial, harmful, mixed, or domain-specific. The same intervention can improve information access while increasing congestion, or reduce one form of risk while shifting costs elsewhere. A single average spillover parameter can therefore hide heterogeneity across relation types and positions. Where such heterogeneity is substantively relevant, the design can preserve it through stratified exposure mappings, role-specific estimands, or multiscale analysis.

A further distinction concerns relational distance. Network path length can serve as one approximation of exposure reach, yet social, institutional, legal, spatial, and infrastructural distance need not coincide. A position two graph steps away may remain practically insulated, while a formally distant actor can receive strong exposure through a high-capacity institutional channel. Spillover analysis should therefore retain the semantics of the transmitting relation.

7.22.5 Network Confounding

Network confounding arises when relational exposure, tie formation, and outcomes share causes that make causal influence difficult to distinguish from selection or common context. Homophily provides the canonical example: positions with similar characteristics can form ties and later display similar outcomes even when direct influence is weak. Shared institutions, spatial environments, prior histories, common shocks, and selection into groups can produce related problems.

Shalizi and Thomas show that homophily and contagion are generically confounded in many observational social-network settings unless strong structural or substantive assumptions are available Shalizi and Thomas 2011. Their result is especially relevant to relational epistemology because an observed similarity among connected positions is compatible with several generative histories. The manifestation—correlated outcomes along ties—therefore underdetermines the causal relation.

Definition 7.213 (Network-confounding profile)**.** A *network-confounding profile* records the exposure relation, tie-formation process, measured common causes, plausible unmeasured common causes, temporal ordering, network evolution, shared contexts, selection processes, and assumptions used to separate influence from alternative relational explanations.

Confounding can enter through the network itself. If treatment changes tie forma-

tion, the post-treatment network can become a mediator or collider relative to some causal questions. Conditioning mechanically on the observed network can then alter the estimand or introduce selection. Conversely, treating a historically formed network as fixed can hide the processes that created exposure opportunities in the first place. The appropriate representation depends on whether network formation precedes treatment, co-evolves with treatment, or is partly caused by treatment.

The problem is not resolved simply by adding more covariates. Rich measurement can reduce plausible confounding, while unmeasured relational histories can remain. Design-based interventions, temporal ordering, negative controls, sensitivity analysis, natural experiments, and qualitative or historical reconstruction can provide complementary leverage. The methodological pluralism developed earlier in the chapter becomes particularly valuable here because causal ambiguity can arise from a missing relation rather than from insufficient statistical sophistication alone.

Network confounding can also be higher-order. Group formation, institutional sorting, or coalition membership may jointly shape ties and outcomes. Pairwise adjustment can miss such structure. The higher-order preservation principle from Section 7.20 therefore extends naturally to causal analysis when the confounding process is jointly constituted.

7.22.6 Relational Counterfactuals

Counterfactual reasoning asks how an outcome would differ under an alternative treatment or exposure condition. In relational settings, the comparison world needs additional specification because changing one assignment can alter another position's exposure, available relations, or institutional context. The counterfactual therefore concerns a relational configuration of assignments and exposures rather than a treatment label in isolation.

A useful distinction separates three kinds of intervention. The first changes an attribute or resource of a focal position while holding the surrounding relation structure approximately fixed. The second changes a relation—for example, creating access, removing a prohibition, or modifying a contractual obligation. The third changes the relational configuration itself, such as reorganizing teams, altering matching rules, or changing institutional authority. These interventions support different counterfactual questions even when they are described informally as acting on the same population.

Definition 7.214 (Relational counterfactual specification)**.** A *relational counterfactual specification* records the focal intervention, assignment configuration, exposure mapping, relations held fixed, relations permitted to change, temporal horizon, boundary, scale, and the outcome contrast used to define the causal estimand.

This specification helps clarify compound interventions. Suppose an employment program provides training and also creates new employer connections. A counterfactual that removes training while preserving the new connections asks a different question from a counterfactual that removes the entire program, including the relations generated through participation. Both can be meaningful, yet they estimate different causal contrasts.

Relational counterfactuals also make the consistency problem more visible. A treatment label can have several relational versions: receiving information from a close colleague, a distant authority, an automated system, or an anonymous source may generate different exposures. If those versions matter to the outcome, treatment definition should preserve the relevant relation rather than assume equivalence across delivery contexts.

The counterfactual world does not require exhaustive reproduction of surrounding detail. Claim-relative abstraction remains possible. The objective is to preserve the relational features that are causally relevant to the estimand and to state which surrounding conditions are treated as stable for the comparison. This discipline keeps counterfactual reasoning tractable without turning relational context into an unlimited list of dependencies.

7.22.7 Causal Graphs

Causal graphs provide a compact language for representing assumptions about causal direction, confounding, mediation, selection, and identification. In relational research, they require a particularly important representational distinction. A social-network graph records specified relations among positions. A causal directed acyclic graph records causal assumptions among variables, events, or states. The two graphs can be connected, but their edges have different semantics.

Ogburn and VanderWeele develop causal diagrams for interference and show how different interference mechanisms lead to distinct causal structures and identification problems Ogburn and VanderWeele 2014. Their approach illustrates the value of representing the treatment of one position, another position's outcome, intermediate outcomes, and allocation mechanisms within a causal graph. The observed social relation can enter that graph as an exposure pathway, selection variable, mediator, moderator, or part of the treatment definition depending on the research question.

Definition 7.215 (Dual-graph specification)**.** A *dual-graph specification* records separately the graph or higher-order representation used to describe empirical relations among positions and the causal graph used to encode assumptions about causal pathways, together with an explicit mapping between the relational features and causal variables used in the analysis.

The distinction protects against several shortcuts. High centrality in an observed network does not by itself identify a causal mediator. An edge in a communication network does not establish a causal arrow from one participant's behavior to another's outcome. A causal edge between two variables does not imply that the corresponding actors are adjacent in the observed social network. Likewise, a cluster in a social graph need not map onto a causal block in the identification strategy.

Temporal structure deserves additional care. By construction, a static directed acyclic graph excludes simultaneous cycles. Time indexing can unfold a feedback process into an acyclic sequence when the temporal ordering is substantively defensible. The underlying social or institutional process may nevertheless contain repeated reciprocal influence over time. The temporal-relational methods later in the chapter provide complementary tools for reconstructing such processes.

Causal graphs also inherit the ontological restraint established earlier in the book. A graph is an explicit representation of a causal model, not a direct visualization of ultimate causal reality. Its value comes from making assumptions inspectable, testing implications where possible, and clarifying which unobserved or relational pathways threaten identification.

7.22.8 Limits of Isolated-Unit Causality

Isolated-unit causal analysis treats the focal unit's potential outcome as sufficiently determined by its own treatment and specified covariates for the estimand at hand. This approximation remains useful across many experiments, quasi-experiments, and observational studies. Causal relational analysis adds a diagnostic question: which cross-position pathways, if present, would materially alter the causal contrast or its interpretation?

The answer is claim-relative. Interference that is negligible for one outcome horizon can become important over a longer period. Spillovers can remain small within one organizational boundary while becoming consequential across institutions. A treatment can have little influence on neighbors' immediate outcomes while changing the network through which later opportunities are distributed. The adequacy of isolated-unit causality therefore depends on treatment reach, outcome horizon, boundary, scale, and the mechanism relevant to the claim.

Definition 7.216 (Relational causal warrant profile)**.** A *relational causal warrant profile* records the causal estimand, treatment specification, outcome profile, assignment mechanism, relational exposure pathways, interference assumptions, confounding structure, counterfactual specification, causal graph, boundary, scale, temporal horizon, uncertainty, and the conditions under which an isolated-unit approximation is considered adequate.

Proposition 7.217 (Relational causal adequacy)**.** *An isolated-unit causal representation is most defensible when plausible cross-position treatment–outcome pathways are weak relative to the stated estimand, controlled by design, or explicitly outside a bounded claim, and when those conditions are supported by substantive or empirical evidence.*

Proposition 7.217 avoids two symmetrical errors. One is to assume independence because the dataset is organized by individuals. The other is to presume that relational embedding makes isolated-unit causal inference unusable. Relational inquiry instead asks which relations are causally operative for the specific contrast and how strongly the design addresses them.

This perspective also changes sensitivity analysis. A sensitivity analysis can vary interference reach, exposure mapping, network boundary, tie uncertainty, treatment versions, or plausible selection mechanisms in addition to conventional unmeasured confounding parameters. When substantive conclusions remain stable across plausible relational specifications, confidence in the bounded claim can increase. When they change sharply, the instability identifies a relational assumption that deserves direct investigation.

Contingent encounter and aesthetic judgment retain a methodological role at this

stage. An unexpected untreated response, spatial cluster, secondary-group effect, temporal lag, or pattern concentrated around particular ties can make a neglected pathway salient. Such an encounter generates a candidate causal relation rather than immediate causal proof. Experimental redesign, exposure reconstruction, documentary evidence, interviews, temporal analysis, or alternative causal models can then evaluate the candidate pathway.

AI-assisted causal analysis can enlarge this exploratory space by generating candidate exposure mappings, graph structures, sensitivity scenarios, and heterogeneous-effect specifications. The same abundance increases the importance of provenance and constraint. A large search over causal graphs or exposure definitions can create convincing patterns through flexibility alone. Research designs therefore benefit from recording which relational assumptions were theory-driven, which emerged through exploration, which were externally validated, and which remain provisional.

Causal relational analysis thus extends causal inference without replacing its design discipline. Treatments and outcomes can be relational, interference and spillover can become part of the estimand, network formation can enter the confounding structure, counterfactuals can depend on assignment configurations, and causal graphs can encode pathways that cross positions and scales. The resulting framework remains selective: causal claims concern specified pathways within stated boundaries rather than a presumption of universal causal connectedness. Section 189 turns to spatial relational analysis, where distance, adjacency, mobility, spatial dependence, spatial boundaries, and geographically mediated relations introduce another family of structures that can shape both relational description and causal interpretation.

7.23 Spatial Relational Analysis

The preceding sections established methods for identifying, characterizing, comparing, statistically modeling, and causally analyzing relations. The present section adds spatial structure to that methodological architecture. Its role is to specify how location, distance, movement, accessibility, infrastructure, territory, distributed spatial conditions, and geographical scale enter relational inquiry. The objective is neither to reduce relations to geometry nor to treat space as a neutral container. Spatial relational analysis asks how spatial arrangements condition which relations can form, persist, intensify, weaken, or become practically consequential, while also examining how relations themselves produce and reorganize spatial configurations. The discussion proceeds through spatial proximity, relational distance, mobility, accessibility, infrastructure, territory, spatial fields, and multiscalar space.

This approach draws on several established lines of geographical and spatial analysis while preserving the ontological and epistemological restraints developed earlier in the book. Tobler's influential formulation concerning spatial proximity helped motivate a large family of spatial-dependence methods Tobler 1970, and spatial econometrics provides explicit tools for modeling spatial dependence and spatial heterogeneity Anselin 1988. At the same time, geographical proximity is only one possible

Table 7.22: Spatial-relational dimensions and characteristic methodological questions

Dimension	Primary analytical contribution	Specification requirement	Characteristic remainder
Spatial proximity	Represents geometric or topological nearness	Metric, coordinate system, adjacency rule, spatial unit, temporal reference	Nearness may differ from practical or institutional connection
Relational distance	Represents effective separation relevant to a relation	Cost, time, institutional, informational, legal, or network pathway	Several distance forms can coexist between the same positions
Mobility	Represents movement among locations and spatial positions	Trajectory, origin–destination semantics, temporal granularity, selection process	Observed movement omits constrained, unrealized, or unrecorded mobility
Accessibility	Represents feasible access to opportunities, resources, or positions	Target opportunity, mode, cost, time, eligibility, information, capacity	Geometric availability may differ from practical access
Infrastructure	Represents material and technical mediation of spatial relations	Infrastructure type, capacity, ownership, operation, reliability, access rule	Infrastructural presence may differ from usable connection
Territory	Represents area-based authority, jurisdiction, control, or membership	Boundary source, authority, enforcement, permeability, historical status	Formal territorial reach may differ from enacted reach
Spatial field	Represents distributed spatial conditions or gradients	Field variable, spatial support, reconstruction method, boundary, scale	Field representation may smooth localized discontinuities
Multiscalar space	Represents spatial organization across interacting resolutions	Scale definitions, cross-scale bridge, nesting, rescaling, temporal scope	Structure visible at one scale may be suppressed at another

condition of relational connection. Massey's relational account of space emphasizes that places and spatial formations can be understood through intersecting social relations and historical processes Massey 1994. Spatial relational inquiry therefore treats geometry, infrastructure, mobility, jurisdiction, institutional access, and symbolic or historical attachments as analytically distinguishable contributors to spatial organization.

Definition 7.218 (Spatial relational inquiry)**.** *Spatial relational inquiry* is a family of methods for reconstructing how spatial location, distance, mobility, accessibility, infrastructure, territorial organization, distributed spatial conditions, and geographical scale condition or express relations among analytical positions.

Definition 7.218 makes the spatial dimension claim-relative. A study can use coordinates, travel times, administrative boundaries, transport networks, service catchments, mobility traces, historical maps, ethnographic observation, legal jurisdictions, or other evidence depending on the relation being investigated. Spatial precision alone does not settle relational meaning. A pair of positions separated by a short Euclidean distance can remain institutionally disconnected, while geographically distant positions can be tightly coupled through transport, finance, law, communication, kinship, or organizational authority.

Table 7.22 summarizes the principal spatial dimensions developed below. The table is organized around methodological functions rather than a hierarchy of spatial representations.

7.23.1 Spatial Proximity

Spatial proximity is one of the most familiar ways in which geography enters social inquiry. Positions can be compared through Euclidean distance, travel distance, adjacency, contiguity, shared boundaries, co-location, neighborhood membership, or other spatial metrics. Such measures can be substantively informative because communication costs, repeated encounter, local exposure, service availability, environmental conditions, and transport requirements often vary with spatial arrangement. The empirical regularity commonly associated with Tobler motivates attention to nearby observations while remaining a methodological tendency rather than a universal rule about social relations Tobler 1970.

The first methodological requirement is to specify which form of proximity is relevant to the research question. Straight-line distance can be appropriate for some exposure processes, while street-network distance can better represent travel, and shared administrative adjacency can matter for jurisdictional interaction. Vertical separation inside a building can be consequential despite small horizontal distance. A river, railway, border, security perimeter, or inaccessible terrain can make two geographically near locations practically distant. Coordinate precision therefore does not remove the need for substantive spatial specification.

Spatial units also matter. Neighborhoods, census areas, parcels, municipalities, service zones, ecological regions, and self-defined places partition space according to different criteria. Aggregating observations into one spatial unit can produce apparent similarity that disappears at a finer resolution. Conversely, extremely fine coordinates can obscure institutions, catchments, or territorial arrangements that operate at coarser spatial scales. Section 7.5 developed this problem as scale selection; spatial inquiry gives it geographical form.

Proximity can also change through time without a change in coordinates. A new bridge, transit line, border restriction, communication infrastructure, or service closure can alter effective nearness. Temporal indexing is therefore relevant when the study concerns changing spatial relations. Historical maps, timetables, transport records, legal boundaries, and infrastructure archives may be necessary for reconstructing earlier proximity conditions.

Definition 7.219 (Spatial proximity profile)**.** A *spatial proximity profile* records the spatial positions being compared, the proximity metric or adjacency rule, coordinate or spatial reference system where relevant, boundary and scale, temporal reference, relevant barriers or connectors, and uncertainty in the underlying spatial observations.

The profile helps distinguish a measured spatial property from the relation inferred from it. Proximity can support opportunities for encounter or exposure, yet evidence of nearness does not by itself establish communication, trust, exchange, authority, dependence, or another substantive relation. Those relations require the identification procedures developed in Section 7.6.

7.23.2 Relational Distance

Relational distance extends spatial analysis beyond geometric separation. Two positions can be geographically close while remaining distant in travel time, cost, legal access, institutional eligibility, information, language, social connection, or organizational pathway. Conversely, geographically distant positions can become relationally close through high-capacity transport, digital communication, shared institutions, recurrent exchange, standardized legal arrangements, or dense organizational links.

The term *distance* therefore needs an explicit target. A commuting study can define distance through generalized travel cost. A study of public-service access can include waiting time, eligibility rules, opening hours, documentation, and information. A study of organizational coordination can use communication delay, authorization steps, or workflow separation. A study of financial integration can define effective distance through transaction costs, settlement infrastructure, or institutional connectivity. These forms of distance can coexist and can change differently over time.

Relational distance also interacts with meaning and position. A route that is practically short for a well-resourced actor can remain costly for a person with limited mobility, restricted legal status, caregiving obligations, language barriers, or weak information access. A border crossing can be routine for one category of traveler and highly uncertain for another. The same spatial arrangement can therefore generate heterogeneous relational distances across positions.

Definition 7.220 (Relational distance profile)**.** A *relational distance profile* specifies the target relation, the dimensions through which separation is operationalized, the positions to which those dimensions apply, their spatial and temporal scope, and the evidence supporting the translation from geographic arrangement to effective relational separation.

Relational distance is especially useful for GRE because economic relations often depend on conversion between physical and institutional distance. A resource can be geographically present yet relationally inaccessible; a market can be physically remote yet institutionally integrated; a public service can be located nearby while remaining difficult to reach because of timing, documentation, language, or transport constraints. Later economic chapters can therefore treat distance as a heterogeneous relational condition rather than as a single metric.

7.23.3 Mobility

Mobility concerns movement among spatial positions and the relational conditions through which movement becomes possible, constrained, costly, encouraged, or consequential. Movement data can include migration histories, commuting trajectories, transport records, shipping flows, mobile-device traces, field observations, travel diaries, vehicle movements, or archival records. These sources can reveal connections that static maps leave weakly visible.

Observed mobility should be distinguished from mobility capacity. A person who remains in one location can possess broad mobility options, while another can remain spatially fixed because movement is costly or institutionally restricted. A low observed flow can therefore reflect preference, constraint, insufficient opportunity,

legal exclusion, weak infrastructure, or measurement failure. Mobility analysis benefits from preserving these alternatives where the evidence does not yet discriminate among them.

Mobility can also generate relations. Repeated commuting can create workplace and neighborhood ties; migration can reorganize household, remittance, legal, and care relations; transport corridors can connect markets and institutions; tourism can reshape local economic configurations; forced displacement can dissolve some relations while creating others. Movement is therefore more than a response to preexisting spatial structure. It can participate in producing new relational architectures.

Temporal granularity matters strongly. A daily commute, seasonal migration, occasional institutional visit, and one-time displacement involve different rhythms and relational implications. Aggregating them into total movement can erase sequence and recurrence. Section 190 will treat temporal relations directly; spatial mobility analysis should retain enough temporal information for the relevant trajectory to remain interpretable.

Definition 7.221 (Mobility relation profile)**.** A *mobility relation profile* records the moving positions or flows, origin and destination semantics, route or pathway where relevant, timing and recurrence, enabling and constraining conditions, observation process, and the relational claims inferred from the movement pattern.

The profile also helps discipline the use of large mobility datasets. Digital traces can provide high-resolution movement observations while omitting people, devices, periods, or movement modes unevenly. Precision in recorded trajectories should therefore remain separate from representativeness of the population or completeness of the mobility process.

7.23.4 Spatial Accessibility

Accessibility concerns the relation between a position and a set of opportunities, resources, services, destinations, or relational possibilities. Hansen's classic formulation made accessibility operational in metropolitan planning by linking locations to reachable opportunities Hansen 1959. Relational inquiry extends this idea by treating access as target-specific and position-sensitive.

A clinic, school, employment center, market, administrative office, archive, public space, or transport node can be geographically available while remaining inaccessible in practice. Travel time and cost matter, but so can operating hours, queueing, disability access, safety, language, legal eligibility, documentation, information, platform access, social recognition, and institutional discretion. The relevant accessibility measure therefore depends on the opportunity under study and the conditions through which a position can use it.

Accessibility is also directional. A service can be reachable from a household while the household remains poorly reachable by emergency providers, delivery systems, or public transport at another time of day. A rural community can have formal access to a regional institution while institutional staff rarely travel in the opposite direction. Directional accessibility can therefore be relevant when flows, authority, or service

provision are asymmetric.

Accessibility can be relationally cumulative. Access to one resource can enable access to another: transport access can support employment access; digital access can support information and administrative access; legal status can support housing or financial access. Conversely, a bottleneck at one stage can reduce access across several downstream relations. GRE later analyzes these effects in terms of capacities, conversion, and generativity; the present section supplies the spatial methodology required to identify them.

Definition 7.222 (Spatial accessibility profile)**.** A *spatial accessibility profile* records the target opportunity or resource, focal position, transport or connection modes, generalized costs, temporal conditions, eligibility and informational conditions, relevant capacities, boundary and scale, and uncertainty in both opportunity and access measurement.

This definition prevents a single accessibility score from standing in for heterogeneous access conditions whose consequences can differ across actors and contexts.

7.23.5 Infrastructure

Infrastructure mediates spatial relations by shaping movement, communication, circulation, settlement, service delivery, and connection among places. Roads, railways, ports, airports, water systems, energy grids, telecommunications networks, housing systems, logistics facilities, digital platforms, and administrative infrastructures can alter the practical distances and opportunities described above.

The presence of infrastructure and usable infrastructural connection should be distinguished. A railway can cross a locality without providing a station. Broadband can technically cover an area while pricing, equipment, reliability, or skills limit use. A road can exist while seasonal conditions make it unreliable. A public building can be physically accessible while institutional procedures prevent practical entry. Spatial-relational analysis therefore benefits from examining capacity, reliability, ownership, operation, maintenance, access rules, and connection points in addition to mapped presence.

Infrastructure can also redistribute relational possibilities. A new transit line can enlarge reachable employment or education; a port expansion can reorganize trade routes; an information system can centralize administrative coordination; a logistics platform can privilege some routes and actors; a border facility can accelerate one flow while intensifying control over another. Infrastructure is therefore relevant to both enablement and constraint.

Historical infrastructure deserves separate attention. Existing relational patterns can be shaped by systems built under earlier institutional, demographic, or political conditions. Their material persistence can carry past spatial decisions into present opportunity structures. Documentary and archival inquiry can help reconstruct these trajectories, while spatial analysis can examine how current relations remain conditioned by inherited layouts.

Definition 7.223 (Infrastructural mediation profile)**.** An *infrastructural mediation profile* records the infrastructure relevant to a target relation, its spatial extent, con-

nection points, capacity, reliability, ownership or authority, access conditions, temporal status, and the pathway through which it is proposed to enable, constrain, redirect, or redistribute relations.

This profile keeps infrastructure analytically connected to the relation under study. Infrastructure can then be modeled as a spatial network, institutional arrangement, field condition, historical object, or combination of these, depending on the research question.

7.23.6 Territory

Territory introduces spatially organized authority, jurisdiction, control, membership, and exclusion. Sack's analysis of territoriality emphasizes area-based strategies through which access to people and things can be influenced or controlled Sack 1986. For relational methodology, territory is therefore more than bounded geometry. A territorial boundary can alter rights, obligations, taxation, mobility, regulation, service eligibility, political membership, property, security, or administrative competence.

Formal territorial boundaries can be reconstructed from law, maps, registries, administrative records, treaties, organizational rules, or other authoritative documents. Their enacted reach can differ. Enforcement capacity, overlapping jurisdiction, informal practice, contested boundaries, extraterritorial rules, cross-border institutions, and practical mobility can create relational configurations that do not coincide exactly with the formal line.

Territory can also be multiplex. The same physical area can fall within municipal, regional, national, electoral, school, health, police, environmental, utility, customary, and organizational jurisdictions. These boundaries can overlap or diverge. A study that uses one territorial partition as its analytical frame should therefore identify which form of authority or membership makes that partition relevant to the claim.

Territorial permeability is equally important. Borders can permit some flows while restricting others. Goods, capital, information, people, legal claims, environmental effects, and institutional authority can cross territorial boundaries under different conditions. The boundary methods developed in Section 7.4 therefore apply directly to territorial analysis.

Definition 7.224 (Territorial relation profile)**.** A *territorial relation profile* records the relevant area, boundary source, authority or jurisdiction, membership or access conditions, enforcement and practical reach, permeability by relation type, temporal status, and contested or overlapping territorial claims.

The profile is especially important when spatial units are used as if they were naturally coherent social units. Administrative territory can be substantively meaningful, yet its relevance should derive from the authority, resource, membership, or institutional relations that the boundary organizes.

7.23.7 Spatial Fields

Some spatial phenomena are better reconstructed through distributed conditions than through isolated pairwise relations. Pollution exposure, land values, policing in-

tensity, service density, climatic risk, linguistic environment, infrastructure quality, market pressure, or institutional influence can vary across space and condition actors according to location. Section 122 developed relational fields epistemologically; spatial inquiry provides methods for reconstructing geographically distributed instances of such conditions.

Spatial statistics and spatial econometrics offer one family of tools for detecting and modeling dependence associated with geographical arrangement. Anselin's spatial econometric framework distinguishes spatial dependence and spatial heterogeneity as features that can require explicit specification in quantitative models Anselin 1988. The relevant spatial weights, neighborhood definitions, or distance functions remain analytical choices. A spatial-lag or spatial-error structure is therefore a statistical representation of dependence under specified spatial relations rather than a direct statement about the substantive mechanism generating the pattern.

Field representations can be useful when influence is gradual, distributed, or locally varying. Interpolation, kernel surfaces, spatial smoothing, exposure maps, accessibility surfaces, or model-based spatial effects can reveal gradients that are difficult to summarize through discrete boundaries. At the same time, smoothing can suppress discontinuities caused by borders, infrastructure, segregation, institutional thresholds, or abrupt environmental change. Field reconstruction should therefore preserve evidence about discontinuities where they matter to the research object.

A spatial field can also overlap with network or territorial structure. A labor-market pressure field can be shaped by transport networks and jurisdictional rules; an environmental field can cross political boundaries; a digital-service field can depend on infrastructure nodes and pricing zones. These overlaps support multi-method reconstruction rather than a requirement that one spatial representation replace the others.

Definition 7.225 (Spatial field profile)**.** A *spatial field profile* records the distributed condition being represented, spatial support, observation and interpolation process, boundary and scale, temporal reference, identified gradients or discontinuities, uncertainty, and the pathway through which field position is proposed to matter for the target relation.

This definition preserves the distinction between a spatially patterned variable and a substantively meaningful field. Pattern can motivate field inquiry; field attribution requires an account of how distributed spatial conditions become consequential for the positions located within them.

7.23.8 Multiscalar Space

Spatial relations frequently operate across several geographical resolutions. Household mobility can depend on neighborhood infrastructure, municipal services, regional labor markets, national law, and transnational transport or migration regimes. A firm's local production site can be connected to regional logistics, national regulation, and global finance. An environmental process can operate across ecological scales that intersect imperfectly with administrative territories. Multiscalar spatial analysis asks how these resolutions are distinguished, connected, and transformed.

Scale should remain analytically distinct from place, territory, and space. Brenner's methodological discussion emphasizes the value of distinguishing geographical scale from related sociospatial concepts and examining processes of scaling and rescaling directly Brenner 2001. The scale-selection principles of Section 7.5 therefore apply geographically: local, regional, national, and transnational scales are useful only when their boundaries and relational relevance are specified for the object under study.

Massey's relational treatment of space also helps resist the assumption that places are internally self-contained units Massey 1994. A locality can be constituted partly through relations extending elsewhere: migration, supply chains, finance, media, legal authority, environmental flows, kinship, tourism, or institutional networks. Spatial relational inquiry can therefore reconstruct a place through both internal organization and external relational reach.

Cross-scale inference requires an explicit bridge. A neighborhood-level pattern does not automatically identify an individual-level mechanism; a national average can conceal local spatial heterogeneity; an individual trajectory can reveal one cross-scale pathway without establishing its prevalence. The cross-scale bridge developed in Section 7.5 remains appropriate here: the researcher specifies how a process at one spatial resolution conditions or is generated through another.

Spatial aggregation can also create scale-induced distortion. The apparent concentration, segregation, accessibility, exposure, or dependence of a phenomenon can change when spatial units or resolution change. Sensitivity analysis can therefore compare substantively plausible spatial partitions, neighborhood definitions, travel thresholds, or field resolutions. The purpose is not to search indefinitely for a preferred map, but to identify whether the substantive conclusion depends strongly on one spatial construction.

Definition 7.226 (Multiscalar spatial profile)**.** A *multiscalar spatial profile* records the spatial resolutions relevant to a research object, the processes represented at each resolution, cross-scale bridges, nesting or overlap relations, rescaling processes, temporal scope, and conclusions that change under plausible alternative spatial resolutions.

The multiscalar profile also supports later economic analysis. Allocation can occur at one geographical scale while access is realized at another; value can be generated locally and captured elsewhere; infrastructure can be financed nationally while its effects vary by neighborhood; regulation can be territorial while economic networks extend transnationally. These are substantive questions about cross-scale relations rather than reasons to privilege a single geographical resolution.

Definition 7.227 (Spatial relational warrant profile)**.** A *spatial relational warrant profile* records the spatial object, proximity or distance specification, mobility and accessibility conditions where relevant, infrastructural and territorial mediators, field assumptions, boundary and scale choices, temporal reference, spatial uncertainty, and the inferential bridge connecting spatial structure to the relational claim.

The profile provides a common reporting structure across the methods developed in this section. It also makes visible which spatial components have been directly measured and which remain theoretical, inferred, or provisional.

Contingent encounter and aesthetic judgment retain a methodological role in spatial inquiry. An unexpected cluster on a map, a route that appears anomalously indirect, a neighborhood separated by a seemingly minor barrier, a discontinuity at an institutional border, or an unfamiliar spatial juxtaposition can make a candidate relation salient. Visual salience does not establish substantive significance. Documentary, ethnographic, mobility, institutional, causal, or statistical analysis can then test whether the apparent spatial structure reflects a consequential relation, a measurement artifact, an aggregation effect, or a transient pattern.

AI-assisted spatial analysis can enlarge this encounter surface through geocoding, map comparison, image interpretation, trajectory clustering, route generation, spatial interpolation, and rapid comparison across geographical scales. The same abundance increases the importance of provenance and spatial semantics. Geocoding errors, changing place names, uncertain boundaries, inaccessible routes, biased location traces, and model-generated spatial similarities can create persuasive visual structures that are weakly connected to the target relation. Human judgment remains particularly important when the significance of place depends on legal, historical, cultural, institutional, or lived meanings poorly captured by coordinates alone.

Spatial relational analysis therefore complements network, statistical, and causal methods by making geographical organization explicit. Proximity can condition encounter without determining relation; relational distance can diverge from geometry; mobility can both express and produce relations; accessibility depends on opportunities and capacities; infrastructure mediates connection; territory organizes spatial authority; fields represent distributed conditions; and multiscalar analysis reconstructs relations across geographical resolutions. Section 190 extends this methodology into temporal relational analysis, where formation, persistence, transformation, sequence, duration, rhythm, gaps, and historical continuity become the primary dimensions of reconstruction.

7.24 Temporal Relational Analysis

The preceding sections developed relational inquiry through object specification, boundary and scale selection, relation identification and characterization, historical persistence, configurations, documentary and field-based evidence, quantitative inference, network structure, causal analysis, and spatial organization. The present section adds an explicitly temporal methodology. Its role is to specify how relations form, persist, transform, dissolve, become ordered in sequence, acquire duration and rhythm, pass through gaps, and remain historically connected across changing manifestations. The objective is to make temporal structure available for relational inference without reducing time to a neutral index attached after the analysis. The discussion therefore treats timing, order, interval, recurrence, interruption, and continuity as properties that can condition what a relation is and what it can generate.

This approach is consistent with process-sensitive traditions in social science. Abbott emphasizes that temporal ordering, events, cases, and turning points can alter the theoretical meaning of social-science observations Abbott 2001. Pierson similarly

shows how timing and sequence can become consequential under mechanisms of increasing returns and path dependence Pierson 2000. Sewell's treatment of historical events provides a related account in which events can transform the structures that condition subsequent action Sewell 1996. Temporal-network analysis adds a formal perspective in which the ordering and duration of relational contacts can change reachability and dynamical consequences even when the aggregated graph remains similar Holme and Saramäki 2012. These traditions motivate a temporal relational methodology in which chronology, process, and historical interpretation remain analytically connected while retaining distinct evidential demands.

Definition 7.228 (Temporal relational inquiry)**.** *Temporal relational inquiry* is a family of methods for reconstructing how the formation, persistence, transformation, dissolution, ordering, duration, rhythm, interruption, and historical continuity of relations condition their meaning, organization, and consequences.

Definition 7.228 treats time as more than a coordinate. A relation recorded at two dates can differ in identity, meaning, intensity, institutional basis, or surrounding configuration. Conversely, a relation can remain historically continuous while its manifestations change substantially. Temporal inference therefore requires explicit criteria for which changes count as persistence, transformation, interruption, succession, or dissolution. Section 7.8 established the identity problem for relations through time; the present section extends that problem into a broader methodology of temporal organization.

Table 7.23 summarizes the principal temporal dimensions developed below. The table separates temporal operations that are often compressed into a single chronological variable.

7.24.1 Relation Formation

Relation formation concerns the process through which a candidate relation becomes sufficiently established to support the claim under investigation. A formation date can sometimes be identified through a contract, registration, first transaction, first recorded interaction, appointment, legal decision, organizational entry, or other discrete manifestation. In other settings formation is gradual. Trust, dependence, informal authority, collaboration, rivalry, or institutional alignment can develop through repeated encounters before a researcher can justify treating the relation as established.

The methodological problem therefore involves more than locating the earliest trace. The earliest surviving record can postdate the practical beginning of the relation, while an early encounter can precede the formation of the relation later attributed to it. A first email between two researchers, for example, does not by itself establish collaboration; a first transfer does not necessarily establish a durable financial relation; a first public statement can precede the institutionalization of an alliance. Formation should be indexed to the substantive relation being claimed.

Formation can be reconstructed through precursor conditions. Shared organizational membership, spatial proximity, prior third-party ties, legal eligibility, technological compatibility, repeated exposure, resource complementarity, or a triggering event can increase the plausibility of later relational formation. These conditions

Table 7.23: Temporal-relational dimensions and characteristic methodological questions

Dimension	Primary analytical contribution	Specification requirement	Characteristic remainder
Formation	Reconstructs how a relation becomes sufficiently established for the target claim	Initiating conditions, precursor relations, first manifestations, recognition criteria	Precursors can precede the date at which the relation becomes observable
Persistence	Reconstructs continued relational identity or functioning across time	Identity-bearing dimensions, continuity carriers, observation intervals	Stable labels can coexist with substantive change
Transformation	Reconstructs change within a historically connected relation	Changed properties, mechanism, timing, continuity evidence, alternative succession account	Transformation thresholds can remain contestable
Dissolution	Reconstructs cessation of a relation and persistence of residues	Ending criteria, last manifestations, residual obligations, memory, infrastructure	Consequences can continue after the relation ends
Sequence	Represents the order in which relational events or changes occur	Event definitions, ordering resolution, simultaneity rule, competing sequences	Similar endpoints can arise through different temporal pathways
Duration	Represents how long a relation or state remains operative	Start and end criteria, censoring, dormancy, observation window	Observed duration can differ from substantive duration
Rhythm	Represents recurrence, periodicity, pacing, and temporal regularity	Event granularity, cycle definition, phase, cadence, temporal baseline	Aggregation can create or suppress apparent regularity
Temporal gaps	Represents interruption, missing observation, latency, dormancy, or discontinuity	Gap type, detection conditions, evidence before and after the gap	Missing records need not indicate relational absence
Historical continuity	Reconstructs lineage across changing periods and temporal semantics	Continuity carriers, category change, periodization, historical context	Lineage can remain while relational identity changes

remain analytically distinct from the relation itself. Treating precursors as already constituting the relation would compress formation into its antecedents and weaken the temporal claim.

Formation can also depend on recognition. Some legal or institutional relations begin when an authorized act occurs; some informal relations become practically consequential only after participants recognize reciprocal expectations; some market or organizational relations form when repeated exchange creates dependence or routinization. The relevant threshold therefore depends on the research object and should be specified before later causal or generative analysis.

Definition 7.229 (Relation formation profile)**.** A *relation formation profile* records the target relation, relevant precursors, earliest observed manifestations, proposed formation interval, formation criterion, recognition or authorization conditions where relevant, boundary and scale, evidential uncertainty, and competing formation accounts.

The interval formulation in Definition 7.229 is useful when the evidence supports a period more clearly than a single date. Historical records often justify claims such as "formed during this phase" more strongly than a precise day of origin. This form of temporal humility also reduces the temptation to convert an archive's first surviving record into an ontological beginning.

7.24.2 Relation Persistence

Persistence concerns continued relational identity, functioning, or recognized relevance across time. Section 7.8 distinguished identity-bearing dimensions from historical lineage. Temporal relational analysis adds observation intervals, continuity evidence, dormancy, and changing temporal resolution to that framework.

A persistent relation can change in intensity, frequency, medium, location, or practical enactment. A long-standing contractual relation can become rarely activated; an organizational role can persist through changes in personnel; a friendship can survive intervals of sparse interaction; an institutional authority relation can remain legally valid while enforcement varies. Persistence therefore requires criteria tied to the substantive relation rather than a fixed demand for continuous visible interaction.

Continuity carriers are especially important. Obligations, shared memory, institutional records, infrastructure, recognized status, routines, expectations, unresolved claims, symbolic markers, or recurrent coordination can connect observations across periods in which direct manifestations are sparse. These carriers can support persistence while remaining subject to interpretation and counterevidence.

Temporal sampling can distort persistence claims. Monthly observation can make intermittent relations appear continuous, while high-frequency data can fragment one enduring relation into many short episodes. Historical records can produce the reverse problem: a relation may appear discontinuous because only occasional traces survive. Researchers should therefore state the temporal grain at which persistence is being assessed.

Definition 7.230 (Relational persistence interval)**.** A *relational persistence interval* is a bounded period during which the available evidence supports continued identity or functioning of a specified relation under stated continuity criteria, while preserving uncertainty about unobserved subintervals and changing manifestations.

Persistence intervals can overlap with periods of transformation. This is methodologically useful because the persistence question and the stability question differ. A relation can persist through significant change, and a statistically stable pattern can represent a succession of relations whose identities differ historically.

7.24.3 Relation Transformation

Transformation concerns substantive change within a historically connected relation. Relevant changes can involve direction, intensity, reciprocity, dependence, authority, meaning, institutional basis, technological mediation, scale, or position within a broader configuration. Sewell's analysis of events as potentially structure-transforming is helpful here because it directs attention toward moments in which linked actions and interpretations reorganize subsequent possibilities Sewell 1996.

Transformation is often gradual. Repeated small adjustments can accumulate until an earlier characterization no longer supports the target claim. In other cases change is concentrated around a legal reform, organizational crisis, technological introduction, conflict, merger, migration, leadership transition, or other temporally localized episode. The methodology should allow both trajectories rather than privileging dra-

matic events as the default model of change.

A transformation claim should identify which relational dimensions changed and which continuity carriers justify treating the later relation as historically connected to the earlier one. This distinction protects the analysis from two opposite errors: preserving identity through a change that effectively created a successor relation, and declaring replacement whenever a persistent relation undergoes substantial adaptation.

Timing can also affect the meaning of transformation. The same formal reform can have different consequences when introduced before or after organizational consolidation, during crisis, after a technological shift, or within a sequence of earlier reforms. Pierson's work on path dependence emphasizes how timing and sequence can become causally consequential under specified self-reinforcing processes Pierson 2000. Temporal relational analysis uses this insight without assuming that path dependence characterizes historical trajectories generally.

Definition 7.231 (Relation transformation profile)**.** A *relation transformation profile* records the pre-change relational characterization, altered dimensions, temporal interval or event sequence, proposed transformation mechanism, continuity carriers, associated boundary or scale changes, alternative succession interpretation, and uncertainty concerning the transformation threshold.

The profile allows transformation to be compared across cases without assuming that formally similar changes possess equivalent historical significance. A change in legal status, for example, can reorganize one relation profoundly while producing limited practical change in another because institutional enactment, resources, or surrounding relations differ.

7.24.4 Relation Dissolution

Dissolution concerns the cessation of the relation specified by the research design. Termination can be formal, practical, gradual, contested, or retrospectively reconstructed. A contract can expire on a known date, while an informal dependency can weaken over a longer interval. An organization can cease operation while legal liabilities remain. A political or economic relation can lose active interaction while preserving obligations, reputational effects, infrastructures, or historical memory.

The end of observation should therefore remain distinct from the end of the relation. Dataset closure, participant dropout, archival silence, platform deletion, organizational exit, or the end of fieldwork can truncate evidence without establishing dissolution. The absent-relation discipline of Section 7.6 applies directly: a credible dissolution claim requires conditions under which continued relation would have been reasonably detectable or alternative evidence supporting cessation.

Dissolution also has residues. Debt, legal precedent, institutional memory, infrastructure, learned routines, mistrust, reputation, ownership claims, records, and symbolic associations can continue to condition later relations. These residues are particularly important for generative analysis because an ended relation can remain causally relevant to trajectories that unfold afterward.

Definition 7.232 (Relation dissolution profile)**.** A *relation dissolution profile* records

the relation-ending criterion, last supported manifestations, formal termination where relevant, practical cessation evidence, residual obligations or effects, successor relations, detection conditions, and uncertainty concerning the timing or completeness of dissolution.

Dissolution can also be partial. One channel of a multiplex relation can end while others persist. Economic exchange can cease while legal liability remains; formal authority can end while informal influence persists; organizational membership can terminate while professional or epistemic relations continue. This makes relation-type disaggregation important when reconstructing endings.

7.24.5 Sequence

Sequence concerns the ordering of events, relational changes, and interventions. Temporal order can matter even when the same elements are present. Collaboration followed by formalization can differ from formal assignment followed by collaboration; infrastructure built before population growth can have different relational consequences from infrastructure added after spatial settlement; an intervention introduced before institutional trust forms can operate differently from the same intervention introduced after a stable relation exists.

Abbott's methodological emphasis on temporal order supports treating sequences as analytical objects rather than as background chronology Abbott 2001. A sequence specification should identify which events are substantively distinguishable, the temporal resolution at which order is observed, and how simultaneous or uncertain ordering is represented. Fine-grained timestamps can be useful, while their precision does not guarantee substantive temporal resolution. Several events recorded seconds apart can belong to one decision episode; historical events recorded by year can conceal consequential ordering within the interval.

Sequence comparison can reveal path-dependent divergence. Two cases can contain similar events yet reach different configurations because the events occurred in a different order. Conversely, different sequences can converge on similar observed states while retaining different histories, commitments, or latent dependencies. End-state comparison alone can therefore hide temporal structure that remains relevant to later behavior.

Definition 7.233 (Relational sequence specification)**.** A *relational sequence specification* records the event or state-transition units, ordering rule, temporal resolution, treatment of simultaneity and uncertain order, relevant precursor conditions, competing sequences, and the relational claim proposed to depend on that ordering.

Sequence inference benefits from documentary, archival, interview, process-tracing, event-history, and digital-record evidence. Computational sequence methods can support comparison across many trajectories, while coding decisions concerning event identity and temporal granularity remain substantively consequential.

7.24.6 Duration

Duration concerns the length of time during which a relation, state, exposure, obligation, or relational configuration remains operative under a specified criterion. Dura-

tion can matter because repeated exposure, accumulated learning, institutionalization, fatigue, trust, depreciation, adaptation, or resource depletion can depend on how long a relation persists rather than solely on whether it occurs.

The beginning and ending criteria determine the duration being measured. A legal relation can begin at authorization, a practical relation at first enactment, and a perceived relation when participants recognize an expectation. The resulting durations can differ while each remains meaningful for a particular question. Researchers should therefore avoid presenting one duration measure as if it exhausts the temporal life of the relation.

Censoring and incomplete observation also matter. A study beginning after relation formation observes an already ongoing relation; a study ending while the relation continues provides only a lower bound on its duration. Archival records can have analogous truncation when earlier or later materials are missing. Statistical duration and event-history methods can address some forms of censoring, while substantive uncertainty about relational identity still requires the historical criteria developed in Section 7.8.

Duration can also interact with intensity. A brief high-intensity relation and a long low-intensity relation can produce different consequences even when cumulative volume is similar. Temporal relational analysis therefore benefits from retaining duration and intensity as separate dimensions before constructing combined exposure measures.

Definition 7.234 (Relational duration profile)**.** A *relational duration profile* records the relation or state being timed, start and end criteria, observation window, censoring or truncation, dormant intervals, temporal resolution, relevant intensity changes, and uncertainty concerning the substantive duration represented by the observed interval.

Duration is also scale-sensitive. An interpersonal relation can change over days while an institutional relation persists for decades; a market episode can unfold rapidly within a longer regulatory regime. Comparing durations therefore requires clarity about the relational object and scale rather than a common clock alone.

7.24.7 Rhythm

Rhythm concerns recurrence, cadence, pacing, periodicity, and patterned variation in relational activity. Payroll cycles, legislative sessions, school calendars, market hours, maintenance routines, seasonal migration, reporting deadlines, weekly meetings, electoral cycles, religious observances, and platform-use patterns can generate temporally structured relations. These rhythms can coordinate actors, create windows of access, synchronize expectations, or generate repeated bottlenecks.

Rhythm is broader than strict periodicity. Some relations recur with approximate regularity, while others involve alternating phases, bursts, pauses, or event-dependent pacing. Time-series and spectral methods can help identify periodic components, and temporal-network methods can reconstruct burstiness or time-respecting paths Hamilton 1994; Holme and Saramäki 2012. The substantive interpretation still depends on the institutional, economic, social, or infrastructural

process producing the pattern.

Temporal aggregation can create artificial rhythm. Monthly reporting can impose apparent monthly regularity on events that occur continuously; business hours can constrain observation of processes continuing informally outside the recorded window. Conversely, sparse sampling can suppress a meaningful weekly or seasonal pattern. Rhythm analysis therefore requires a baseline against which recurrence is being evaluated and attention to the recording infrastructure that produces timestamps.

Rhythms can also interact across scales. A daily operational cycle can be nested within monthly financial reporting, annual budgeting, multi-year strategic planning, and longer institutional change. Synchronization or desynchronization among these rhythms can become substantively important. A funding cycle that is poorly aligned with an ecological, educational, or organizational process can generate delays or distortions even when each cycle appears regular in isolation.

Definition 7.235 (Relational rhythm profile)**.** A *relational rhythm profile* records the recurring process, temporal unit, cadence or periodicity, phase structure, variation around the pattern, recording schedule, interacting rhythms, and the proposed pathway through which temporal regularity becomes consequential for the relation.

Rhythm is particularly relevant to later generative and economic analysis because the timing of resource arrival, renewal, coordination, or interruption can affect the capacities a relation is able to sustain. The same total resource delivered under different temporal patterns can therefore support different trajectories.

7.24.8 Temporal Gaps

Temporal gaps arise when observed relational activity, documentation, or measurement is interrupted. A gap can reflect substantive dormancy, strategic silence, seasonal inactivity, temporary suspension, broken infrastructure, organizational closure, unavailable records, sampling intervals, failed measurement, or a relation that has ended. These possibilities require separation because a gap in manifestation is not equivalent to a gap in relational existence.

Section 7.10 developed documentary silence and Section 7.11 developed archival absence. Temporal relational analysis generalizes those ideas to gaps between observations. Evidence before and after a gap can support continuity, reconstitution, or succession depending on identity-bearing dimensions and continuity carriers. A renewed transaction after a long interval might reactivate an existing obligation, resume a dormant relation, or constitute a newly formed relation between historically connected parties.

Temporal gaps also affect causal inference. Unobserved changes inside a gap can weaken claims about sequence or mechanism. A measured pre-state and post-state do not identify what happened in between. Process tracing, interviews, administrative records, digital traces, or comparative evidence can sometimes narrow the set of plausible intervening trajectories, while the remaining uncertainty should remain visible.

Definition 7.236 (Temporal gap profile)**.** A *temporal gap profile* records the interval

with reduced or absent observation, the relevant relation, expected detection process, plausible substantive and evidential explanations, continuity evidence on each side of the interval, possible intervening changes, and the implications of the gap for persistence, sequence, and causal claims.

The profile helps distinguish missingness from dormancy and dormancy from dissolution. It also protects longitudinal AI-assisted reconstruction from filling evidential gaps with plausible but unsupported narratives. Model-generated interpolation can be useful for sensitivity analysis or forecasting, while reconstructed values should remain visibly distinct from observed historical traces.

7.24.9 Historical Continuity

Historical continuity concerns the relation between temporally separated configurations when both the relation and the categories through which it is described can change. This problem is broader than persistence. A relation can belong to a continuous historical lineage while undergoing enough transformation that the later configuration should not be treated as substantively identical to the earlier one. Section 7.8 introduced this distinction; the present subsection develops its methodological implications for longer historical horizons.

Historical periodization is part of the analysis. Political, economic, legal, technological, demographic, environmental, and cultural processes can operate on different timescales, and period boundaries selected for one process may fit another poorly. Abbott's process-sensitive methodology and Pierson's analysis of timing and path dependence both encourage attention to trajectories whose explanatory structure changes across periods Abbott 2001; Pierson 2000. Koselleck's work on historical time further reminds us that the temporal concepts through which actors understand past, present, and future can themselves change historically Koselleck 2004.

This creates a category problem. Terms such as household, employment, citizenship, market, organization, education, property, platform, or work can retain lexical continuity while their institutional and relational content changes. Long-run datasets or historical comparisons should therefore preserve category history rather than assuming semantic invariance from identical labels. Conversely, different historical labels can refer to partially comparable relational functions. Section 7.16 developed this as comparative equivalence; temporal inquiry adds diachronic category transformation.

Historical continuity can be reconstructed through overlapping carriers: records, institutions, obligations, infrastructures, legal succession, organizational lineage, routines, symbolic references, inherited resources, and remembered events. The evidential burden grows when fewer carriers remain or when the later relation is connected mainly through retrospective narrative. Lineage can still be analytically important under such conditions, while the claim should be scoped accordingly.

Definition 7.237 (Historical continuity profile)**.** A *historical continuity profile* records the relational lineage, periodization, continuity carriers, transformations in relation properties, changes in relevant categories or temporal semantics, evidential gaps, successor configurations, and the scope within which continuity is being claimed.

Proposition 7.238 (Temporal relational warrant)**.** *A temporal relational claim is most clearly supported when the relevant relational identity, temporal unit, formation and ending criteria, ordering assumptions, observation process, gaps, boundary and scale, and historical category changes are specified at a level adequate to the claim being made.*

Proposition 7.238 is a methodological discipline rather than a demand for complete historical reconstruction. Different questions require different temporal resolutions. A study of rapid communication can require seconds or minutes; an institutional study can work with months or years; a historical political-economy analysis can require decades or generations. Temporal adequacy depends on whether the chosen representation preserves the differences on which the substantive inference rests.

Contingent encounter and aesthetic judgment remain important in temporal inquiry. An unexpected recurrence, a strangely timed interruption, an archival date that fails to align with an institutional narrative, a long period of apparent inactivity, or a sudden change in cadence can make a possible temporal structure salient before its significance is understood. Subsequent documentary, statistical, ethnographic, causal, or historical inquiry determines whether the pattern represents a meaningful relation, a recording artifact, a boundary effect, or coincidence. AI-assisted temporal analysis can enlarge this encounter surface through timeline extraction, event clustering, sequence comparison, change-point detection, temporal-network reconstruction, and comparison across long archives. The increased abundance of candidate temporal patterns reinforces the need to preserve source provenance, distinguish observed from reconstructed intervals, and keep aesthetic salience separate from evidential warrant.

Temporal relational analysis therefore complements the spatial, network, causal, and historical methods developed earlier in this chapter. Formation specifies how relations begin; persistence reconstructs continuity; transformation captures change within lineage; dissolution identifies endings and residues; sequence preserves ordering; duration represents temporal extent; rhythm captures recurring organization; temporal-gap analysis preserves uncertainty across interruptions; and historical continuity connects changing relations across longer horizons. Section 191 extends this methodological architecture from temporal organization to field-based relational analysis, where distributed influence, local conditions, field position, gradients, overlap, and field boundaries become the primary objects of reconstruction.

7.25 Field-Based Relational Analysis

The preceding sections developed relational inquiry through explicit ties, higher-order configurations, statistical dependence, causal pathways, spatial organization, and temporal trajectories. The present section introduces a complementary methodology for cases in which the target of inquiry depends on distributed conditions that are only partly localized in identifiable pairwise relations. Its role is to operationalize the epistemology of relational fields developed in Section 122 of Chapter 5. The objective is to specify how distributed influence, local conditions, field position, gradients, overlapping fields, boundaries, and field reconstruction can be investigated

without allowing field language to become a residual label for unexplained context. The discussion therefore treats a field as a target-relative analytical reconstruction whose warrant depends on the evidence that distributed relational organization contributes to the claim under investigation.

Several established traditions motivate this problem while using field language in different ways. Bourdieu and Wacquant develop a relational sociology in which positions, forms of capital, structured struggle, and field-specific stakes become central to explanation Bourdieu and Wacquant 1992. Martin surveys field theory more generally and emphasizes explanatory approaches in which regularities in action depend on position relative to others within an organized domain Martin 2003. Fligstein and McAdam develop strategic action fields as mesolevel social orders embedded in wider fields and connected through actors, governance units, and episodes of stability and change Fligstein and McAdam 2012. Organizational-field analysis likewise shows how organizations can be conditioned by coercive, mimetic, and normative pressures extending beyond direct exchange relations DiMaggio and Powell 1983. Field-based relational analysis can draw on these traditions while retaining the ontological suspension, evidential discipline, boundary sensitivity, and methodological pluralism developed earlier in this book.

Definition 7.239 (Field-based relational inquiry)**.** *Field-based relational inquiry* is a family of methods for reconstructing distributed relational conditions in which the position, possibilities, constraints, expectations, or responses of relevant analytical positions depend materially on an organized environment whose target-relevant significance is only partly represented by isolated local ties.

Definition 7.239 does not privilege one formal representation. A field can be reconstructed through qualitative accounts of position and practice, institutional rules, historical trajectories, resource distributions, network structure, spatial gradients, legal categories, classifications, latent statistical structure, or combinations of these. The methodological question is whether the chosen reconstruction preserves the distributed organization required by the substantive claim. A field representation is therefore evaluated through its evidential fit and inferential contribution rather than through the sophistication of its formal vocabulary.

Table 7.24 summarizes the principal methodological dimensions developed below. The table also indicates the characteristic remainder that can survive each mode of field reconstruction.

7.25.1 Distributed Influence

Distributed influence concerns target-relevant conditioning that is difficult to assign cleanly to one observed dyad or one localized event. A firm's financing possibilities can depend on regulatory expectations, liquidity conditions, risk classifications, professional conventions, and the practices of several institutions whose effects converge without appearing as one direct tie. A researcher's publication strategy can be conditioned by journal hierarchies, funding expectations, disciplinary norms, evaluation systems, and peer communities. A household's practical opportunity set can depend on labor-market structure, service accessibility, credit availability, legal status, transport, and prevailing classifications. In each example, the target is locally experienced

Table 7.24: Field-based relational dimensions and characteristic methodological requirements

Dimension	Primary analytical contribution	Specification requirement	Characteristic remainder
Distributed influence	Reconstructs conditioning that is dispersed across relations, positions, rules, resources, or expectations	Target, candidate carriers, propagation or conditioning pathway, alternative common causes	Distributed association can remain compatible with several mechanisms
Local conditions	Specifies the field conditions encountered from a particular position or site	Position, local neighborhood, relevant field variables, temporal reference, access conditions	Local manifestation may only partially reveal wider organization
Field position	Represents location within an organized relational environment	Positional criteria, relevant relations/resources, boundary, scale, historical interval	Similar positions can support heterogeneous action or interpretation
Field gradient	Represents directional or differential change across a reconstructed field	Relational coordinate, ordering or metric, field variable, uncertainty, discontinuities	Smooth representation can obscure thresholds and categorical breaks
Overlapping fields	Represents simultaneous conditioning by partially distinct fields	Field definitions, cross-field carriers, translation rules, joint positions, temporal scope	Observed effects can remain difficult to attribute among interacting fields
Field boundary	Delimits the domain within which distributed conditioning is reconstructed	Relevance criterion, entry/exit conditions, permeability, external dependencies, sensitivity analysis	Boundary exclusions can remain consequential to the focal field
Field reconstruction	Integrates heterogeneous evidence into a revisable distributed representation	Evidence sources, transformation chain, positional logic, comparison set, uncertainty	Different reconstructions can preserve different dimensions of the same domain
Limits of field language	Tests whether field terminology adds discriminating structure to the inquiry	Competing representations, simpler explanations, scale, agency, mechanism, ontological status	Some distributed patterns may be better represented without a field construct

while some of its conditioning is distributed.

The methodological task is to identify the carriers through which distributed influence becomes consequential. Such carriers can include rules, prices, classifications, resource concentrations, expectations, reputations, technical standards, organizational templates, spatial infrastructures, legal permissions, network positions, or repeated signals. Calling these conditions a field adds epistemic value only when their organization and target relevance are specified more precisely than a generic reference to “context.”

Distributed influence can also arise through patterned absence or scarcity. A peripheral actor can face restricted alternatives because potential partners are concentrated elsewhere; a profession can impose expectations through widely reproduced credentialing practices; a platform can condition behavior through algorithmic visibility rules applied across a large population. These effects may be weakly localized in individual interactions while remaining relationally structured at the level of the broader environment.

The first inferential challenge is alternative explanation. A distributed pattern can reflect field conditioning, common exposure to an external cause, compositional differences, selection into positions, network diffusion, institutional rules, or several interacting mechanisms. Field analysis should therefore preserve a comparison set rather than treating spatial or social regularity as sufficient evidence for a field ef-

fect. Section 7.22 developed a similar discipline for causal relational analysis; field-based inquiry extends it to distributed conditioning whose mechanism can be heterogeneous or only partially observed.

Definition 7.240 (Distributed influence profile)**.** A *distributed influence profile* records the target outcome or relational condition, candidate distributed carriers, relevant positions, proposed conditioning or propagation pathways, spatial and temporal scope, competing explanations, and the evidence supporting the claim that distributed organization contributes to the target.

The profile does not require that influence be represented as a physical force. The term refers to structured conditioning whose effects vary with position in the reconstructed environment. This restraint is important because field metaphors can otherwise suggest continuity, direction, or determinacy that the evidence does not support.

7.25.2 Local Conditions

Field-based inquiry becomes empirically tractable through local conditions. A field is distributed, yet researchers encounter it through situated manifestations: a firm's borrowing terms, an organization's reporting requirements, a worker's available alternatives, a researcher's evaluation environment, a household's service options, or a participant's practical expectations. Local conditions therefore provide an interface between distributed organization and position-specific experience.

Local conditions should be specified at the position and time relevant to the claim. The same nominal field can present very different conditions to actors with different legal status, resources, organizational affiliation, geographic location, category membership, network position, or historical trajectory. An institutional field can appear permissive to one organization and restrictive to another because the organizations occupy different positions relative to regulators, funders, competitors, and professional communities. A credit environment can generate different effective constraints for households facing different collateral rules, income classifications, or documentation requirements.

This positional heterogeneity connects field analysis to the scale and boundary problems developed in Sections 7.4–7.5. A local condition can be defined at the level of a person, dyad, organization, neighborhood, institution, or other analytical position. Its field relevance depends on the wider distributed structure that makes the local condition informative. Fine-grained observation can reveal variation within an aggregate field, while a broader reconstruction can show why apparently local constraints recur across sites.

Local evidence can include interviews, ethnography, contracts, administrative decisions, prices, waiting times, legal classifications, organizational routines, transaction terms, network neighborhoods, spatial access, or repeated behavioral responses. The evidence should retain the distinction between the local manifestation and the wider field reconstructed from it. A difficult borrowing experience can be consistent with field-level credit constraints, yet a single case does not establish the distributed pattern. Conversely, aggregate field measures can obscure how the same environment is encountered differently across positions.

Definition 7.241 (Local field condition profile)**.** A *local field condition profile* records the focal position or site, the field dimensions relevant to that position, observed manifestations, neighboring relations, institutional and spatial conditions, temporal reference, and the inferential bridge connecting the local observations to the wider field reconstruction.

This profile helps preserve the bidirectional movement of field analysis. Local observations contribute to field reconstruction, and field reconstruction changes the interpretation of local observations. Neither direction removes the need for evidential justification.

7.25.3 Field Position

Field position refers to an analytical location within a distributed relational organization. Position can be defined through access to resources, authority, recognition, dependence, network relations, legal status, classification, market role, organizational function, symbolic standing, or combinations of these dimensions. Bourdieu and Wacquant emphasize positions within structured distributions of capital and struggle Bourdieu and Wacquant 1992; Fligstein and McAdam distinguish incumbents, challengers, governance units, and other positions within strategic action fields Fligstein and McAdam 2012. Field-based relational inquiry treats these as established conceptual resources while allowing positional criteria to vary with the research target.

A field position differs from an attribute when its meaning depends materially on the surrounding relational organization. “Large firm” is partly an attribute description, while “dominant supplier in a concentrated procurement field” is positional because dominance depends on the distribution of alternatives, buyer dependence, institutional rules, and the positions of other suppliers. Likewise, legal authority is positional when it derives from a structured relation among offices, subjects, procedures, and jurisdictions.

Positions can be categorical, ordinal, metric, latent, or historically reconstructed. A legal regime can create explicit categories; a network can support structural equivalence classes; a correspondence analysis can recover relational dimensions; qualitative inquiry can reconstruct recognized incumbents and challengers; archival evidence can reveal changing positions across historical periods. Formal precision should remain proportional to the evidence. A latent coordinate can summarize relational regularities while leaving its substantive meaning open to interpretation, as Section 7.21 emphasized.

Field position can condition possibilities without determining action. Actors in similar positions can adopt different strategies because of histories, capabilities, identities, interpretations, cross-field affiliations, or contingent encounters. Positional analysis therefore supports claims about structured opportunities, constraints, exposure, or likely interaction patterns more readily than categorical predictions of behavior.

Definition 7.242 (Field position profile)**.** A *field position profile* specifies the analytical position, the relational dimensions through which it is located, relevant resources or classifications, neighboring or counterpart positions, boundary and scale, temporal interval, and the evidence supporting the positional interpretation.

The profile also permits multiple position systems to coexist. An organization can occupy a strong market position, a weak regulatory position, and a peripheral symbolic position within overlapping domains. Later GRE analysis can use this plurality to study conversion power among economic, institutional, epistemic, and symbolic resources without assuming a single hierarchy.

7.25.4 Field Gradient

A field gradient represents systematic variation in a target-relevant condition across positions in a reconstructed field. The condition can concern access, expected return, constraint, legitimacy, visibility, exposure, bargaining possibility, information, recognition, or another relationally meaningful quantity. Gradient language becomes useful when the inquiry needs to describe how a condition changes across an ordered relational space rather than merely classify positions into discrete categories.

The underlying coordinate should be specified explicitly. A spatial field can use geographic coordinates; an organizational field can use authority or dependency position; a market field can use price, access, concentration, or substitutability; an epistemic field can use recognized standing, institutional access, or visibility; a network representation can use structural position. Several coordinates can coexist, and their relationship need not be linear or metrically uniform.

Gradients can be smooth, discontinuous, thresholded, or locally irregular. A legal eligibility rule can create a sharp discontinuity. A transport network can produce pockets of high accessibility inside a broader low-access region. An evaluation system can produce nonlinear returns around a categorical threshold. Treating these structures with a smooth field model can be useful for approximation while also hiding the discontinuities most relevant to institutional interpretation.

Field gradients are therefore representation-dependent. Interpolation, smoothing, dimensionality reduction, latent embedding, or statistical estimation can produce a visually coherent surface even when the underlying evidence is sparse. The resulting gradient should remain distinguishable from direct observation. Uncertainty can vary across the field, especially near boundaries, underrepresented positions, or periods of institutional change.

Definition 7.243 (Field gradient profile)**.** A *field gradient profile* records the target-relevant condition, the coordinate or ordering over which variation is represented, measurement or reconstruction method, discontinuities and thresholds, temporal reference, local uncertainty, and the substantive pathway through which the gradient is expected to matter.

The concept also creates a bridge to later generative analysis. A gradient can describe differential conditions for possible change, while Chapter 8 will ask the stronger question of whether and how those conditions participate in generating trajectories. Description of a field gradient therefore precedes generative attribution.

7.25.5 Overlapping Fields

Positions frequently participate in several fields whose organizing principles, resources, classifications, and temporal rhythms differ. A university can simultane-

ously occupy educational, scientific, labor, legal, financial, and reputational fields. A firm can be situated within product markets, credit systems, regulatory regimes, professional communities, supply networks, and technological standards. A household can encounter labor, housing, welfare, educational, legal, and care fields at the same time. Field overlap is therefore a central methodological problem rather than an exceptional complication.

The first task is to preserve field differentiation. Two fields can include many of the same actors while organizing them through different relations and stakes. A bank and a firm can interact through credit, regulation, ownership, payment infrastructure, and information disclosure. Collapsing these into one broad field can obscure the specific pathway through which one domain conditions another.

The second task is to reconstruct cross-field carriers. Resources, classifications, credentials, standards, narratives, technologies, people, and legal statuses can move between fields. Their meaning can change during transfer. Academic prestige can influence funding access; financial resources can purchase technical capacity; regulatory status can enable market participation; professional certification can alter organizational authority. These conversions are especially important for GRE because later chapters will study heterogeneous value and conversion among value forms.

Field overlap can also generate conflict. A practice rewarded within one field can be constrained by another; temporal rhythms can be misaligned; categories can be incompatible; authority can be divided. An organization may face market incentives that conflict with professional norms, or legal authorization that fails to generate practical legitimacy. Such tensions can be analytically informative because they reveal which field conditions are active at a particular site or moment.

Definition 7.244 (Overlapping field profile)**.** An *overlapping field profile* records the candidate fields relevant to a target, their organizing relations and positional criteria, shared and field-specific participants, cross-field carriers or conversion pathways, points of conflict or reinforcement, temporal scope, and uncertainty about attribution among fields.

Field overlap also creates a methodological warning for AI-assisted analysis. Embedding or clustering methods can combine several relational dimensions into one representation because doing so improves predictive compression. The resulting latent space can be useful while obscuring the distinction among fields that matter substantively. Field differentiation should therefore be preserved when the research question depends on distinct organizing logics.

7.25.6 Field Boundary

Field boundaries delimit the domain within which distributed relational conditioning is reconstructed. Section 7.4 treated boundary construction generally; field analysis requires additional attention because the field can extend beyond formal organizational, legal, spatial, or categorical borders. A regulator outside a market can shape market behavior; a transnational standard can condition domestic organizations; a funding body can influence research institutions without direct membership; external suppliers can alter bargaining possibilities inside a regional economy.

Some fields have explicit entry conditions. Licensing, membership, accreditation, platform access, professional certification, legal jurisdiction, or participation rules can create institutionally recognized boundaries. Other fields have graded or permeable edges. Information, resources, standards, reputations, labor, and classifications can travel across nominal domains. The effective field boundary should therefore be indexed to the target-relevant conditioning process rather than assumed from formal membership alone.

Boundary construction can use nested specifications. A narrow field can capture immediate actors and relations, while a wider field includes upstream institutions or external dependencies. Comparing the resulting reconstructions reveals whether positional conclusions, gradients, or inferred constraints are stable. When plausible boundary alternatives materially alter the claim, that dependence should remain visible in the final interpretation.

The boundary remainder introduced in Section 7.4 is especially useful here. External actors, institutions, or processes can be excluded from the focal field for tractability while remaining documented as potentially consequential. This allows field analysis to remain bounded without converting methodological exclusion into substantive non-existence.

Definition 7.245 (Field boundary profile)**.** A *field boundary profile* records the focal field, target-relevance criterion, entry and exit conditions where identifiable, permeability, external dependencies, nested or alternative boundaries, temporal reference, and boundary remainders that may affect interpretation.

Field boundaries can also change historically. A profession can expand jurisdiction, a market can integrate across regions, a platform can alter eligibility, or a legal reform can change membership and authority. Boundary sensitivity should therefore be temporal as well as spatial and institutional.

7.25.7 Field Reconstruction

Field reconstruction integrates heterogeneous evidence into a revisable account of distributed relational organization. The task is an inverse problem: researchers observe documents, classifications, local conditions, network ties, prices, narratives, spatial patterns, legal statuses, organizational routines, or behavioral responses and infer a wider field whose structure is only partially manifest. The epistemology of Chapter 5 therefore remains active at each stage of the reconstruction.

A practical reconstruction can proceed through several linked operations. The researcher first specifies the target and provisional field dimensions. Evidence is then gathered from sources capable of observing different parts of the field. Positions, local conditions, boundaries, gradients, and cross-field relations are reconstructed with explicit provenance. Competing representations are compared. The resulting field model is revised when new evidence exposes omitted positions, changed boundaries, alternative mechanisms, or historical discontinuities.

Methodological plurality is particularly valuable here. Network analysis can identify relational position; archival inquiry can reconstruct field formation; ethnography can reveal how positions are locally experienced; interviews can recover par-

ticipant interpretations; legal analysis can specify authority and membership; spatial methods can reconstruct geographic gradients; quantitative models can estimate position-dependent variation; comparative inquiry can test whether field patterns travel across contexts. These contributions can converge without being translated into a single metric.

A field reconstruction should also distinguish observed components from inferred structure. A network edge, administrative category, legal status, interview account, or spatial coordinate can be directly observed under specified conditions. The field position or gradient inferred from those observations is a higher-level analytical construction. Preserving this transformation chain makes the reconstruction contestable and allows later researchers to re-epistemize the field under alternative concepts or methods.

Definition 7.246 (Field reconstruction profile)**.** A *field reconstruction profile* records the target, provisional field dimensions, evidence sources and provenance, reconstructed positions and local conditions, boundary and scale, temporal interval, gradients or distributed regularities where relevant, competing representations, uncertainty, and the transformations connecting observed manifestations to the field claim.

Contingent encounter and aesthetic judgment can contribute to field reconstruction by making distributed structure perceptible before its mechanism is known. A repeated phrase across institutions, a surprising similarity among distant organizations, an anomalous local constraint, an unexpected gradient, or a cluster of documentary classifications can suggest that several observations belong to a common field problem. Subsequent inquiry determines whether the apparent pattern reflects distributed relational organization, shared external causes, measurement structure, selection, or coincidence. AI-assisted retrieval, embedding, clustering, network reconstruction, and spatial visualization can enlarge this encounter surface while increasing the importance of provenance, alternative representations, and source-level validation.

7.25.8 Limits of Field Language

Field language is analytically useful when it contributes discriminating structure to a research question. Its usefulness weakens when the term merely substitutes for environment, context, culture, system, market, institution, or unexplained residual variation without identifying the distributed organization relevant to the claim. A methodological field analysis should therefore make clear what becomes more intelligible through the field representation than through simpler descriptions of local ties, aggregate attributes, shared exposure, or institutional rules.

One limit concerns observational equivalence. Network structure, common external causes, selection into positions, legal constraints, spatial clustering, and genuine field conditioning can generate similar patterns. Field attribution therefore benefits from comparison with alternative representations and from evidence showing that position within the proposed field changes interpretation or expected conditions in a target-relevant way.

A second limit concerns determinism. Position can structure possibilities without

fixing action. Actors can interpret, resist, strategically exploit, or transform field conditions. Similar field positions can therefore yield heterogeneous trajectories. Field-based explanations should preserve agency, local histories, capabilities, and contingent encounters when those differences affect the target.

A third limit concerns scale. A field identified at one analytical resolution can decompose into several mechanisms at a finer scale or appear as one component of a broader field at a coarser scale. The multiscale discipline developed in Section 7.5 therefore applies directly: field claims should identify the scale at which distributed organization is reconstructed and the bridge required for claims that travel across scales.

A fourth limit concerns formal representation. Spatial surfaces, networks, latent embeddings, correspondence maps, statistical random effects, and dynamical models can represent field-like structure. Predictive success can strengthen confidence in a representation while leaving the substantive ontology open. A formally smooth field can conceal discontinuities; a latent space can combine distinct organizing logics; a network can omit distributed rules or classifications; a qualitative field map can understate quantitative variation. Representation choice should follow the research object and preserve known remainders.

A fifth limit concerns generative and causal claims. Reconstructing a field and locating positions within it does not by itself establish that the field generated a particular outcome. Causal relational analysis in Section 7.22 requires pathways and counterfactual structure; Chapter 8 will impose an additional burden for generative claims concerning capacities, relations, structures, and future possibility. Field-based analysis can provide the distributed conditions within which those mechanisms operate while remaining analytically prior to stronger attribution.

Proposition 7.247 (Field-language adequacy)**.** *Field language contributes methodological value when the inquiry specifies a target-relevant distributed organization, reconstructs meaningful positional or local variation, states boundary, scale, and temporal scope, compares plausible alternative representations, and preserves uncertainty arising from partial observation and representation choice.*

Proposition 7.247 is intentionally graded. A historical case study, ethnography, legal-institutional analysis, spatial model, network analysis, latent statistical model, or mixed-method design can each support a field claim when the evidence and representation are aligned with the target. The proposition asks for discriminating warrant rather than a single canonical field method.

Field-based relational analysis therefore complements the methodological sequence developed across this chapter. Explicit ties identify local relations; higher-order methods preserve jointly constituted structures; statistical methods model dependence; causal analysis reconstructs pathways; spatial and temporal inquiry locate relations across geography and history; field-based inquiry addresses distributed conditions in which position within an organized environment changes what local relations mean or make possible. Section 192 turns next to the measurement of relations, where these distinctions become operational through indicators, scales, composite measures, proxy variables, relational intensity, and measurement uncertainty.

7.26 Measurement of Relations

The preceding sections established how relational inquiry can specify objects, construct boundaries, select scales, identify and characterize relations, reconstruct configurations, and examine statistical, causal, spatial, temporal, and field-based structure. The present section addresses the measurement problem that follows from those operations. Its role is to specify how properties of relations become observable, codable, comparable, and quantitatively or qualitatively assessable without collapsing a relation into the indicators through which it is measured. The objective is to distinguish indicators from proxies, composite measures, relation strength, relation quality, stability, accessibility, measurement error, and invariance. The discussion treats measurement as a transformation from manifestations into claim-relevant representations whose adequacy depends on the target relation, boundary, scale, temporal interval, and intended inference.

Measurement theory has long distinguished observed responses from the constructs they are intended to support. Cronbach and Meehl frame construct validity as an inferential problem concerning the relation between observations and theoretically specified constructs Cronbach and Meehl 1955. Messick later emphasizes validity as a property of interpretations and uses of scores rather than a simple intrinsic property of the observed score itself Messick 1995. Contemporary scale-development guidance similarly distinguishes constructs, indicators, indices, reliability, and validity DeVellis and Thorpe 2021. Relational inquiry inherits these concerns while adding several complications: the target can be a relation rather than an individual attribute; measurement can depend on both or several positions; the measurement operation can alter the relation; and the meaning of a score can change across relational configurations, scales, and historical settings.

Definition 7.248 (Relational measurement)**.** *Relational measurement* is the documented transformation through which manifestations associated with a specified relation are converted into indicators, categories, scores, comparisons, or other representations intended to support a claim about one or more properties of that relation.

Definition 7.248 keeps three objects separate: the target relation, the manifestations through which researchers gain access to it, and the measurement representation produced from those manifestations. A count of messages, a legal classification, an interview-coded trust score, a transaction volume, a network weight, or an accessibility index can each become a relational measure. Their usefulness depends on the inferential bridge connecting the observed manifestation to the property under study.

Table 7.25 summarizes the principal measurement dimensions developed below. The table emphasizes that stronger measurement requires both technical discipline and substantive alignment with the relation being represented.

7.26.1 Indicators

An indicator is an observable or codable manifestation used to represent a specified relational property. Message frequency can indicate communication activity; con-

Table 7.25: Relational measurement dimensions and characteristic methodological requirements

Dimension	Primary contribution	Specification requirement	Characteristic remainder
Indicator	Links an observable manifestation to a target relational property	Target property, observation rule, coding rule, temporal window, direction of interpretation	Similar indicator values can arise from different relational processes
Proxy	Uses an accessible variable to represent a less directly observed relational property	Proxy rationale, expected correspondence, failure conditions, alternative pathways	Proxy variation can reflect processes unrelated to the target
Composite measure	Combines several indicators into a multidimensional representation	Component semantics, weighting rule, aggregation logic, missing-data rule, validation	Aggregation can conceal internal heterogeneity and compensating components
Relation strength	Represents magnitude of a specified relational dimension	Dimension of strength, unit, direction, normalization, scale and time	Frequency, volume, salience, dependence, and enforceability may diverge
Relation quality	Represents evaluative properties of a relation	Quality dimensions, standpoint, normative or experiential criteria, aggregation rule	Different participants can experience the same relation differently
Relation stability	Represents persistence or variability of relational properties through time	Identity criterion, observation interval, expected variability, transformation threshold	Stable observation can coexist with changing relational meaning
Relation accessibility	Represents practical ability to activate, reach, or use a relation or relational resource	Focal position, target relation/resource, barriers, costs, permissions, temporal conditions	Formal availability can coexist with low practical accessibility
Measurement error	Represents divergence between recorded measure and target-relevant manifestation or property	Error source, direction, dependence, missingness, validation data, sensitivity analysis	Several error sources can coexist and propagate through later inference
Measurement invariance	Tests whether measurement meaning is sufficiently comparable across groups, times, scales, or contexts	Comparison domain, invariance criterion, model or coding stability, substantive interpretation	Apparent change can reflect changing measurement relations rather than target change

tract duration can indicate one aspect of continuity; repayment regularity can indicate one aspect of financial performance; reported reliance can indicate perceived dependence; reciprocal nominations can indicate recognized affiliation; and observed queue position can indicate one aspect of institutional access. The indicator does not become the relation merely because it is numerically precise.

Relational indicators are often generated jointly. A dyadic response can depend on who is asked, who is named, the direction of the relation, the institutional context, and the observation period. A relation between an organization and a regulator can be indicated by inspections, filings, sanctions, licenses, or correspondence, while each indicator reveals a different manifestation of the relation. A measurement design should therefore state which relational property an indicator is intended to represent and which manifestations remain outside the measure.

The same manifestation can also support several candidate interpretations. Frequent communication can indicate coordination, conflict, supervision, dependence, intimacy, or administrative burden. A high transaction volume can reflect trust, contractual lock-in, market concentration, or temporary necessity. Indicator interpretation therefore requires the relational characterization work developed in Section 7.7 and the institutional, legal, historical, or qualitative context relevant to the claim.

Definition 7.249 (Relational indicator profile)**.** A *relational indicator profile* records the target relational property, observed manifestation, observation and coding rule, unit, direction, temporal window, boundary and scale, expected interpretation, plausible alternative interpretations, and known conditions under which the indicator can become misleading.

The profile preserves provenance from manifestation to measure. It is particularly useful when AI-assisted pipelines generate indicators automatically from text, logs, images, or administrative records. Automated extraction can enlarge coverage while adding classification error, version dependence, and model-specific transformation steps. The resulting indicator should remain linked to the source manifestation and extraction procedure.

7.26.2 Proxies

A proxy is used when a target relational property is difficult to observe directly and another observable quantity is expected to covary with it sufficiently for the intended analysis. Geographic distance can proxy interaction cost in some settings; transaction repetition can proxy continuing exchange; shared membership can proxy opportunity for contact; response latency can proxy one aspect of accessibility or attention; and contractual concentration can proxy one dimension of dependence. Proxy use can be valuable when direct measurement is expensive, unavailable, invasive, or historically impossible.

The methodological burden is greater than simple association. A proxy requires an account of why variation in the proxy is expected to track the target relation and under which conditions that correspondence weakens. Geographic distance becomes a poor proxy for accessibility when transport, border controls, digital communication, or institutional permissions dominate physical distance. Communication frequency becomes a poor proxy for trust when supervision or conflict produces repeated contact. Organizational co-membership becomes a weak proxy for interaction when the institution is large or internally segmented.

Proxy validity can also change historically. A landline call record may have represented communication differently before widespread mobile messaging. Formal employment status can become a weaker proxy for economic dependence when subcontracting or platform work expands. A proxy therefore has a temporal domain in addition to a substantive domain.

Proposition 7.250 (Proxy-scope discipline)**.** *A proxy supports a relational inference most clearly when the proposed correspondence between proxy and target property is specified for a bounded population, context, scale, and historical interval, together with plausible processes that can weaken that correspondence.*

Proposition 7.250 does not require direct access to the target in each application. Historical and archival research often depends on indirect traces. It requires the indirectness to remain visible so that later evidence can strengthen, revise, or reject the proxy relation.

7.26.3 Composite Measures

Some relational properties are difficult to represent with one indicator. Accessibility can involve travel time, monetary cost, eligibility, documentation, opening hours, information, language, safety, and institutional discretion. Dependence can involve concentration of alternatives, switching costs, substitutability, legal obligations, and time needed to reorganize. Relation quality can involve trust, fairness, responsiveness, recognition, reliability, and perceived respect. Composite measures combine several indicators to represent such multidimensional properties.

Composite construction introduces substantive choices. Components can be added, averaged, weighted, multiplied, thresholded, normalized, or modeled as indicators of a latent construct. Each operation implies something about substitutability. An additive index can permit a high value on one component to compensate for a low value on another. A minimum-based measure treats the weakest component as limiting. A multiplicative structure makes severe weakness in one component reduce the whole score sharply. These differences are analytical assumptions and should be justified by the relation being studied.

DeVellis and Thorpe emphasize that scale construction requires theoretical specification, item development, reliability assessment, and validation rather than mechanical aggregation DeVellis and Thorpe 2021. Relational inquiry adds the need to identify whose standpoint each component represents. A relation can appear high-quality to an organization because it is efficient while being experienced as inaccessible or coercive by another participant. Combining these perspectives into one score can obscure asymmetry.

Definition 7.251 (Composite relational measure profile)**.** A *composite relational measure profile* records the target property, component indicators, component provenance, scaling and normalization rules, weighting or aggregation logic, treatment of missing components, participant standpoint where relevant, validation evidence, and sensitivity to alternative constructions.

Sensitivity analysis is especially important for composite measures. If a substantive conclusion changes when a plausible alternative weighting or aggregation rule is used, the instability belongs in the evidential record. A robust composite does not require identical numerical values across specifications; it requires clarity about which conclusions persist and which depend on the chosen construction.

7.26.4 Relation Strength

Relation strength is often treated as if it were one scalar property. Section 7.7 established a broader characterization: intensity, duration, dependence, enforceability, salience, frequency, reciprocity, and consequence can vary independently. Measurement should therefore state which dimension is being represented before assigning a value described as “strength.”

A financial relation can have high monetary volume and low duration. A professional tie can involve infrequent communication yet high consequence because access to a rare resource depends on it. A legal relation can be rarely activated while remaining strongly enforceable. A caregiving relation can involve intense time com-

mitment without large monetary flows. A platform relation can be frequent yet easily substitutable. These examples show why generic tie-strength scores can conceal substantively important differences.

For some research questions, a one-dimensional measure is appropriate. Transaction volume can be the relevant dimension when studying liquidity exposure; contact frequency can be relevant when studying information opportunities. The methodological issue is not scalar measurement itself, but the extension of a dimension-specific measure into a broader claim about the relation.

Proposition 7.252 (Dimension-indexed strength)**.** *A measure of relational strength supports interpretation most clearly when the dimension of strength is named explicitly and when evidence is provided before the measure is generalized to other dimensions of the relation.*

This proposition is particularly relevant to network weights. Section 7.19 distinguished frequency, volume, duration, distance, exposure, and confidence as different edge weights. The present section extends that discipline to relational measurement more generally.

7.26.5 Relation Quality

Relation quality concerns evaluative properties of a relation. These can include trust, fairness, responsiveness, respect, reliability, recognition, procedural clarity, mutuality, safety, or perceived legitimacy. Unlike frequency or duration, quality often depends partly on participant interpretation and normative criteria. The measurement design should therefore identify the standpoint and dimension from which quality is being assessed.

A relation can be evaluated differently by its participants. An employer can assess an employment relation as efficient while a worker assesses it as insecure. An institution can classify an interaction as procedurally compliant while the affected person experiences it as inaccessible. A service relationship can be reliable in delivery while weak in recognition or voice. These differences are not necessarily measurement failures; they can reveal asymmetry in the relation itself.

Quality measures can use surveys, interviews, behavioral indicators, complaints, response times, observed practices, legal compliance, or composite indices. Each source supports different claims. Self-reports provide direct access to participant experience while remaining sensitive to framing, memory, incentives, and expectations. Behavioral indicators can capture enacted practice while leaving meaning underdetermined. Institutional measures can describe compliance while underrepresenting informal experience. Triangulation becomes valuable when the dimensions are expected to converge or when their divergence is substantively meaningful.

Cronbach and Meehl's construct-validity framework is useful here because quality concepts such as trust or legitimacy are not validated by one indicator alone Cronbach and Meehl 1955. Messick's emphasis on the interpretation of scores likewise cautions against treating a numerical quality score as self-interpreting Messick 1995. In relational inquiry, validation asks whether the score supports the specific claim being made about the relation under the stated conditions.

Definition 7.253 (Relational quality profile)**.** A *relational quality profile* records the quality dimensions, participant or institutional standpoint, indicators and elicitation conditions, aggregation rule, relevant normative criteria, disagreement among perspectives, and the inferential scope supported by the measure.

This profile allows disagreement to remain visible. A study can report high procedural reliability and low perceived recognition without forcing the two into one average. Preserving that multidimensionality can be analytically more informative than producing a single quality rank.

7.26.6 Relation Stability

Relation stability concerns the variability of a relation or one of its properties through time. It should be distinguished from relational persistence. A relation can persist while its intensity varies substantially; it can remain statistically stable while its institutional meaning changes; and repeated manifestations can remain similar even after the underlying relation has been reconstituted. The identity discipline of Section 7.8 therefore precedes stability measurement.

Stability can be operationalized through variability in contact frequency, transaction volume, network position, role occupancy, response time, legal status, reported trust, or other relation-specific indicators. Different time windows can generate different conclusions. A relation can be stable over weeks while transforming over years. Seasonal relations can show predictable periodic variation that should not be confused with instability. Institutional relations can remain formally stable while practical enactment varies across administrations or local sites.

A stability measure should therefore state the temporal resolution, observation window, expected rhythm, and identity criterion. Section 7.24 developed relation formation, persistence, transformation, dissolution, sequence, rhythm, and gaps; stability measurement becomes meaningful when situated within that temporal architecture.

Definition 7.254 (Relational stability profile)**.** A *relational stability profile* records the focal relational property, identity criterion, observation interval, temporal resolution, expected or institutionalized rhythms, variability measure, transformation thresholds, missing intervals, and historical conditions relevant to interpreting observed change.

The profile also helps distinguish measurement instability from relational instability. Changes in survey wording, administrative definitions, logging systems, sampling frames, or data-linkage rules can create apparent variation even when the target relation changes little.

7.26.7 Relation Accessibility

Relation accessibility concerns the practical possibility of reaching, activating, using, entering, or maintaining a relation or relational resource from a specified position. It extends the spatial accessibility discussion in Section 7.23 beyond geography. A service relation can be formally available yet difficult to activate because of documentation, cost, language, information, queueing, eligibility, opening hours, digital

requirements, safety concerns, or discretionary gatekeeping. A professional network can exist while remaining inaccessible to newcomers. A legal remedy can be formally established while difficult to invoke because of procedural burden or representation costs.

Accessibility is therefore focal-position dependent. The same institution can be highly accessible to one actor and difficult to access for another. It is also target-specific: access to information, decision makers, credit, legal remedy, care, employment, or organizational participation can involve different barriers. A useful measure should specify what relation is being accessed, by whom, for what purpose, and under which temporal conditions.

Accessibility can be measured through travel time, monetary cost, waiting time, documentation requirements, success rates, number of intermediaries, network path constraints, eligibility, digital friction, observed dropout, or participant reports. A composite measure can be appropriate when several barriers jointly determine practical access, but the aggregation assumptions should remain visible.

Definition 7.255 (Relational accessibility profile)**.** A *relational accessibility profile* records the focal position, target relation or relational resource, activation requirements, material and institutional barriers, permissions, intermediaries, temporal conditions, alternative routes, observed success or failure, and uncertainty concerning unobserved barriers.

Accessibility can itself be relationally generated. Gatekeepers, brokers, credentials, reputation, prior relations, legal status, and institutional classifications can change the cost of entering another relation. Measuring accessibility therefore often requires reconstructing a small relational configuration rather than one distance or cost variable.

7.26.8 Measurement Error

Measurement error arises when the recorded representation differs from the manifestation or relational property relevant to the intended claim. In relational data, error can enter through node identity, edge detection, direction, weight, timing, participant recall, administrative coding, survey response, missing records, entity resolution, extraction models, or researcher interpretation. Butts demonstrates how network reconstruction can be affected by informant accuracy, measurement error, and missing data Butts 2003. The relational case therefore extends familiar measurement-error problems into multiple linked dimensions.

Error can be random, systematic, position-dependent, institutionally generated, or historically changing. A platform can record interactions of one type more completely than another. Powerful organizations can have more extensive documentary traces than informal groups. Survey respondents can recall salient relations more readily than routine ones. Administrative systems can systematically exclude relations that fall outside recognized categories. AI extraction systems can perform differently across languages, document types, or historical formats.

Measurement error can also be dependent across observations. If one institution changes its reporting system, several relations can be affected simultaneously. If a

name-resolution algorithm merges two organizations, many edges can be misclassified. If a participant systematically omits one category of relationship, the resulting errors share a source. Standard error models that assume independent measurement noise may then be insufficient.

Definition 7.256 (Relational measurement-error profile)**.** A *relational measurement-error profile* records plausible error sources, affected entities or relations, direction and dependence of error where known, temporal and institutional origin, validation evidence, missingness interactions, transformation steps, and sensitivity of substantive conclusions to plausible error structures.

Validation subsamples, repeated measurements, multiple informants, administrative cross-checks, source inspection, manual annotation, and sensitivity analysis can help characterize error. The goal is calibrated inference rather than the assumption of error-free relational data.

7.26.9 Measurement Invariance

Measurement invariance concerns whether a measure retains sufficiently comparable meaning across groups, times, institutions, languages, scales, or relational configurations. Meredith's formal treatment distinguishes several levels of factorial invariance and shows why comparability depends on the stability of the measurement relation rather than merely on use of the same instrument Meredith 1993. Relational inquiry extends this problem beyond psychometric scales because the relation between manifestation and target property can itself vary across contexts.

The same number of messages can represent different degrees of relational engagement across communication cultures or organizational roles. A complaint rate can represent different levels of dissatisfaction when reporting costs differ. A legal-status category can have different practical consequences across jurisdictions. A trust scale can function differently across languages or institutional settings. A network weight based on transaction volume can change meaning under inflation, market restructuring, or organizational growth. Reusing the same coding rule therefore does not establish comparable measurement.

Invariance can be considered across several dimensions. *Semantic invariance* concerns whether the measured category retains a sufficiently similar meaning. *procedural invariance* concerns whether the observation and coding process operates comparably. *scale invariance* concerns whether changes in analytical resolution preserve the interpretation of the measure. *temporal invariance* concerns whether the manifestation-to-property relation remains sufficiently stable through time. *positional invariance* concerns whether the measure functions comparably for actors occupying different relational positions.

These forms of invariance need not hold simultaneously. A measure can be semantically comparable while the data-collection process changes, or procedurally stable while the social meaning of the indicator shifts. In such cases, the comparison can sometimes be repaired through recalibration, stratification, reweighting, revised coding, bridge studies, or a narrower inferential claim.

Definition 7.257 (Measurement invariance profile)**.** A *relational measurement-*

invariance profile records the comparison domains, target property, indicator semantics, measurement procedure, scaling and coding rules, relevant relational positions, temporal and institutional conditions, evidence for comparability, detected non-invariance, and the adjustments or scope restrictions used in response.

Measurement invariance is particularly important for longitudinal, cross-cultural, cross-institutional, and AI-assisted research. Automated models can create apparent uniformity by mapping heterogeneous expressions into a shared embedding or category system. That common representation can improve comparability while also concealing context-specific meaning or unequal error rates. A shared numerical space should therefore be evaluated for the relational distinctions it preserves before cross-context comparisons are interpreted substantively.

The measurement architecture developed in this section can be summarized through a final warrant principle.

Proposition 7.258 (Relational measurement warrant)**.** *A relational measure supports its intended inference most clearly when the target property, manifestation, transformation rule, standpoint, boundary, scale, temporal scope, error structure, and comparability conditions are documented sufficiently to reconstruct how the measure acquires its meaning.*

Proposition 7.258 preserves the distinction among measurement precision, construct interpretation, and substantive relational warrant. A highly reliable score can still represent the wrong property; a valid measure in one setting can lose comparability in another; and a noisy measure can sometimes support a bounded conclusion when its uncertainty is well characterized. Measurement therefore remains part of the epistemic relation between researcher and object rather than a neutral step that precedes interpretation.

The section also preserves the role of contingent encounter and aesthetic judgment developed earlier in the book. A strangely inconsistent indicator, unexpected disagreement between measures, sudden loss of invariance, or anomalous mismatch between formal accessibility and lived access can first make a measurement problem salient. Subsequent inquiry can determine whether the discrepancy reflects error, changing relational meaning, hidden heterogeneity, institutional transformation, or a limitation in the original object specification. As AI lowers the cost of producing scores, embeddings, classifications, and composite indices, the ability to inspect these measurement relations and revise them responsibly becomes increasingly consequential.

The next section turns to one of the most persistent consequences of incomplete measurement: missingness in relational data. Missingness can occur not only because values are unrecorded, but because actors, ties, events, or entire categories of relation fail to enter the evidential system. Section 193 therefore develops missingness as both a statistical problem and a potentially relationally generated phenomenon.

7.27 Missingness in Relational Data

Section 7.26 treated measurement as a transformation from relational manifestations into an analytical representation. The present section examines a closely related problem: some actors, relations, events, documents, attributes, or relational categories fail to enter the evidential system from which that representation is constructed. Its role is to develop missingness as a relational methodological problem rather than a generic absence of values. The objective is to distinguish several mechanisms of missingness, identify the inferential risks associated with each, and specify when patterned non-observation can itself become substantively informative. The discussion proceeds through missing actors, missing relations, hidden relations, strategic concealment, unequal observability, archival missingness, digital missingness, and missingness as substantive evidence.

Conventional missing-data analysis distinguishes mechanisms according to how the probability of missingness relates to observed and unobserved variables Little and Rubin 2019. Those distinctions remain useful, but relational inquiry introduces additional structure. An actor can be missing because the sampling frame excludes a relevant population; a relation can be missing because one endpoint does not report it; an edge can disappear because a platform does not log a particular interaction; a legal or economic relation can remain hidden because it is informal, confidential, or strategically concealed; and an archival relation can become unobservable because the relevant records were not produced, were poorly preserved, were weakly described, remained undigitized, or were not made accessible. Missingness can therefore be generated by the same relational field that the study is trying to reconstruct.

Network research provides a concrete illustration. Kossinets shows that boundary specification, actor nonresponse, and fixed-choice censoring can alter observed network statistics in different directions, so incomplete relational data need not behave like independent missing entries in an otherwise intact table Kossinets 2006. Butts likewise demonstrates that network inference can be sensitive to informant accuracy, measurement error, and incomplete relational reports Butts 2003. These results motivate a broader methodological principle: missingness should be attached to a specified observation process and relational position before the researcher decides how to repair, model, or interpret it.

Definition 7.259 (Relational missingness)**.** *Relational missingness* is a condition in which a potentially relevant actor, relation, event, attribute, trace, or category is absent from the available evidential representation because of the processes through which the research object is bounded, observed, recorded, preserved, accessed, transformed, or disclosed.

Definition 7.259 keeps missingness distinct from substantive absence. A relation can be absent in the field yet completely observed as absent; it can exist in the field yet remain missing from the data; or its status can remain uncertain because the observation process provides weak detection conditions. Section 7.6 established this distinction for relation identification. The present section extends it to the broader architecture of relational data production.

Table 7.26 summarizes the principal forms of missingness developed below and the characteristic inferential problem associated with each.

Table 7.26: Forms of relational missingness and characteristic inferential risks

Form	Typical source	Primary inferential risk	Methodological response
Missing actors	Sampling-frame exclusion, nonresponse, identifier failure, hidden population, boundary choice	Distorted composition, topology, prevalence, or exposure	Reconstruct frame, compare inclusion mechanisms, preserve actor-level uncertainty
Missing relations	Nonreporting, censoring, incomplete logging, failed linkage, temporal aggregation	False sparsity, altered dependence, biased topology or exposure	Specify edge-generation process, validate subsets, perform sensitivity analysis
Hidden relations	Informality, privacy, weak manifestation, off-record practice, category mismatch	Treating weak visibility as weak relational importance	Triangulate indirect traces and competing relational explanations
Strategic concealment	Secrecy, evasion, reputational protection, legal or economic incentives	Endogenous missingness correlated with the target relation	Model concealment incentives and preserve alternative explanations
Unequal observability	Position, power, infrastructure, language, institutional capacity, surveillance	Visibility becomes confounded with importance, legitimacy, or prevalence	Compare observation regimes and map observability by position
Archival missingness	Non-creation, destruction, retention rules, access, description, digitization	Historical reconstruction inherits survival and custody biases	Reconstruct provenance, preservation pathway, and archival silence
Digital missingness	Platform ontology, deletion, API limits, encryption, moderation, offline activity	Recorded interaction is mistaken for the complete relational field	Audit logging architecture, platform boundaries, and extraction transformations
Substantive missingness	Exclusion, secrecy, informality, fear, nonrecognition, unequal recordability	Missingness is treated only as nuisance rather than possible evidence	Test whether missingness mechanism is itself relationally generated

7.27.1 Missing Actors

Missing actors arise when relevant positions fail to enter the analytical population. The source can be an incomplete sampling frame, nonresponse, weak institutional registration, migration, informal participation, account deletion, entity-resolution failure, organizational opacity, or a boundary specification that excludes actors who remain relationally consequential. The resulting problem is more than a smaller sample. Missing actors can change the composition of the observed field and alter the relations among the actors who remain visible.

The effect depends on where missing actors are located. Omission of peripheral actors may affect prevalence estimates while leaving some central structures comparatively stable. Omission of brokers, gatekeepers, highly connected actors, marginalized populations, or entire categories of participant can alter reachability, community structure, exposure pathways, centrality, and the interpretation of institutional boundaries. Kossinets' simulations show that actor nonresponse and boundary specification can affect network-level statistics differently Kossinets 2006. Relational missingness should therefore preserve the mechanism of actor omission rather than treating a common percentage of missing cases as equivalent across studies.

The boundary problem is especially important. An actor can be absent because the study deliberately defined the field without that position. That methodological exclusion is different from failed observation within an accepted boundary. Section 7.4 introduced boundary remainders precisely for such cases. A funder, regulator, supplier, informal intermediary, or external household member can remain outside the focal dataset while still being documented as potentially relevant to the relations ob-

served inside it.

Actor identity also matters. Longitudinal data can lose an actor because an identifier changes, two identities are merged, one organization splits, or a digital account ceases to represent the same analytical entity. Such cases connect missingness to the relational-identity problem developed in Section 7.8. Apparent actor disappearance can therefore reflect substantive exit, measurement failure, reconstitution, or identifier discontinuity.

Definition 7.260 (Missing-actor profile)**.** A *missing-actor profile* records the target population or relational field, inclusion criteria, sampling or registration frame, known or suspected omitted positions, mechanism of omission, identity uncertainty, boundary status, temporal interval, and plausible effects of actor omission on the substantive claim.

The profile can remain useful even when recovery of omitted actors is incomplete. Its purpose is to make composition uncertainty visible and to indicate which conclusions remain sensitive to plausible actor-level incompleteness.

7.27.2 Missing Relations

Missing relations occur when relevant actors are observed but one or more relations among them fail to enter the data. Survey respondents can omit routine or sensitive ties; administrative systems can record transactions while missing informal obligations; communication platforms can log messages while excluding face-to-face interaction; fixed-choice surveys can censor nominations after a preset number; linkage procedures can fail to connect records that belong to the same dyad; and temporal aggregation can erase brief or intermittent relations.

This form of missingness can be structurally dependent. If one respondent systematically underreports conflict relations, several edges sharing that actor can be missing together. If one institution changes its reporting software, many relations can disappear simultaneously. If a platform excludes one message type from an API, omission can follow interaction mode across the network. Missing-edge processes therefore often violate the convenient idea that each relation has an independent probability of being absent.

The inferential consequences depend on the target. Missing weak ties can affect reachability and bridging; missing high-volume ties can alter weighted centrality; missing directed ties can distort reciprocity; missing negative relations can create an unrealistically cooperative configuration; missing cross-group ties can exaggerate segregation; and missing temporal episodes can change apparent sequence or duration. Section 7.19 therefore treated network uncertainty as uncertainty in the graph specification itself rather than only in parameters estimated after a graph has been fixed.

Definition 7.261 (Missing-relation profile)**.** A *missing-relation profile* records the candidate relation type, observation and reporting process, relation endpoints, censoring or linkage rules, temporal coverage, direction and weight where relevant, known validation evidence, likely dependence among missing relations, and sensitivity of the substantive conclusion to plausible unobserved ties.

A useful response can include validation subsamples, repeated elicitation, multiple informants, documentary cross-checking, administrative linkage, alternative graph reconstructions, or sensitivity analysis. Imputation can be appropriate in some settings, but an imputed edge should remain distinguishable from an observed one when the substantive interpretation depends on source and provenance.

7.27.3 Hidden Relations

Some relations are difficult to observe because their ordinary manifestations are weak, private, informal, episodic, or poorly aligned with recognized categories. Informal caregiving, undocumented work, off-record advice, tacit brokerage, confidential negotiation, unregistered debt, reputational influence, and unofficial authority can remain consequential while leaving comparatively sparse formal traces. Calling such relations *hidden* describes an observation problem; it does not by itself establish secrecy or deliberate concealment.

Hidden relations often become visible indirectly. Repeated co-occurrence, correlated decisions, unexplained resource flows, references in correspondence, third-party testimony, spatial co-presence, legal disputes, institutional workarounds, or sudden coordination can support a candidate relation. Yet several mechanisms can generate similar traces. A pair of organizations can make similar decisions because of direct coordination, shared regulation, common professional norms, or a common external shock. The inference from indirect trace to hidden relation therefore requires an explicit bridge and competing explanations.

Category systems can also hide relations by making them difficult to name. Bowker and Star show how classifications organize visibility and action while leaving some cases awkwardly positioned or excluded Bowker and Star 1999. A relation that lacks an administrative category, formal contract type, recognized kinship label, or platform event type can become weakly recordable even when participants experience it as consequential. Hiddenness can thus emerge from the ontology of the recording system rather than from the intentions of the actors involved.

Definition 7.262 (Hidden-relation profile)**.** A *hidden-relation profile* records the candidate relation, reasons for weak direct observability, indirect manifestations, competing explanations, relevant classification or recording systems, participant or third-party accounts, boundary and scale, temporal scope, and uncertainty concerning the relation's existence or characterization.

The profile encourages cautious inference. A hidden relation can be a strong explanatory candidate while remaining less directly evidenced than a formally documented relation. That difference in evidential access should remain visible in the final claim.

7.27.4 Strategic Concealment

Strategic concealment is a narrower process in which actors or institutions have incentives to reduce, redirect, fragment, or manipulate the traces through which a relation could be observed. The relevant incentives can involve legal exposure, taxation, competition, organizational reputation, privacy, contractual restrictions, polit-

ical sensitivity, market strategy, professional sanctions, or protection of vulnerable participants. Concealment can operate through non-disclosure, indirect intermediaries, off-record communication, record fragmentation, selective reporting, classification changes, deletion, or movement into channels with weaker observability.

The existence of an incentive does not establish that concealment occurred. Researchers should therefore distinguish *concealment opportunity*, *concealment incentive*, *concealment behavior*, and *observed missingness*. A confidential negotiation can be poorly visible because confidentiality is institutionally routine; a missing transaction can reflect technical failure; a sparse archive can result from weak preservation rather than purposeful destruction. Strategic concealment becomes a warranted explanation only when the evidential pathway supports more than the mere possibility of secrecy.

Concealment can itself be relationally structured. An actor may possess the authority to classify records, the resources to hire intermediaries, the technical capacity to move communication into private channels, or the institutional standing to resist disclosure. Another actor may be highly observable because participation requires reporting. Missingness can therefore reflect unequal capacities to manage visibility.

Definition 7.263 (Strategic-concealment profile)**.** A *strategic-concealment profile* records the relation potentially concealed, actors able to affect observability, relevant incentives and constraints, available concealment mechanisms, observed trace anomalies, alternative non-strategic explanations, temporal scope, and the evidential basis for attributing missingness to deliberate action.

This profile is particularly important for ethical writing. Strong claims of concealment can imply intention or wrongdoing. The level of attribution should therefore remain proportionate to the evidence, consistent with the epistemic-humility principle adopted across the book.

7.27.5 Unequal Observability

Relations are often observed under unequal conditions. Some organizations produce extensive auditable records because law, professional standards, or administrative systems require them. Informal groups can leave fewer records. Digitally mediated actors can generate dense traces while offline participants remain comparatively invisible. Powerful institutions can be highly documented in some domains while retaining greater capacity to control access in others. Marginalized participants can be simultaneously subject to intense surveillance and poorly represented in records relevant to their own experience.

These differences create an *observability structure*. Visibility can vary with institutional capacity, language, legal status, technology, geography, organizational form, research access, documentation norms, surveillance, and archival preservation. The resulting dataset can therefore overrepresent relations that are easy to record and underrepresent relations that are socially consequential but weakly institutionalized.

A common inferential risk is to equate documentary or digital density with relational importance. A formally regulated financial relation can produce thousands of records, while a short informal conversation can alter access to employment or legal

protection. Conversely, a dense digital trace can correspond to low relational commitment. Visibility and substantive importance should therefore remain separate dimensions.

Definition 7.264 (Relational observability profile)**.** A *relational observability profile* records how observation opportunities vary across positions, relation types, institutions, languages, technologies, locations, and times; which mechanisms generate those differences; and how unequal observability can affect the composition and interpretation of the available evidence.

Unequal observability also has implications for epistemic justice. If some positions systematically enter research through official categories while others appear only through external classification, missingness can reproduce asymmetries in whose relations become recognizable. Triangulation and participatory source development can sometimes widen the evidential field, while privacy and safety can appropriately limit visibility in other cases.

7.27.6 Archival Missingness

Archival missingness concerns historical traces that fail to become available for present reconstruction. Section 7.11 treated the archive as a relational infrastructure of production, custody, arrangement, preservation, description, access, and encounter. Missingness can arise at each stage. A record may not have been created in the relevant form; it may also have been destroyed, lost, dispersed, reclassified, restricted, poorly catalogued, left undigitized, or rendered difficult to retrieve by language, format, or institutional arrangement.

Trouillot emphasizes that silences can enter historical production at several moments, including fact creation, assembly, retrieval, and retrospective significance Trouillot 1995. That insight is directly relevant to relational reconstruction. If an actor's relations were rarely recorded, later network or institutional histories can appear sparser around that actor even when the underlying field was not. If one organization preserves correspondence while another destroys routine records, apparent asymmetry in influence can partly reflect archival survival.

The absence of a record therefore needs an archival detection model. The researcher should ask whether the institution normally generated this kind of record, whether retention was expected, whether access is complete, whether cataloguing would make it discoverable, and whether the search strategy was capable of finding it. Only under sufficiently strong detection conditions can archival non-observation contribute substantially to an absence claim.

Definition 7.265 (Archival missingness profile)**.** An *archival missingness profile* records the expected record type, production conditions, custody and retention pathway, known destruction or dispersal, access restrictions, description and digitization status, retrieval strategy, comparison archives, and the consequences of missing traces for the relational reconstruction.

The profile preserves the distinction between a missing archive and an archive of absence. The former concerns incomplete evidence; the latter can sometimes document that an expected relation, authorization, transaction, or institutional act did not

occur under conditions where such events were reliably recorded.

7.27.7 Digital Missingness

Digital systems can generate very large relational datasets while still producing systematic missingness. Platform logs reflect a technical ontology of accounts, events, sessions, transactions, permissions, and interfaces. Interactions occurring outside that ontology can remain unrecorded. Deleted content, private channels, encrypted communication, offline meetings, API restrictions, rate limits, moderation, data-retention policies, account suspension, identifier changes, device loss, and platform migration can further alter what is observable.

Digital missingness can also be produced by research access. A platform can expose a public API that returns a subset of fields, apply ranking or sampling before retrieval, limit historical depth, or change access policies during a project. The researcher can then possess a technically complete extract of an interface that is substantively incomplete relative to the platform's internal data and still more incomplete relative to the wider relational field.

Automated processing introduces additional gaps. Entity-resolution systems can fail to match names across documents; language models can miss low-frequency relation types; optical or speech recognition can perform unevenly across formats and languages; classification thresholds can suppress uncertain cases; and deduplication can merge distinct actors. These transformations can make missingness appear after the original record was successfully captured.

Definition 7.266 (Digital missingness profile)**.** A *digital missingness profile* records the platform or system ontology, logging rules, retention and deletion policies, public or researcher access channel, API or retrieval limits, identifier changes, offline or private interaction channels, transformation and extraction steps, known performance variation, and the temporal interval over which these conditions apply.

The profile is particularly important for AI-assisted research because automated systems can produce a persuasive sense of completeness. High retrieval volume and fluent synthesis do not establish corpus completeness. Provenance should preserve which repositories, interfaces, time windows, languages, and extraction methods were actually searched.

7.27.8 Missingness as Substantive Evidence

Missingness is sometimes generated by the relational phenomenon under investigation. Informal work can be missing from official employment records because institutional recognition is part of the substantive issue. People facing retaliation may avoid reporting a relation. Excluded populations may lack the documentation required to enter administrative systems. Confidential relations can leave fewer public traces because privacy is constitutive of their organization. Illicit or stigmatized exchange can be weakly documented because participants manage visibility. Unequal institutional recognition can determine which forms of care, labor, ownership, or participation become recordable.

Such cases create a methodological opportunity and a risk. The opportunity is

that patterned missingness can reveal something about access, recognition, power, secrecy, informality, or institutional classification. The risk is circular inference: researchers can explain missing evidence by the very hidden relation they seek to prove. Missingness therefore becomes substantive evidence only when the proposed mechanism is independently supported and competing observation-process explanations are considered.

A useful procedure is to reconstruct the *missingness pathway*. The researcher identifies where the trace would normally be generated, which actor or institution controls that stage, what incentives or constraints affect recording, how the pattern differs across positions or times, and which alternative mechanisms could produce a similar gap. Comparative cases can be especially helpful. If one legal reform changes reporting incentives and missingness changes selectively for the relations affected by the reform, the pattern can strengthen a relational explanation while still requiring attention to concurrent changes.

Definition 7.267 (Relational missingness mechanism profile)**.** A *relational missingness mechanism profile* records the missing object, stage of the observation or record-production process at which missingness arises, actors or institutions affecting that stage, candidate relational mechanism, alternative explanations, comparison evidence, boundary, scale, temporal scope, and uncertainty concerning whether the missingness is substantively generated.

The profile supports a final warrant principle.

Proposition 7.268 (Relational missingness warrant)**.** *A substantive inference from missing relational data becomes more credible when the missing object, observation process, missingness mechanism, relational position, boundary, scale, temporal scope, alternative explanations, and sensitivity of the conclusion to plausible unseen evidence are documented sufficiently to reconstruct the inferential pathway.*

Proposition 7.268 preserves several levels of uncertainty. Statistical uncertainty about unobserved values is one component. Uncertainty can also concern which actors belong to the field, which relation types were recordable, whether nonresponse was strategic, whether archival loss was selective, whether digital retrieval omitted a class of event, and whether the proposed substantive mechanism actually generated the missingness. These forms need not be collapsed into one probability estimate.

Contingent encounter and aesthetic judgment remain relevant here. A strangely empty region in a relational map, repeated absence of one category from records, an unexpected discontinuity after a platform change, or a conspicuous archival silence can first become salient before the researcher knows whether the pattern is meaningful. Subsequent inquiry should distinguish ordinary data loss, boundary error, classification mismatch, strategic concealment, unequal observability, and genuinely substantive missingness. In AI-assisted research, large-scale retrieval can make missingness harder to perceive because the returned corpus can feel abundant. The methodological task therefore includes asking which relations had little chance to enter the searchable corpus in the first place.

The next section turns from incomplete evidence to the integration of heterogeneous evidence. Section 194 develops triangulation across heterogeneous sources.

7.28 Triangulation of Relational Evidence

The preceding sections developed several distinct evidential interfaces for relational inquiry: documents, archives, ethnographic encounters, interviews, legal and institutional materials, comparative designs, quantitative models, networks, spatial and temporal representations, field reconstruction, measurement systems, and missingness analysis. The role of the present section is to specify how evidence from such interfaces can be combined without treating methodological plurality as simple accumulation. Its objective is to distinguish convergence, complementarity, inconsistency, and contradiction across evidential pathways; to identify the conditions under which cross-source agreement strengthens a relational claim; and to preserve disagreements that reveal genuine differences of position, scale, time, representation, or meaning. The discussion proceeds through documentary, interview, observational, quantitative, historical, and cross-scale triangulation before addressing contradictory evidence and irreducible disagreement.

Triangulation has a long methodological history in social inquiry. Jick describes triangulation as the use of multiple qualitative and quantitative methods to examine a common research problem and emphasizes the complementary strengths of different methods Jick 1979. Mixed-method research develops this problem more systematically by treating integration as a design choice involving distinct forms of evidence and inference Creswell and Plano Clark 2018. Mathison adds an especially important caution: triangulation can yield convergence, inconsistency, and contradiction, and the latter two outcomes require interpretation rather than being treated as failed convergence Mathison 1988. Relational inquiry extends this insight because different methods frequently observe different manifestations, positions, temporal intervals, and scales of the same relational field.

Definition 7.269 (Relational triangulation)**.** *Relational triangulation* is the structured comparison of partially distinct evidential pathways concerning a relational claim, with explicit attention to the object, manifestation, standpoint, boundary, scale, temporal scope, transformation process, and uncertainty carried by each pathway.

Definition 7.269 makes independence and alignment separate questions. Two sources can be methodologically different while sharing the same administrative classification, archive, sampling frame, platform log, interview population, or institutional narrative. Their agreement may then reflect a common upstream source. Conversely, two sources can appear inconsistent because they describe different scales or periods. Triangulation therefore requires reconstruction of the pathways through which evidence became available before evidential agreement or disagreement is interpreted.

Table 7.27 summarizes the principal triangulation forms developed below.

A useful starting point is to distinguish four outcomes of triangulation. *Convergence* occurs when distinct evidential pathways support sufficiently compatible claims. *Complementarity* occurs when the pathways illuminate different dimensions of a relation without requiring identical results. *Tension* occurs when results differ in ways that may be explained by scale, time, standpoint, measurement, or boundary. *Contradiction* occurs when the available interpretations remain materially incompatible within the same stated scope. These outcomes can coexist within one

Table 7.27: Forms of relational triangulation and characteristic inferential contributions

Form	Evidential pathways	Potential contribution	Characteristic caution
Documentary	Administrative, organizational, legal, archival, public, digital records	Source cross-checking, provenance reconstruction, formal–enacted comparison	Shared record-production system can create correlated evidence
Interview	Participants in different positions, repeated interviews, interview–document comparison	Positional knowledge, meaning, experience, contradiction, temporal reinterpretation	Agreement can reflect common narratives or shared institutional exposure
Observational	Field observation, participant observation, repeated sites, observer perspectives	Enacted practice, tacit coordination, informal relation, breakdown and repair	Observer access and field position condition visibility
Quantitative	Measures, datasets, estimators, model families, sampling frames, validation subsets	Pattern stability, measurement comparison, sensitivity, distributional scope	Specification agreement can share the same measurement or boundary assumptions
Historical	Archives, contemporary records, later testimony, period comparison, category history	Sequence, continuity, transformation, provenance, changing meaning	Surviving traces can share preservation and archival-selection biases
Cross-scale	Individual, dyadic, organizational, institutional, field, spatial, temporal scales	Cross-scale consistency, bridge identification, scale-specific mechanisms	Apparent disagreement can reflect legitimate scale dependence
Contradictory	Evidential pathways supporting incompatible interpretations	Boundary revision, mechanism differentiation, uncertainty localization	Premature averaging can erase informative conflict
Preserved disagreement	Competing interpretations retained after reasonable inquiry	Reopenability, plural reconstruction, future re-epistemization	Requires explicit account of the unresolved locus and its consequences

study. A legal record and an organizational chart can converge on formal authority, interviews can complement that evidence with accounts of practical dependence, ethnography can reveal tension between prescribed and enacted coordination, and quantitative analysis can expose subgroup differences that contradict an aggregate institutional narrative.

Definition 7.270 (Triangulation profile)**.** A *triangulation profile* records the focal relational claim, evidential pathways, degree of pathway independence, manifestations accessed, standpoints represented, boundary and scale, temporal scope, transformations applied to the evidence, observed convergence or divergence, alternative explanations, and the consequences of unresolved disagreement for the claim.

The profile prevents triangulation from becoming a rhetorical statement that "multiple sources agree." It asks which sources agree, why their agreement is informative, where they may share upstream dependence, and which parts of the claim remain weakly supported.

7.28.1 Documentary Triangulation

Documentary triangulation compares records produced through different documentary pathways. Section 7.10 distinguished administrative, institutional, organizational, correspondence, public, and digital records, while Section 7.11 examined archives as infrastructures of selection, preservation, arrangement, and access. These differences matter because documents that appear independent can originate

from the same reporting system or classification regime.

A legal filing, annual report, administrative database, and public statement may contain the same organizational category because each inherits it from a common institutional source. Counting four documents would overstate evidential independence. Documentary triangulation therefore begins with provenance. The researcher asks who produced the record, for what operational purpose, under which categories, through which custody and transformation chain, and whether the document reproduces another source.

Documentary convergence is especially informative when distinct production systems generate compatible traces. A formal contract can establish a legal relation; payment records can indicate enactment; correspondence can reveal interpretation or renegotiation; meeting minutes can document institutional recognition; and later archival records can show persistence or dissolution. These sources contribute differently to the relational claim. Agreement across them can strengthen confidence because each is vulnerable to different errors and incentives.

Documentary triangulation can also expose divergence between formal representation and enacted relation. A policy may assign responsibility to one office while correspondence repeatedly routes practical decisions through another. An organizational chart may preserve a reporting line that transactional records show has become marginal. A registry can classify an organization as active while financial or operational records show prolonged inactivity. Such discrepancies should be treated as candidate evidence concerning institutional transformation, documentary lag, category mismatch, or uneven enactment.

Definition 7.271 (Documentary triangulation chain)**.** A *documentary triangulation chain* records the provenance and transformation pathway of each documentary source, the relational dimension each source bears on, shared upstream dependencies among sources, and the inferential contribution of convergence or divergence across those sources.

This chain complements the documentary provenance chain developed in Section 7.10. Its purpose is comparative: provenance is reconstructed across sources so that documentary multiplicity can be distinguished from evidential independence.

7.28.2 Interview Triangulation

Interview triangulation compares accounts across relational positions, temporal moments, interview formats, and other evidential pathways. Section 7.13 treated interviews as relationally produced evidence whose meaning depends on participant position, memory, elicitation conditions, and interviewer–participant interaction. Triangulation therefore requires more than repeated questioning.

Participants can possess asymmetrical access to the same relation. A manager may know formal decision procedures, a frontline worker may know everyday implementation, a client may know practical accessibility, and an external regulator may know compliance history. Their accounts can converge on one dimension while diverging on another. Such positional divergence can be analytically valuable because it helps reconstruct how the relation appears and operates from different locations within

the configuration.

Repeated interviews with the same participant can also triangulate temporal interpretation. A participant may reinterpret an earlier event after later institutional change. The later account does not automatically invalidate the earlier one; the difference can reveal changing meaning, memory, or relational position. Maintaining date, context, and elicitation conditions makes temporal reinterpretation itself researchable.

Interview triangulation becomes stronger when it crosses evidence types. A participant's account of informal authority can be compared with observed practice, documentary decision trails, network position, or institutional outcomes. The purpose is not to make interviews pass an external "truth test." Participant accounts can provide distinctive evidence about experience, meaning, perceived constraint, and practical knowledge even when formal records differ. Cross-source comparison helps specify what kind of claim each source can support.

Shared narratives require caution. Several participants can repeat the same institutional explanation because they were trained through the same professional discourse, rely on the same official account, or occupy similar positions. Convergence then demonstrates the circulation or institutionalization of that narrative more directly than it demonstrates the historical accuracy of the narrative's content.

Definition 7.272 (Positional interview triangulation)**.** *Positional interview triangulation* compares accounts from participants occupying substantively different relational positions while preserving differences in access, role, dependence, authority, temporal standpoint, and exposure to shared narratives.

The definition supports comparison without assigning automatic epistemic priority to one position. The relevant question is which relational dimension each position is comparatively well placed to observe and where its access remains limited.

7.28.3 Observational Triangulation

Observational triangulation compares observations across sites, times, observers, modes of participation, and supporting sources. Ethnographic inquiry in Section 7.12 showed that observation is situated: researcher presence, access, attributed role, and participation can alter what becomes visible. Triangulation can make some of these conditions explicit.

Repeated observation across different temporal periods can distinguish routine practice from exceptional events. Observation across sites can reveal whether an apparently local pattern travels with an organizational rule, depends on one team, or varies with local infrastructure. Several observers can notice different aspects of the same interaction because of disciplinary training, language competence, social position, or practical access. The differences among observations can therefore become data about the observation process as well as about the field.

Observation can also be triangulated with formal and reported relations. A documented procedure may describe how coordination is expected to occur; interviews may describe how participants believe it occurs; observation can show how it is enacted under ordinary or stressful conditions. Divergence among these pathways can

indicate informal repair, symbolic compliance, undocumented discretion, changing routines, or misalignment between formal and practical organization.

The observational record itself requires provenance. Field notes, audio or video, coding schemes, researcher memos, and later analytic summaries represent different transformations of an encounter. Agreement among several coded variables extracted from the same recording provides less evidential independence than agreement between that recording, independent documentary traces, and observations conducted under another access condition.

Definition 7.273 (Observational triangulation profile)**.** An *observational triangulation profile* records observation sites, temporal intervals, observer positions, participation modes, recording transformations, focal relational dimensions, supporting evidence, and the extent to which convergent observations arise from independent or shared observational conditions.

Observational triangulation can be especially useful when tacit coordination, informal authority, routine repair, or embodied practice is central to the research object. It remains bounded by where and when observation was possible.

7.28.4 Quantitative Triangulation

Quantitative triangulation examines whether a relational conclusion remains supported across substantively relevant measurements, datasets, sampling frames, model families, estimators, temporal windows, or validation designs. Sections 7.18, 7.21, 7.22, and 7.26 developed the corresponding problems of estimation, dependence, causal identification, and measurement. Triangulation draws these elements together while preserving the difference between robustness within one representation and corroboration across different representations.

A finding can remain stable across several regression specifications because the specifications share the same measurement system, sample exclusions, boundary, and temporal aggregation. This form of robustness is useful, yet its evidential reach differs from convergence between independent administrative data, survey measures, observational records, and a separately designed validation sample. Quantitative triangulation should therefore classify which dimensions are actually varied.

Measurement triangulation compares indicators that operationalize the same target property through different manifestations. Sampling triangulation compares conclusions across frames or populations. Model triangulation compares alternative dependence or functional specifications. Temporal triangulation compares intervals or aggregation windows. Design triangulation compares observational, quasi-experimental, experimental, or other identification strategies where available. These forms can produce different patterns of convergence and disagreement.

Cross-validation and out-of-sample prediction provide another useful form of evidence, especially for predictive relational models. Predictive stability can show that a pattern travels to held-out observations under a specified data-generating setting. It does not by itself establish the substantive relational interpretation assigned to that pattern. A latent-space model, for example, can predict ties well while several social

mechanisms remain compatible with the latent positions.

Definition 7.274 (Quantitative triangulation matrix)**.** A *quantitative triangulation matrix* records which elements of a quantitative inference are varied across analyses—measurement, sample, boundary, scale, time, model family, estimator, dependence structure, or identification design—and which elements remain shared.

This matrix makes robustness claims more informative. It allows the researcher to say that a result is stable across model families while remaining dependent on one measurement system, or stable across two datasets while sensitive to boundary definition. Such statements preserve the actual scope of quantitative convergence.

7.28.5 Historical Triangulation

Historical triangulation compares traces produced at different times, by different institutions, for different purposes, and from different positions in relation to the events under study. Its objective is to reconstruct sequence, continuity, transformation, and category change while accounting for survival, archival selection, retrospective interpretation, and unequal recordability.

Contemporary records and retrospective testimony often perform different epistemic functions. A contemporaneous ledger can establish that a transaction was recorded at a particular time; a later interview can explain how participants understood the transaction or how its significance changed. An official report can document institutional classification; correspondence can reveal disagreement around that classification; later archival arrangement can shape which traces become readily discoverable. Historical triangulation therefore combines evidential forms while keeping their temporal positions visible.

Triangulation across periods can also test continuity claims. A relation described with the same institutional name across decades may show changes in authority, membership, legal basis, or practical enactment. Conversely, terminology can change while a recognizable relational lineage persists. Sections 7.8 and 7.24 developed identity and temporal profiles for these cases. Historical triangulation supplies the heterogeneous traces needed to evaluate those profiles.

Archival survival creates correlated gaps. Several sources can be missing because the same institution destroyed records, failed to preserve informal communications, restricted access, or adopted a classification system that excluded certain actors. Apparent historical convergence among surviving sources should therefore be interpreted together with the archival visibility architecture developed in Section 7.11 and the missingness mechanisms of Section 7.27.

Definition 7.275 (Historical triangulation profile)**.** A *historical triangulation profile* records the temporal position, provenance, category system, survival pathway, retrospective distance, relational standpoint, and inferential role of each historical source used to reconstruct a relational trajectory.

Historical triangulation can strengthen a sequence or continuity claim even when sources differ in meaning. Complementarity across traces is often more important than literal agreement because different historical sources were created to record different aspects of the relational field.

7.28.6 Cross-Scale Triangulation

Cross-scale triangulation examines how evidence concerning a relational phenomenon changes when represented at different analytical scales. Section 7.5 developed individual, dyadic, organizational, community, institutional, field, and multiscale inquiry. Triangulation across these resolutions can reveal whether an observed relation is scale-stable, scale-specific, or connected through identifiable cross-scale bridges.

An individual-level account of constrained access can coexist with organization-level evidence of high average service provision. A firm-level analysis can show stable output while team-level observations reveal substantial internal reorganization. A national indicator can improve while a regional or subgroup distribution becomes more unequal. These results can appear contradictory when scale is left implicit. Once scale is specified, they may describe different aspects of the same configuration.

Cross-scale convergence becomes especially informative when an explicit bridge connects the scales. A legal reform can alter organizational procedures; changed procedures can affect frontline interactions; those interactions can influence individual access. Evidence at each scale can corroborate different stages of the pathway. The presence of similar trends across scales provides weaker support when the bridge itself remains unspecified.

Scale transformation can also generate discrepancies mechanically. Aggregation can suppress heterogeneity; disaggregation can dissolve institutional organization; spatial averaging can hide boundary discontinuities; temporal aggregation can erase sequence. Cross-scale triangulation therefore includes a representation audit asking which relational distinctions are preserved or lost when moving between scales.

Definition 7.276 (Cross-scale triangulation profile)**.** A *cross-scale triangulation profile* records the relational object at each scale, the representation used at that scale, proposed cross-scale bridges, aggregation or disaggregation transformations, scale remainders, observed convergence or divergence, and the scope of cross-scale inference.

The profile helps distinguish evidence that supports a cross-scale mechanism from evidence that merely shows patterns at several resolutions.

7.28.7 Contradictory Evidence

Contradictory evidence deserves explicit analysis because methodological diversity frequently produces results that cannot be reconciled through simple averaging. Mathison's account of triangulation emphasizes that contradiction and inconsistency can be legitimate outcomes requiring explanatory work Mathison 1988. Relational inquiry provides several candidate sources for such contradiction.

First, evidence can concern different manifestations of the proposed relation. A formal record can indicate legal authority while ethnography shows weak practical compliance. Second, standpoints can differ. An institution can experience a process as efficient while participants experience it as inaccessible. Third, scales can differ. Aggregate stability can coexist with local disruption. Fourth, temporal scopes can differ. Short-term gains can coexist with long-term deterioration. Fifth, measurement

systems can encode different definitions. Sixth, evidence can genuinely support competing substantive explanations within the same scope.

Contradiction analysis should therefore begin by localizing the disagreement. The researcher asks whether the conflicting results concern the same object, relational property, boundary, scale, temporal interval, standpoint, and inferential target. Apparent contradiction often weakens after these dimensions are separated. Remaining contradiction becomes more informative because the locus of incompatibility is clearer.

Definition 7.277 (Contradiction localization)**.** *Contradiction localization* identifies the smallest analytically relevant set of object, manifestation, standpoint, boundary, scale, time, measurement, or inferential assumptions on which two evidential claims remain incompatible.

Localization supports proportionate revision. If contradiction arises from one measurement definition, the measurement layer may require revision. If it persists across multiple measurements but changes with scale, scale specification becomes the likely target. If several partially independent pathways support incompatible mechanisms within the same scope, theoretical or causal revision may be warranted.

Contradictory evidence can also expose unequal epistemic authority. Institutional records can dominate an inquiry because they are easier to quantify or cite, while experiential evidence remains weakly represented. The reverse can also occur when a vivid narrative receives disproportionate weight relative to broader evidence. Triangulation should preserve the provenance and warrant of each pathway rather than resolving disagreement through prestige or rhetorical salience alone.

Proposition 7.278 (Contradiction diagnostic)**.** *When materially contradictory evidential claims concern sufficiently aligned objects, boundaries, scales, temporal scopes, and relational properties, the contradiction provides a reason to examine measurement, access, mechanism, theory, or object specification before forcing synthesis.*

Proposition 7.278 treats contradiction as a possible diagnostic resource. The appropriate response depends on where the disagreement is localized and on the strength and independence of the competing evidential pathways.

7.28.8 Preserving Irreducible Disagreement

Some disagreements can remain after reasonable efforts at clarification, additional evidence collection, remeasurement, boundary revision, and theoretical reconstruction. Preserving such disagreement can be epistemically preferable to producing a synthetic statement whose apparent unity exceeds the available warrant. This follows the broader GRE principle of preserving translation remainders and failed syntheses when heterogeneous representations do not support complete equivalence.

Irreducible disagreement can take several forms. Participants can sustain incompatible interpretations of the same institutional relation. Legal doctrine and lived practice can remain normatively and descriptively misaligned. Historical sources can support more than one plausible reconstruction because crucial traces are missing. Quantitative models can fit the observed data similarly while implying different mechanisms. Cross-cultural concepts can resist complete translation. Competing

scales can disclose structures that cannot be compressed into one scalar summary without substantial loss.

Preservation requires structure. Merely listing several interpretations can obscure which parts are shared and where the disagreement begins. A useful record identifies the common evidence, competing inferential bridges, divergent assumptions, evidence that would discriminate among them, practical consequences of adopting one interpretation, and the conditions under which the disagreement should be reopened.

Definition 7.279 (Irreducible disagreement record)**.** An *irreducible disagreement record* preserves competing relational interpretations together with their shared evidence, divergent evidence, assumptions, inferential bridges, unresolved uncertainties, consequences for downstream claims, and possible conditions for future re-evaluation.

This record supports the open and cumulative research practice developed in Section 164. Future researchers may encounter new archives, methods, scales, or conceptual resources that reorganize the disagreement. Preservation therefore retains future epistemic option value rather than converting present underdetermination into artificial closure.

AI-assisted research strengthens the practical importance of this discipline. Large language models and automated synthesis systems can rapidly produce reconciled summaries from heterogeneous sources. Such synthesis can be useful for orientation, yet it can also smooth over evidential conflict, minority interpretations, scale dependence, missingness, and source asymmetry. A triangulation workflow should therefore preserve source-level disagreement before generating an integrated narrative. AI can help search for corroborating and disconfirming evidence, compare formulations, or detect recurrent discrepancies; responsibility for deciding whether apparent convergence is epistemically warranted remains attached to the research process and its accountable human and institutional participants.

Contingent encounter and aesthetic judgment also have a distinctive role in triangulation. A researcher may notice that two sources "fit too neatly," that one small observation disrupts an otherwise coherent narrative, or that several methods disagree in a patterned way. Such salience can motivate renewed inquiry without serving as proof. The subsequent task is to reconstruct source dependence, missingness, boundary, scale, measurement, and alternative explanations sufficiently to determine whether the perceived pattern survives disciplined comparison.

Proposition 7.280 (Relational triangulation warrant)**.** *A relational claim gains support from triangulation to the extent that the contributing evidential pathways are sufficiently aligned with the target claim, their shared dependencies are understood, relevant differences in standpoint, boundary, scale, and time are preserved, and convergence or disagreement remains traceable to the evidence that generated it.*

Proposition 7.280 provides the section's transition to the next methodological problem. Once heterogeneous evidence has been compared and disagreements have been localized or preserved, relational inquiry still requires criteria for deciding how strongly a claim is warranted. Section 195 therefore turns from triangulation to the validation of relational claims.

7.29 Validation of Relational Claims

The preceding sections developed procedures for specifying relational objects, constructing boundaries and scales, identifying and characterizing relations, reconstructing configurations, working with heterogeneous evidence, measuring relations, analyzing missingness, and triangulating evidential pathways. The role of the present section is to specify how such work supports claims that remain credible under relevant tests, alternative specifications, and changes of evidential standpoint. Its objective is to distinguish several forms of validity and robustness that bear on relational inquiry, to clarify the relation between validation and scope, and to prevent "validated" from becoming a global label attached to a claim after one successful test. The discussion proceeds through construct, historical, and relational validity; boundary, scale, representation, and cross-method robustness; external validity; and the limits of validation.

Validity is treated here as a property of an inference or interpretation within a specified evidential and theoretical configuration. Cronbach and Meehl's classic account of construct validity emphasizes that validation concerns the network of relations connecting theoretical constructs, observations, and expected empirical consequences rather than one isolated correlation Cronbach and Meehl 1955. Messick similarly treats validity as evaluation of the meaning and use of interpretations built from observed performances or measurements Messick 1995. Relational inquiry extends this inferential view because the meaning of a relational claim depends additionally on object specification, boundary, scale, temporal scope, representation, standpoint, and the pathways through which evidence became observable.

Definition 7.281 (Relational validation profile)**.** A *relational validation profile* records a focal relational claim, its evidential basis, construct and historical interpretation, boundary, scale, temporal scope, representation, alternative specifications, disconfirming evidence, cross-method comparisons, transfer domain, remaining uncertainties, and the conditions under which the claim should be revised or reopened.

Definition 7.281 makes validation claim-relative. A relation may be well validated as legally constituted yet weakly validated as practically enacted. A network position may be robust under several graph specifications while the substantive interpretation assigned to that position remains uncertain. A historical continuity claim may be well supported within one periodization while cross-cultural transfer remains weak. The validation profile therefore preserves which dimension of the claim has actually been tested.

Table 7.28 summarizes the validation dimensions developed below.

A relational claim can therefore accumulate support along several dimensions without becoming unrestricted. Validation narrows uncertainty relative to stated alternatives and conditions. It can also expose where a claim remains dependent on a particular boundary, scale, representation, or historical context. Such dependence is often informative because it specifies the domain in which the claim is meaningful.

Table 7.28: Validation dimensions for relational claims

Dimension	Primary question	Typical test	Characteristic caution
Construct validity	Does the representation bear on the intended relational property?	Indicator convergence, discriminant evidence, theoretical consequences	Shared manifestations can create apparent convergence
Historical validity	Does the claim preserve period-specific categories, sequence, and temporal conditions?	Source comparison, periodization sensitivity, category-history reconstruction	Present categories can be projected backward
Relational validity	Does the evidence warrant the proposed relation and its stated properties?	Alternative relation models, source/standpoint comparison, identification audit	Manifestation can be mistaken for relation
Boundary robustness	Does the claim survive plausible changes in the analytical domain?	Boundary expansion/contraction, omitted-relation audit	Stability can depend on excluding consequential external relations
Scale robustness	How does the claim change across relational resolutions?	Multiscale reconstruction, aggregation/disaggregation sensitivity	Scale dependence can be substantive rather than a flaw
Representation robustness	Does the claim depend on one encoding or model family?	Alternative graph, spatial, field, statistical, qualitative, or higher-order representations	Similar outputs can share upstream assumptions
Cross-method robustness	Do heterogeneous methods support compatible dimensions of the claim?	Triangulation, contradiction localization, independent replication	Method agreement can reflect shared sources or categories
External validity	Under which conditions does the claim travel beyond the studied configuration?	Comparative transfer, replication, transportability analysis	Transfer can fail when relational conditions change
Limits of validation	Which uncertainties remain after reasonable testing?	Counterevidence review, scope statement, reopenability criteria	Validation can become rhetorical closure if limits disappear

7.29.1 Construct Validity

Construct validity concerns the relation between the theoretical property invoked by a claim and the manifestations or measures used to represent that property. Section 7.26 distinguished indicators, proxies, composites, relational strength, quality, stability, accessibility, measurement error, and invariance. Validation asks whether the inferential bridge connecting these manifestations to the target property is sufficiently supported for the intended claim.

The problem is especially important in relational inquiry because many relational constructs are multidimensional. Trust, dependence, accessibility, authority, recognition, reciprocity, integration, and relational quality can be manifested through behavior, testimony, legal status, resource flows, institutional routines, or network position. Agreement among several indicators can support a construct interpretation when those indicators arise through sufficiently distinct manifestations. Agreement becomes less informative when several indicators are transformations of the same source or share the same institutional classification.

Construct validation also requires discriminant work. A measure interpreted as authority should be examined against plausible alternatives such as expertise, popularity, formal role, dependence, or communication frequency. A measure interpreted as trust can be compared with compliance, familiarity, repeated interaction, or constrained dependence. This does not require a unique indicator for each concept. It requires a sufficiently explicit account of why the observed manifestation supports one relational interpretation more strongly than relevant alternatives.

Definition 7.282 (Relational construct map)**.** A *relational construct map* records the target relational property, candidate manifestations, indicators or proxies, theoretical expectations, competing constructs, discriminating evidence, measurement transformations, and the boundary, scale, time, and standpoint within which the construct interpretation is intended to hold.

The construct map extends the construct-validity logic of Cronbach and Meehl Cronbach and Meehl 1955 by making relational scope explicit. A behavioral indicator of dependence can have one meaning within a closed organization and another when exit options exist outside the observed boundary. A communication frequency measure can indicate coordination in one institutional setting and surveillance in another. Construct validity therefore depends partly on the surrounding relational configuration.

Messick's emphasis on the interpretation and use of scores also matters here Messick 1995. A construct measure can have adequate descriptive meaning while becoming problematic when used for classification, intervention, or institutional ranking. Chapter 11 will return to this issue in application-dominant praxis. At the research stage, the relevant discipline is to preserve the inferential steps from manifestation to construct and to avoid treating measurement convenience as conceptual adequacy.

7.29.2 Historical Validity

Historical validity concerns whether a relational claim preserves the temporal conditions under which its categories, meanings, institutions, and evidence were produced. Sections 7.8, 7.11, 7.17, and 7.24 showed that relational identity, archival survival, interpretive categories, and temporal sequence can each change through time. A historically valid claim therefore requires more than attaching dates to observations.

One problem is category projection. Terms such as household, employment, citizenship, market, profession, organization, ownership, or welfare can have different institutional meanings across periods. Even when a label persists, the relations organized under that label may change. Conversely, terminology can change while a recognizable relational lineage remains. Historical validation asks whether the categories used in the analysis preserve these changes or silently impose a later classification on earlier evidence.

Periodization is another source of validation pressure. A conclusion can depend on where a historical interval begins or ends. The apparent formation of a relation can move when earlier records are recovered; the apparent stability of an institution can disappear when a longer period is considered; a short reform episode can look discontinuous while a longer trajectory reveals substantial continuity. Historical robustness therefore benefits from plausible alternative periodizations and explicit criteria for selecting among them.

Historical validity also depends on evidential survival. Documentary convergence among surviving sources can reflect a shared archival selection process. Section 7.27 developed missingness profiles for such cases. Validation should therefore distinguish evidence about the historical relation from evidence about the archive through which that relation becomes visible.

Definition 7.283 (Historical validation profile)**.** A *historical validation profile* records periodization, category meanings, temporal identity criteria, source-production dates, survival and archival pathways, alternative historical reconstructions, relevant discontinuities, and the effect of plausible temporal re-specification on the focal relational claim.

Historical validity can remain strong within a bounded period even when longer-term transfer is uncertain. The objective is not to make claims timeless across periods. It is to align the temporal scope of the claim with the temporal organization of the evidence and the categories used to interpret it.

7.29.3 Relational Validity

Relational validity concerns whether the evidence supports the existence, identity, properties, and configuration of the relation actually claimed. This dimension synthesizes the identification and characterization work of Sections 7.6 and 7.7. It is especially important because many datasets record events or co-occurrences that can be represented as edges without establishing the substantive relation attributed to those edges.

A transfer can indicate payment, gift, repayment, redistribution, reimbursement, extortion, or another relation depending on legal, institutional, and interpretive context. A message can indicate collaboration, instruction, reporting, conflict, monitoring, or routine communication. A shared organizational membership can create a potential relation without demonstrating direct interaction. Relational validity therefore asks whether the inferential bridge from manifestation to relation has been tested against plausible alternatives.

The same issue applies to relational properties. Direction, reciprocity, dependence, authority, constraint, enablement, multiplexity, and meaning require distinct evidence. A relation can be securely identified while one of its properties remains uncertain. Validation should preserve that asymmetry rather than assigning a single credibility label to the entire relational profile.

Definition 7.284 (Relational validity matrix)**.** A *relational validity matrix* records, for each claimed relational property, the evidential manifestations, inferential bridge, competing interpretations, supporting and disconfirming evidence, positional and temporal scope, and remaining uncertainty.

The matrix supports differentiated claims. Researchers may conclude that a contractual relation is well established, practical authority is moderately supported, and experiential trust remains uncertain. Such differentiated validation is often more informative than a binary claim that the "relationship" has been validated.

Relational validity also includes negative and absent relations. Section 7.6 distinguished structured prohibition, avoidance, blocking, or exclusion from mere non-observation. Validation of absence requires credible detection conditions, while validation of a negative relation requires evidence for the mechanism organizing the non-connection or opposition.

Proposition 7.285 (Relational claim decomposition)**.** *A relational claim is more amenable to validation when existence, identity, properties, configuration, temporal*

scope, and substantive meaning are evaluated as distinguishable components whose evidential support can differ.

Proposition 7.285 favors analytical decomposition without assuming that the components are independent. Their interactions can become part of the relational explanation.

7.29.4 Boundary Robustness

Boundary robustness examines how a relational claim changes under substantively plausible modifications of the analytical domain. Section 7.4 treated boundaries as question-relative hypotheses about relevance and tractability. Validation therefore asks whether the focal inference depends materially on one boundary choice.

Boundary sensitivity can be tested by expanding the domain to include adjacent actors, external institutions, cross-border flows, informal participants, or infrastructure providers; by contracting the domain to the most directly involved positions; or by altering inclusion rules for uncertain cases. The purpose is not to reward invariance for its own sake. A claim can be boundary-dependent because the underlying phenomenon is genuinely open to external relations.

For example, an organization can appear internally centralized when suppliers, regulators, parent organizations, or digital infrastructures are excluded. A local service network can appear sparse until informal providers are added. A community can appear cohesive under a membership boundary while showing substantial brokerage through nonmembers. Boundary sensitivity can therefore reveal constitutive external relations rather than methodological weakness.

Definition 7.286 (Boundary robustness profile)**.** A *boundary robustness profile* records the baseline boundary, plausible alternative boundaries, newly included or excluded relations, boundary remainders, changes in the focal estimate or interpretation, and the substantive explanation for observed boundary sensitivity or stability.

Boundary robustness supports scoped inference. If a conclusion remains stable across several plausible boundaries, confidence in that conclusion can increase within the tested domain. If the conclusion changes, validation shifts toward explaining which external relations make the difference. Both outcomes can contribute knowledge.

7.29.5 Scale Robustness

Scale robustness asks how a relational claim changes when the phenomenon is represented at different analytical resolutions. Section 7.5 distinguished individual, dyadic, organizational, community, institutional, field, and multiscale inquiry. A claim may remain broadly stable across these resolutions, become more precise at one scale, or reverse when aggregation suppresses heterogeneity.

Scale sensitivity can therefore be evidentially meaningful. An organization can appear stable while team-level relations reorganize rapidly. A national indicator can improve while particular regions deteriorate. An aggregate network can become more connected while some local neighborhoods become more isolated. Such divergence

should not be treated automatically as failed validation. It can reveal scale-specific organization.

Validation requires clarity about which scale carries the claim. A claim about institutional authority may be well supported at the organizational or legal scale even when individual experiences vary. A claim about accessibility can require individual and spatial resolutions because aggregate service provision leaves practical access unresolved. Cross-scale generalization becomes stronger when explicit bridges connect the scales.

Definition 7.287 (Scale robustness profile)**.** A *scale robustness profile* records the focal claim at each examined scale, transformations used to move among scales, cross-scale bridges, scale remainders, convergent and divergent results, and the interpretation assigned to scale dependence.

Scale robustness therefore differs from demanding numerical invariance. The validation question is whether scale dependence is understood sufficiently to support the stated scope of the claim.

7.29.6 Representation Robustness

Representation robustness examines whether a relational conclusion depends on one encoding, model family, measurement system, or formalization. Chapter 4 emphasized that formal or geometric representations can be analytically useful without establishing ultimate ontology. Sections 7.19, 7.20, 7.21, and 7.25 extended this discipline to graphs, higher-order structures, statistical models, and field representations.

The same relational material can be represented as a graph, hypergraph, spatial surface, event sequence, hierarchical model, field map, legal relation, institutional configuration, qualitative process narrative, or mixed representation. These representations preserve different properties. Validation therefore benefits from asking whether the substantive conclusion survives changes in representation that preserve the relational dimensions relevant to the claim.

A pairwise graph can suggest a central broker, while a higher-order representation shows that several apparent dyadic ties belong to one jointly constituted group relation. A latent-space model can reveal stable proximity, while an institutional reconstruction suggests that the proximity arises from a shared administrative constraint. A spatial surface can show a gradient that disappears once accessibility is represented through transport networks rather than Euclidean distance. Such differences are not merely model-selection problems; they can reveal which relational properties the original representation obscured.

Definition 7.288 (Representation robustness audit)**.** A *representation robustness audit* records alternative representations of the focal relational object, the properties each representation preserves or loses, shared assumptions, transformations among representations, changes in the focal claim, and the substantive interpretation of representation-sensitive results.

Representation robustness is strongest when alternative encodings provide genuinely different access to the claim. Running several algorithms on the same graph can be useful, yet the comparison remains narrower than moving between graph,

documentary, spatial, and institutional representations whose error structures and assumptions differ more substantially.

7.29.7 Cross-Method Robustness

Cross-method robustness asks whether a relational claim remains credible when examined through methods with partially distinct access conditions and failure modes. Section 7.28 developed triangulation as structured comparison among documentary, interview, observational, quantitative, historical, and cross-scale evidence. Validation adds a further question: after convergence, complementarity, tension, or contradiction has been identified, what degree of warrant does the combined evidence support?

Cross-method agreement is especially informative when methods differ in source production, measurement, standpoint, and inferential route. A legal record can establish formal authority, ethnography can show its enactment, interviews can reveal perceived dependence, and quantitative records can show patterned decision flows. These methods need not produce identical observations to support compatible parts of a relational claim.

Shared bias remains a central concern. Several methods can rely on the same administrative classifications or population frame. Interview participants can share one institutional narrative. Documentary and quantitative records can both inherit the same reporting rule. Cross-method validation therefore requires the pathway-independence analysis introduced in Section 7.28.

Contradiction can also strengthen validation indirectly by narrowing alternatives. If one interpretation fails under independent observational evidence while another remains compatible with documents, interviews, and temporal sequence, the set of plausible explanations contracts. Conversely, persistent contradiction within aligned scopes can identify a claim that should remain provisional.

Definition 7.289 (Cross-method validation matrix)**.** A *cross-method validation matrix* records the relational dimension examined by each method, evidential pathway, source dependence, principal failure modes, observed convergence or contradiction, alternative explanations, and the effect of each method on the warranted scope of the focal claim.

This matrix gives methodological plurality a cumulative structure while preserving irreducible disagreement where synthesis remains weakly supported.

7.29.8 External Validity

External validity concerns whether a relational claim travels beyond the configuration in which it was initially established. Case-study methodology has long treated generalization as a design problem rather than an automatic consequence of sample size Gerring 2007. Relational inquiry adds that transport depends on whether the relations supporting the original claim remain sufficiently similar in the target setting.

Transfer can occur across populations, organizations, jurisdictions, cultures, historical periods, spatial regions, technological infrastructures, or scales. Similarity in observed variables can be insufficient when institutional rules, network structure,

legal status, language, historical trajectory, or access conditions differ. External validation therefore requires an account of which relational conditions are expected to remain relevant across settings.

A mechanism can travel while its manifestation changes. For example, gatekeeping can occur through formal licensing in one setting and informal brokerage in another. Conversely, similar manifestations can arise through different mechanisms. External validity is therefore strengthened by distinguishing the transferable relational function or mechanism from the local representation through which it becomes visible.

Definition 7.290 (Relational transfer profile)**.** A *relational transfer profile* records the source and target configurations, focal relational mechanism or property, relevant similarities and differences, boundary and scale correspondence, measurement comparability, institutional and historical conditions, expected transfer limits, and evidence obtained in the target setting.

The transfer profile supports graded generalization. A claim can travel strongly across organizations within one institutional regime, moderately across related jurisdictions, and weakly across historically different systems. Such graded external validity is often more informative than a single declaration of generalizability.

AI-assisted research increases both the opportunities and risks of external validation. Large language models and automated retrieval can rapidly surface apparent analogies across domains. Embeddings and similarity measures can identify cases that appear close in a shared representation. These tools can enlarge the encounter surface for comparison, while similarity in representation remains distinct from relational equivalence. Transfer still requires validation of the substantive conditions on which the original inference depended.

7.29.9 Limits of Validation

Validation reduces uncertainty relative to specified alternatives, tests, and scopes. It rarely removes the need for revision. This limitation is especially important for relational inquiry because evidence access, boundaries, scale, historical conditions, representations, and institutional settings can change after a claim has been evaluated.

One limit is open-ended alternatives. Researchers can test prominent competing interpretations without exhausting the space of possible explanations. Another is evidence dependence: additional records, newly accessible archives, changed platforms, improved measurement, or later observations can reorganize the evidential field. A third is reflexivity: publication of a relational claim can alter behavior, classifications, institutional responses, or future observability. A fourth is generativity: Chapter 8 will examine cases in which relations contribute to future structures whose development cannot be fully validated from the present configuration alone.

Validation also has costs. Expanding samples, collecting independent sources, replicating across settings, reconstructing historical categories, or testing alternative representations consumes time, money, attention, and access. The research problem is therefore one of proportionate validation. More consequential claims, broader transfer claims, and stronger causal or normative conclusions generally

warrant more demanding validation than narrow descriptive claims with limited downstream use.

Definition 7.291 (Validation remainder)**.** A *validation remainder* is the set of materially relevant uncertainties, alternative explanations, untested domains, representation dependencies, missing evidence, or transfer conditions that remain after the validation procedures undertaken for a relational claim.

Preserving the validation remainder supports epistemic humility and future re-epistemization. It allows later researchers to distinguish what the original study tested from what it left open. The remainder can also guide replication, additional data collection, or targeted methodological development.

Counterevidence deserves a visible place in this record. A claim that survives several supportive tests can still require revision when high-quality evidence conflicts with its central mechanism or scope. Section 163 treated failure and negative results as resources for proportionate revision. Validation should therefore preserve the possibility that later counterevidence changes the balance of warrant.

Contingent encounter and aesthetic judgment retain a role at this stage. A result can appear unexpectedly elegant, unstable, patterned, or anomalous; a small contradictory case can disrupt an apparently well-validated account; a representation can reveal a structure that previous validation procedures did not anticipate. Such salience can motivate renewed testing while remaining distinct from validation itself. In AI-assisted research, where many robustness checks and alternative models can be generated cheaply, the scarcity increasingly lies in deciding which tests are substantively discriminating and which merely repeat the same assumptions in another technical form.

Proposition 7.292 (Relational validation warrant)**.** *A relational claim gains warrant through validation to the extent that tests bear on the claim's intended construct, historical conditions, relational structure, boundary, scale, representation, methodological pathway, and transfer domain, while materially relevant counterevidence and validation remainders remain visible.*

Proposition 7.292 frames validation as structured exposure to relevant alternatives and failure conditions. The objective is calibrated credibility rather than rhetorical closure. Once a relational claim has been validated to a level proportionate to its intended use, the research process still faces ethical obligations concerning consent, privacy, third-party exposure, representation, classification, and data governance. Section 196 therefore turns from epistemic validation to the ethics of relational inquiry.

7.30 Ethics of Relational Inquiry

The preceding sections developed methods for specifying relational objects, reconstructing configurations, combining heterogeneous evidence, measuring relations, analyzing missingness, triangulating evidence, and validating relational claims. The role of the present section is to examine the ethical conditions under which those methodological capacities may be exercised responsibly. Its objective is to move from an ethics centered primarily on isolated research participants toward an ethics atten-

tive to relations, third parties, institutions, classifications, infrastructures, and downstream uses of research representations. The discussion proceeds through consent, privacy, relational privacy, third-party exposure, vulnerable relations, representational harm, classification harm, data governance, and researcher responsibility. The method is relational and scope-sensitive: established human-subject principles remain important, while the analysis asks what additional ethical problems appear when data and claims concern relations among persons, organizations, communities, and institutions.

Research ethics has long emphasized respect for persons, beneficence, justice, informed consent, risk–benefit assessment, and equitable selection of participants. The Belmont Report remains a prominent articulation of these principles in human-subject research National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research 1979. Relational inquiry retains these commitments while introducing a recurrent complication: information supplied by one participant can reveal, classify, or alter the visibility of another person or group that did not directly participate in the research. A network edge, family relation, organizational tie, legal status, interview narrative, correspondence archive, geolocation trace, or relational inference may therefore distribute ethical consequences beyond the individual from whom the evidence was obtained.

Definition 7.293 (Relational ethics profile)**.** A *relational ethics profile* records the research object, participating and non-participating affected positions, consent conditions, informational flows, relational privacy risks, vulnerable relations, possible representational and classification harms, data-governance arrangements, anticipated downstream uses, mitigation procedures, and the allocation of research responsibility across the inquiry lifecycle.

Definition 7.293 places ethics within research design from the outset and extends it beyond final-stage compliance review. Ethical assessment can influence which relations are collected, which identifiers are retained, which representations are published, how uncertainty is communicated, and which forms of reproducibility are appropriate. It can also affect whether a technically informative analysis is worth performing when the foreseeable exposure or misuse risk exceeds the epistemic gain.

Table 7.29 summarizes the ethical dimensions developed below.

The table emphasizes that relational ethics concerns both research procedure and the representations produced by research. A relation can become ethically consequential through collection, inference, publication, classification, or later institutional reuse. These stages may involve different affected parties and therefore different safeguards.

7.30.1 Consent

Consent in relational inquiry concerns participation in research and the foreseeable relational scope of the evidence contributed. The Belmont tradition treats informed consent through information, comprehension, and voluntariness National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research 1979. Relational inquiry adds a scope problem: a participant may knowingly contribute information about personal experience while the resulting dataset also per-

Table 7.29: Ethical dimensions of relational inquiry

Dimension	Primary ethical object	Characteristic risk	Methodological response
Consent	Participation and use of contributed evidence	Scope expansion beyond what participants understood	Layered consent and scope review
Privacy	Information about identifiable positions	Inappropriate collection, linkage, disclosure, or reuse	Context-sensitive information-flow assessment
Relational privacy	Information contained in ties and configurations	Exposure of one position through another's data	Relation-level disclosure analysis
Third-party exposure	Non-participating affected positions	Inference about people or groups outside the consent process	Third-party risk mapping and minimization
Vulnerable relations	Relations with asymmetric exit, dependence, or exposure	Coercion, retaliation, amplified dependency, or unsafe disclosure	Relation-sensitive safeguards and access controls
Representational harm	Published accounts, models, narratives, and visualizations	Stigmatization, distortion, decontextualization, or identity reduction	Context preservation, uncertainty, and contestability
Classification harm	Categories, labels, scores, and inferred types	Misclassification, reification, exclusion, or institutional reuse	Classification provenance and downstream-use review
Data governance	Custody, access, retention, linkage, and reuse	Secondary exposure or use beyond justified scope	Stewardship, role-based access, retention and reuse rules
Researcher responsibility	Decisions across the research lifecycle	Diffused accountability under collaborative or AI-assisted inquiry	Traceable decision authority and revision obligations

mits inference about colleagues, relatives, organizations, communities, or interaction partners.

A consent procedure should therefore describe the research operation at a level appropriate to the likely consequences of participation. For a conventional interview this may include recording, transcription, quotation, and archival retention. For relational research it can also include linkage, network reconstruction, inference about interaction partners, combination with administrative data, longitudinal reuse, or publication of structural patterns. The ethical significance of these possibilities depends on identifiability, sensitivity, context, research purpose, and downstream access.

Definition 7.294 (Relational consent scope)**.** A *relational consent scope* specifies the forms of participation, evidence contribution, linkage, relational inference, reuse, dissemination, and foreseeable third-party implication that a participant is being asked to authorize within a defined research setting.

The definition limits consent to the participant's own authorization and identifies where additional ethical review is required for information concerning other people mentioned in the account. In network or household research, for example, one person's nomination of another can generate information about the nominated position without creating consent on that person's behalf.

Consent can also require temporal review. A dataset collected for one relational question can later support substantially different inferences when linked with new sources or analyzed with more capable models. A research team can therefore maintain a *consent-to-inference map* that records which analytical operations were reasonably within the original consent scope and which later operations introduce new ethical exposure. Re-consent, additional review, aggregation, de-identification, or a narrower research design may be appropriate when the inferential scope changes

materially.

Voluntariness is itself relational. A formal option to decline can coexist with dependence on an employer, school, care provider, gatekeeper, research sponsor, or community authority. Consent assessment should therefore examine whether the surrounding relation alters the practical cost of refusal. This becomes especially important where participation occurs inside hierarchical institutions or where participants reasonably believe that refusal could affect access, status, evaluation, or future opportunities.

7.30.2 Privacy

Privacy in relational inquiry concerns the appropriateness of information flows across research contexts. It includes secrecy and confidentiality in some settings, while extending beyond them. Nissenbaum's contextual-integrity framework analyzes privacy through social context, actors, information types, and transmission principles, thereby treating appropriate information flow as context-sensitive Nissenbaum 2010. This perspective is particularly useful for relational research because the ethical significance of the same datum can change when it moves between contexts or is linked with other information.

A public record, for example, may be legally accessible while large-scale aggregation, cross-dataset linkage, or inference about social relations creates a materially different informational flow. An organizational roster may be routine within an institution yet become sensitive when combined with communication logs and performance records. A location trace may appear mundane at one temporal resolution while repeated observations reveal patterns of association, residence, worship, health care, work, or political activity. Ethical analysis therefore benefits from examining transformations in informational meaning alongside the limited distinctions available from a public/private binary.

Definition 7.295 (Relational privacy context)**.** A *relational privacy context* records the relevant actors, information types, relational inferences, original and proposed recipients, transmission conditions, institutional norms, temporal scope, and the values or legitimate purposes that structure an information flow.

The privacy context provides a bridge between data governance and substantive relational interpretation. It can reveal that a technically permissible transformation changes who can know what about whom, at what granularity, and for which purpose. It can also expose situations in which de-identification at the record level leaves a relational configuration readily recognizable to insiders.

Privacy risk should therefore be assessed after plausible linkage and inference, not only at the moment of raw-data collection. This is especially relevant for small communities, rare institutional positions, distinctive relational configurations, or longitudinal records where identity can emerge from structure even after conventional identifiers are removed.

7.30.3 Relational Privacy

Relational privacy concerns information whose ethical significance resides partly in the connection among positions. A relation can be sensitive even when information about each endpoint is individually mundane. Co-membership, communication, kinship, financial exchange, professional collaboration, care, conflict, mobility, or repeated co-location can expose affiliations and dependencies that participants would reasonably treat differently from isolated attributes.

This creates a unit-of-protection problem. Conventional privacy procedures often focus on records associated with an identifiable individual. Relational data require attention to dyads, groups, configurations, and positions whose disclosure may affect several parties simultaneously. A published network can identify a broker, isolated participant, coalition, peripheral subgroup, or gatekeeping organization even when names are replaced by pseudonyms.

Definition 7.296 (Relational privacy unit)**.** A *relational privacy unit* is the smallest relational object whose disclosure, linkage, or inference is ethically relevant to the research question, such as a dyad, group membership, higher-order relation, configuration, trajectory, or position within a field.

The privacy unit should be matched to the representation. Dyadic data may require edge protection; higher-order data may require protection of group membership; temporal data may require trajectory protection; field analysis may require care around identifiable positions even when individual attributes are suppressed. This approach also helps researchers evaluate whether aggregation genuinely reduces exposure or merely relocates it.

Relational privacy can create tensions with reproducibility. Full release of an edge list, event history, or linked archive may permit independent analysis while also enabling re-identification or disclosure of sensitive connections. Reproducibility can therefore be pursued through controlled-access data, synthetic representations, code release, disclosure-controlled aggregates, secure enclaves, preregistered transformations, or other governance arrangements that preserve methodological transparency without requiring unrestricted disclosure of sensitive relations.

7.30.4 Third-Party Exposure

Third-party exposure arises when research about participating positions produces information about people, groups, or institutions that did not directly enter the research process. Relational inquiry makes this problem especially visible because one participant's evidence often contains information about others. Interviews describe colleagues and family members; communication logs contain senders and recipients; organizational documents identify decision makers; mobility traces reveal co-presence; network nominations reveal uncontacted alters.

The ethical issue depends on the nature and consequence of the exposure. Mentioning a public institutional role can pose little additional risk in one study, while inferring a stigmatized affiliation, hidden dependency, or interpersonal conflict can create substantial risk in another. The appropriate unit of review is therefore the third-party claim, its evidential pathway, and its foreseeable consequence; the mere

presence of another person in the data provides insufficient ethical differentiation.

Definition 7.297 (Third-party exposure map)**.** A *third-party exposure map* records non-participating positions about which the research can generate identifiable or consequential information, the evidential pathway producing that information, its sensitivity, likelihood of recognition, plausible downstream recipients, and available risk-reduction measures.

The map is particularly useful for AI-assisted relational extraction. A model can identify names, co-occurrence patterns, likely affiliations, latent communities, or predicted ties from materials originally collected for a narrower purpose. The speed of inference can make third-party exposure easy to overlook because the affected positions did not directly participate in the research interaction. Ethical review should therefore include the inferential products of analysis, not only the raw inputs supplied by participants.

Third-party considerations also interact with publication. A richly described case can be scientifically valuable while allowing insiders to identify people or organizations from contextual clues. Researchers may need to alter detail, aggregate relations, delay disclosure, negotiate quotation, or retain sensitive findings in a controlled archive. Such decisions should preserve the integrity of the analysis as far as feasible while making the reason for non-disclosure traceable in the research record.

7.30.5 Vulnerable Relations

Vulnerability in relational inquiry can arise from the characteristics or circumstances of persons and from the structure of the relation in which they are embedded. The Belmont Report recognizes the need for additional protection where autonomy is limited or vulnerability affects the ethical justification of participation National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research 1979. A relational approach adds attention to dependence, exit costs, authority, resource asymmetry, secrecy, exposure, and the consequences of disclosure within a specific relation.

A participant can possess substantial decision-making capacity while remaining vulnerable within an employment, migration, care, debt, housing, educational, familial, or organizational relation. Disclosure may therefore carry asymmetric consequences. The researcher should examine who can sanction whom, who controls access to resources, who bears the cost of exposure, and whether research participation changes those relations.

Definition 7.298 (Relational vulnerability profile)**.** A *relational vulnerability profile* records the relevant dependence, authority, exit conditions, resource asymmetries, exposure pathways, retaliation risks, confidentiality constraints, and protective capacities that shape a participant's or third party's vulnerability within the research setting.

The profile avoids treating vulnerability as a permanent identity label. Vulnerability can vary across relations and over time. The same person may hold substantial authority in one domain and face strong dependence in another. Ethical safeguards can therefore be calibrated to the relational pathway through which harm could oc-

cur.

Vulnerable relations also affect sampling and interpretation. Highly dependent or exposed participants may be less able to participate, less willing to speak openly, or more likely to use indirect language. Their underrepresentation can generate epistemic as well as ethical consequences. Protecting participants and improving relational validity can therefore align when safer research conditions enable previously suppressed evidence to become available.

7.30.6 Representational Harm

Representational harm concerns consequences produced by the way research describes, visualizes, models, quotes, or narrates people and relations. A representation can be empirically grounded while still compressing a person or group into one salient relation, reproducing a stigmatizing narrative, erasing internal disagreement, or presenting a historically contingent classification as an enduring identity. These risks are especially relevant in relational research because diagrams and network visualizations can make structural positions appear definitive and intuitively self-explanatory.

Representational ethics therefore concerns both accuracy and consequence. An accurate statement can be misleading when detached from its boundary, scale, time, uncertainty, or institutional context. A centrality score can become a public label of influence; a cluster can become a presumed community; a legal classification can become an attributed identity; a historical relation can be narrated as continuous despite substantial transformation.

Definition 7.299 (Representational harm profile)**.** A *representational harm profile* records the research representation, affected positions, salient simplifications, uncertainty, plausible misreadings, foreseeable institutional or public uses, contestability mechanisms, and available contextual safeguards.

The profile encourages researchers to ask how a representation may travel beyond the immediate scholarly argument. A figure designed to communicate one structural feature can be reproduced in media, policy documents, litigation, organizational evaluation, or automated decision systems with much weaker contextual qualification. The ethical burden therefore includes reasonable anticipation of high-consequence reinterpretation where such reuse is foreseeable.

Fricker's account of epistemic injustice provides one useful perspective on unequal credibility and unequal participation in meaning-making Fricker 2007. Relational research can compound these inequalities when participants with limited institutional voice are represented through categories or interpretations they have little opportunity to contest. Contestability, participant checking where appropriate, alternative interpretations, and careful disclosure of uncertainty can reduce this risk without converting participant agreement into the sole criterion of validity.

7.30.7 Classification Harm

Classification harm arises when research categories, inferred types, scores, clusters, or labels shape visibility and treatment in ways that exceed their evidential scope.

Bowker and Star show how classifications and standards organize information infrastructures and social interaction Bowker and Star 1999. In relational inquiry, classification can also alter the relations under study by changing who is recognized, compared, prioritized, investigated, funded, sanctioned, or excluded.

The ethical problem becomes more consequential when classifications move from description into institutional action. A research-generated label such as "high risk," "peripheral," "uncooperative," "influential," "vulnerable," or "low trust" can acquire administrative force when incorporated into organizational or policy systems. A category originally designed for one analytical purpose can then be reinterpreted as a stable property of a person, community, or institution.

Definition 7.300 (Classification consequence profile)**.** A *classification consequence profile* records the category or score, construction procedure, evidential scope, affected positions, uncertainty, decision contexts in which reuse is plausible, potential feedback effects, contestability, and procedures for revision or withdrawal.

Classification feedback deserves particular attention in generative relational research. Once a category enters an institutional process, actors may respond to it, resources may be redistributed, expectations may change, and future data may reflect the classification's effects. Later researchers can then mistake a classification-induced pattern for confirmation of the original category. Preserving the timing and institutional use of classifications helps distinguish descriptive evidence from consequences partly generated by the measurement or classification system itself.

AI-assisted classification intensifies this issue by lowering the cost of generating inferred categories at scale. Ethical review should therefore consider whether a model-generated classification is necessary to the research question, how its error and uncertainty are represented, and whether storing the classification creates downstream risks disproportionate to its epistemic contribution.

7.30.8 Data Governance

Data governance concerns the rules, responsibilities, and infrastructures through which relational evidence is collected, stored, linked, accessed, transformed, retained, shared, and deleted. Relational datasets can retain sensitivity after conventional identifiers are removed because structure, rare positions, temporal trajectories, and combinations of attributes can support re-identification. Governance should therefore address relational disclosure as well as record-level confidentiality.

A relational data-governance plan can specify stewardship roles, permitted analyses, linkage rules, access tiers, retention periods, disclosure review, version history, incident response, and conditions for secondary use. These provisions are especially important for collaborative research in which several institutions, contractors, or AI systems participate in data processing. Responsibility should remain traceable across transfers even when technical complexity distributes the work across several systems and institutions.

Definition 7.301 (Relational data-governance profile)**.** A *relational data-governance profile* records data custodians, authorized roles, relational sensitivity, linkage permissions, transformation history, storage and access controls, retention and deletion

rules, secondary-use conditions, disclosure procedures, and mechanisms for audit, correction, and incident response.

Privacy as contextual integrity is useful here because governance concerns the appropriateness, purpose, and recipients of information flows in addition to the quantity of information Nissenbaum 2010. A dataset can be secure against external access while still being used internally for a purpose inconsistent with the context in which the evidence was contributed. Governance therefore needs both technical security and purpose-sensitive rules.

Open and cumulative research, developed in Section 164, can coexist with controlled access. Reproducibility may be supported through code, schemas, synthetic data, secure access environments, transformation logs, or qualified replication agreements when unrestricted relational data release would create disproportionate exposure. Ethical openness concerns reconstructability and accountable access. Maximal public disclosure is one possible transparency mechanism among several, and it can be inappropriate for sensitive relational evidence.

7.30.9 Researcher Responsibility

Researcher responsibility integrates the preceding ethical dimensions across the lifecycle of inquiry. Responsibility includes choices about object specification, boundary, scale, recruitment, consent, representation, classification, model selection, data governance, publication, and revision. It also includes decisions about which technically feasible analyses deserve to be performed and which outputs should remain controlled because their foreseeable harms outweigh their contribution to the stated research purpose.

Relational inquiry can distribute agency across research teams, institutions, infrastructures, funders, data providers, software systems, and AI models. Distributed cognition does not eliminate the need for accountable decision authority. Section 160 developed this issue for AI-assisted research, and Section 161 extended it to heterogeneous research collectives. Ethical practice therefore benefits from identifying who authorizes consequential transformations, who reviews disclosure, who can correct an error, and who remains responsible for the published claim.

Definition 7.302 (Research responsibility chain)**.** A *research responsibility chain* records consequential decisions across the research lifecycle, the persons or institutions authorized to make them, the evidence and ethical considerations available at the time, downstream dependencies, review points, and procedures for correction or withdrawal when later information changes the ethical assessment.

The responsibility chain also supports epistemic humility. Researchers can document why a decision appeared proportionate under the available evidence without implying that the decision is beyond later revision. New information about reidentification risk, participant expectations, institutional misuse, historical context, or model error can justify reopening an earlier ethical judgment.

Contingent encounter and aesthetic judgment have an ethical dimension as well. A surprising field encounter, archival trace, unexplained silence, unusual network pattern, or AI-generated association may make a new relation salient. Curiosity can

appropriately motivate investigation, while salience alone does not establish ethical permission to pursue, expose, or publish the relation. The passage from encounter to research object therefore includes an ethical judgment about proportionality, vulnerability, privacy, and downstream consequence in addition to epistemic judgment about plausibility and significance.

Proposition 7.303 (Relational ethical adequacy)**.** *A relational inquiry becomes ethically better grounded to the extent that its consent scope, informational flows, third-party implications, vulnerable relations, representational and classification consequences, data governance, and responsibility chain remain aligned with the evidential purpose and foreseeable consequences of the study, while material uncertainties and revision conditions remain visible.*

Proposition 7.303 is intentionally procedural and leaves substantive ethical judgment open to context-specific requirements. Ethical adequacy depends on substantive context, applicable law, institutional review requirements, community norms, and the evolving consequences of research technologies. The proposition therefore provides a structure for disciplined judgment whose application remains dependent on the specific research context.

The methodological consequence of this section is that ethics belongs inside relational inquiry. Object specification determines who becomes visible; boundaries determine who is omitted; measurement and classification create representations that can travel; publication changes informational access; and AI increases the speed at which new relational inferences can be generated. Section 197 therefore turns next to reporting practices that make these analytical and ethical decisions explicit, reproducible where appropriate, and open to later reinterpretation.

7.31 Reporting Relational Inquiry

The preceding sections developed a relational methodology for specifying research objects, constructing boundaries and scales, identifying and characterizing relations, reconstructing configurations, combining heterogeneous evidence, quantifying uncertainty, validating claims, and governing ethical consequences. The role of the present section is to translate those methodological commitments into a reporting architecture that permits readers and later researchers to reconstruct how a relational claim was produced. Its objective is to make boundary, scale, representation, assumptions, uncertainty, alternative models, provenance, reproducibility, and reinterpretability visible in the research record. The discussion proceeds through these nine dimensions and treats reporting as an integral component of epistemic accountability across the research lifecycle. The method is claim-relative and ethically constrained: the degree of disclosure should be sufficient for assessment and cumulative inquiry while remaining proportionate to privacy, legal, security, stewardship, and third-party obligations developed in Section 7.30.

Relational claims are especially vulnerable to compression during reporting. A published graph can omit the decisions by which nodes and edges were constructed; a regression coefficient can hide the boundary, exposure mapping, dependence assumptions, or missingness process; an institutional description can present formal

Table 7.30: Reporting dimensions for relational inquiry

Dimension	Reported object	Characteristic opacity	Reporting practice
Boundary	Inclusion, exclusion, permeability, and remainder	Apparent closure of the relational domain	State boundary rule, exclusions, and sensitivity
Scale	Analytical resolution and cross-scale bridge	Transfer across levels without justification	State focal scale and aggregation/decomposition logic
Representation	Graph, field, statistical, legal, historical, qualitative, or other form	Representation mistaken for the relation itself	State preserved and suppressed properties
Assumptions	Material inferential and operational commitments	Hidden conditions supporting the claim	Record assumption, role, evidence, and sensitivity
Uncertainty	Evidential, model, boundary, scale, temporal, and interpretive uncertainty	Precision interpreted too broadly	Disaggregate material uncertainty sources
Alternative models	Plausible competing relational specifications	One convenient model presented as uniquely implied	Report alternatives and discriminating evidence
Provenance	Source, custody, transformation, linkage, and analytical history	Claim detached from evidential trajectory	Preserve source-to-claim transformation chain
Reproducibility	Recoverability of analytical operations	Weak independent reconstruction	Provide code, specifications, environments, or controlled reconstruction routes
Reinterpretability	Capacity for later re-analysis under new concepts or questions	Published conclusion becomes the only surviving epistemic object	Preserve recoverable evidence, versions, context, and interpretive remainder

rules without the evidence concerning enacted practice; an archival interpretation can conceal the record-survival pathway on which it depends. Concise presentation is often necessary, yet compression becomes epistemically costly when it removes information required to understand what the claim means, where it applies, or how it might be challenged.

Definition 7.304 (Relational reporting profile)**.** A *relational reporting profile* records the research object, boundary, scale, representation, material assumptions, uncertainty structure, alternative relational models, evidential and analytical provenance, reproducibility conditions, reinterpretability conditions, and relevant ethical or access constraints associated with a reported relational claim.

Definition 7.304 provides a reporting counterpart to the methodological profiles developed throughout this chapter. Its purpose is not to maximize documentation indiscriminately. The relevant standard is whether a reader can recover the inferential architecture of the claim and identify which changes in object specification, boundary, scale, representation, evidence, or assumptions could alter its interpretation.

Table 7.30 summarizes the dimensions developed below.

The dimensions in Table 7.30 are interdependent. Boundary and scale shape what enters the representation; representation and assumptions shape the inferential operation; uncertainty and alternative models delimit warrant; provenance supports reconstruction; reproducibility tests recoverability of the analytical procedure; reinterpretability preserves future epistemic option value when later researchers ask different questions of the same evidence.

7.31.1 Explicit Boundary

Boundary reporting states which positions, relations, institutions, places, time intervals, records, or interaction types are treated as internal to the focal analysis and which remain outside it. Section 7.4 developed boundary construction as a question-relative methodological operation. Reporting should therefore preserve the boundary rule itself and make clear that the extent of the resulting dataset or case corpus follows from that rule.

An explicit boundary statement can identify inclusion and exclusion criteria, permeability, external relations retained as contextual conditions, and the boundary remainder. In network inquiry this can include roster construction, relation-type inclusion, and treatment of external nodes. In archival inquiry it can include collections searched, restricted holdings, languages, date ranges, and finding systems. In institutional research it can distinguish formal membership from effective relational reach. In spatial inquiry it can record whether the domain follows administrative territory, travel-time accessibility, infrastructural connectivity, or another spatial criterion.

Boundary reporting also benefits from explaining why the chosen boundary is adequate for the claim. A study may intentionally restrict itself to one organization even when relevant relations extend beyond it. Such restriction can remain methodologically defensible when the claim is correspondingly local and external relations are preserved as potential remainders. Difficulty arises when the reported conclusion silently expands beyond the boundary that generated the evidence.

Definition 7.305 (Boundary reporting statement)**.** A *boundary reporting statement* records the focal analytical domain, inclusion and exclusion criteria, permeability assumptions, materially relevant external relations, boundary remainders, and the sensitivity of the reported claim to plausible alternative boundaries.

Definition 7.305 makes boundary sensitivity reportable without requiring an exhaustive enumeration of everything outside the study. The objective is to preserve exclusions that could materially alter interpretation, transfer, or causal inference.

7.31.2 Explicit Scale

Scale reporting identifies the resolution at which entities, relations, configurations, and temporal processes are represented. Section 7.5 showed that scale selection can change which relational properties become visible. A report should therefore state whether the analysis operates primarily at individual, dyadic, organizational, community, institutional, field, regional, transnational, or another substantively defined scale, together with the transformations used to move among scales.

This is especially important when aggregation creates new analytical objects. An organizational average does not preserve each interpersonal relation inside the organization; a regional accessibility surface does not preserve each person's mobility constraints; an institution-level network does not preserve the full set of within-institution ties. Conversely, decomposing an institution into individual observations can suppress authority, routine, memory, or legal competence that exists at a coarser level of organization.

A scale report should identify cross-scale bridges when the argument moves from

one resolution to another. If an individual-level behavioral pattern is interpreted as an institutional effect, the evidential pathway connecting institutional organization to individual experience should be visible. If an organizational pattern is used to support a claim about a transnational field, the aggregation and transfer logic should be reported. Scale dependence can then become a substantive finding whose analytical consequences remain visible.

Definition 7.306 (Scale reporting statement)**.** A *scale reporting statement* records the focal analytical resolution, aggregation and decomposition rules, cross-scale bridges, scale remainders, temporal resolution where relevant, and the observed sensitivity of the claim to plausible alternative scales.

Such reporting is particularly important for multiscale and fast–slow inquiry developed later in the book. It allows later researchers to distinguish a change in the phenomenon from a change produced by the resolution at which the phenomenon was represented.

7.31.3 Explicit Representation

Relational inquiry can represent the same research object through graphs, matrices, fields, statistical models, institutional maps, legal-position structures, historical narratives, spatial surfaces, higher-order structures, or qualitative configurations. Each representation preserves some properties more directly than others. Section 7.29 therefore treated representation robustness as one dimension of validation. Reporting should make the representational choice and its consequences explicit.

A graph report can state node and edge semantics, direction, weighting, temporal aggregation, and whether higher-order relations were projected into pairwise form. A statistical report can identify the observation structure, estimand, dependence model, and meaning assigned to latent variables or random effects. A field-based report can identify the relational coordinate and evidence supporting distributed organization. A legal reconstruction can distinguish formal status, institutional interpretation, and enacted practice. A qualitative configuration can state how cases, relations, and interpretive categories were constructed from field materials.

Definition 7.307 (Representation disclosure)**.** A *representation disclosure* records the formal or interpretive representation used for a relational claim, the properties it is intended to preserve, transformations applied to the underlying evidence, properties known to be suppressed or approximated, and the substantive bridge from representation to interpretation.

The representation disclosure supports ontological restraint. A latent coordinate, graph edge, field gradient, institutional category, or historical periodization can be analytically productive without being presented as exhaustive ontology. It also supports comparison among alternative representations because readers can identify whether two apparently different results arise from different evidence, different transformations, or different representational commitments.

7.31.4 Explicit Assumptions

Relational claims depend on assumptions that can arise at several stages of inquiry. Some concern measurement: a proxy is assumed to track a target property. Some concern missingness: unobserved relations are assumed to follow a specified mechanism. Some concern causality: exposure mappings, interference pathways, exclusion restrictions, or temporal ordering support an estimand. Others concern history, institutional identity, legal continuity, network boundaries, or cross-cultural comparability.

Reporting assumptions is therefore broader than listing the conditions of a statistical estimator. The relevant assumptions are those whose failure could materially alter the relational claim. A historical analysis might depend on the assumption that two archives record comparable institutional categories. A network analysis might depend on the assumption that a communication record provides an adequate indicator of a specified relation. An interview comparison might depend on sufficient comparability of elicitation conditions. A multiscale analysis might depend on a proposed bridge between organizational and institutional levels.

Definition 7.308 (Relational assumption register)**.** A *relational assumption register* records the material assumptions supporting a claim, the stage of inquiry at which each assumption operates, its evidential or theoretical basis, plausible failure modes, available diagnostics or sensitivity analyses, and the consequences of failure for the reported conclusion.

The register can distinguish operational assumptions from theoretical assumptions and strong assumptions from approximations introduced for tractability. This distinction helps readers assess where additional evidence would most improve the claim. It also reduces a recurrent problem in AI-assisted analysis, where software can execute a technically valid procedure while leaving the substantive assumptions that justify its use weakly articulated.

7.31.5 Explicit Uncertainty

Uncertainty reporting should preserve the heterogeneous sources of uncertainty developed throughout this chapter. Sampling error, parameter uncertainty, measurement error, missing relations, boundary uncertainty, scale uncertainty, temporal identity, interpretation, model specification, archival survival, representation choice, and ethical access restrictions can each affect a relational claim. Compressing these sources into a single confidence interval or verbal qualifier can conceal which part of the inference remains uncertain.

The relational uncertainty envelope introduced in Section 7.21 provides one model for reporting. It can be adapted to qualitative and historical inquiry by recording uncertainty about source interpretation, identity continuity, missing evidence, periodization, and competing explanations. Uncertainty can also be asymmetric: evidence may strongly support the existence of a relation while leaving its intensity, direction, or mechanism less secure.

Definition 7.309 (Relational uncertainty statement)**.** A *relational uncertainty statement* separates materially relevant sources of uncertainty, indicates which compo-

nents are quantified and which remain qualitative or interval-based, states how uncertainty affects the scope or strength of the claim, and preserves unresolved dependencies among uncertainty sources when they matter to interpretation.

Explicit uncertainty supports the epistemic humility principle adopted for this project. It permits precise claims where evidence is strong while keeping other dimensions provisional. It also helps distinguish substantive instability from weak observation. A relation can vary strongly through time and still be measured with relatively low uncertainty, while an apparently stable estimate can rest on substantial uncertainty about boundaries, missingness, or construct meaning.

7.31.6 Alternative Relational Models

Reporting a single relational model can give the impression that the evidence uniquely determines one representation or explanation. In many inquiries, several plausible specifications remain available. A social configuration can be represented as a network, a higher-order structure, an institutional arrangement, or a field; a temporal trajectory can admit several periodizations; an observed association can be consistent with influence, selection, shared environment, or measurement structure; a legal relation can have several plausible interpretations under contested doctrine or institutional practice.

Alternative-model reporting does not require presenting an unlimited set of possibilities. It requires preserving alternatives that are substantively plausible and materially consequential for the claim. These alternatives can be compared through fit, predictive performance, historical evidence, triangulation, sensitivity analysis, interpretive coherence, mechanism evidence, or another criterion appropriate to the method.

Definition 7.310 (Alternative relational model record)**.** An *alternative relational model record* documents substantively plausible competing specifications, the evidence each preserves or explains, their principal assumptions, discriminating evidence, differences in downstream conclusions, and the reasons for retaining, revising, or setting aside each model.

This record connects directly to the validation remainder developed in Section 7.29. A preferred model can be reported clearly while unresolved alternatives remain visible. Model abundance under AI-assisted research makes this discipline increasingly consequential because generating additional specifications is becoming inexpensive while the evidential task of distinguishing among them remains demanding.

7.31.7 Provenance

Provenance connects a published relational claim to the evidence and transformations through which it was produced. Documentary provenance in Section 7.10, archival provenance in Section 7.11, reflexive field-note chains in Section 7.12, and research audit trails in Chapter 6 each addressed parts of this problem. Reporting relational inquiry requires these local provenance practices to be connected to the final analytical output.

A provenance chain can include source production, custody, collection, sampling,

transcription, translation, cleaning, linkage, entity resolution, coding, aggregation, model fitting, visualization, interpretation, and revision. For AI-assisted work it can additionally record model-assisted extraction, summarization, classification, translation, coding suggestions, or synthetic transformations where these operations materially affect the reported claim. Provenance does not require preservation of sensitive content in an unrestricted repository. It requires sufficient recoverability of the transformations that matter to assessment, subject to ethical and legal constraints.

Definition 7.311 (Relational claim provenance chain)**.** A *relational claim provenance chain* records the evidential sources, custody or access conditions, material transformations, linkage and coding operations, analytical procedures, version history, interpretive decisions, and responsible actors through which a relational claim moved from manifestation to reported conclusion.

The FAIR principles emphasize findability, accessibility, interoperability, and reusability while treating rich metadata and provenance as important conditions for later reuse Wilkinson et al. 2016. For relational inquiry, provenance additionally helps later researchers distinguish changes in source material from changes in object specification, representation, or interpretation. This distinction is essential when research is re-epistemized under later methods or concepts.

7.31.8 Reproducibility

Reproducibility concerns whether the analytical operations supporting a reported result can be reconstructed with sufficient fidelity to evaluate the result. Open-research initiatives emphasize transparent methods, materials, data practices, and replication as institutional supports for cumulative inquiry Nosek et al. 2015; Open Science Collaboration 2015. Relational inquiry retains these goals while requiring attention to data sensitivity, changing relational systems, proprietary infrastructures, and historically unique evidence.

Reproducibility can therefore take several forms. Computational work can preserve code, software versions, random seeds, model specifications, preprocessing rules, and dependency environments. Qualitative research can preserve coding procedures, sampling logic, interview protocols, interpretive memos, and traceable evidence excerpts where disclosure is appropriate. Archival and historical research can document collections, finding aids, search strategies, record identifiers, exclusions, and interpretive transformations. Sensitive relational datasets can support reconstruction through secure environments, controlled access, synthetic examples, disclosure-limited extracts, or qualified replication arrangements.

Definition 7.312 (Relational reproducibility package)**.** A *relational reproducibility package* contains the materials and access instructions required to reconstruct the material analytical operations supporting a relational claim, including specifications, transformation rules, code or procedural descriptions, version information, and ethically appropriate routes to the underlying evidence.

Datasheet-style documentation provides one useful precedent for making dataset motivation, composition, collection process, uses, and limitations visible Gebru et al. 2021. The relational reproducibility package extends this logic from datasets to the complete evidence-to-claim pathway. Its adequacy is claim-relative: a descriptive

graph, historical interpretation, causal estimate, and legal-institutional reconstruction require different forms of reconstruction.

Reproducibility also has temporal limits. Platforms change, APIs close, institutions reorganize, archives are reclassified, and software dependencies disappear. Reporting should therefore distinguish reproducibility of an analytical operation from literal recreation of the historical research environment. Preservation of versions, snapshots, schemas, documentation, and provenance can retain substantial reconstructability even when the original environment is not recoverable exactly.

7.31.9 Reinterpretability

Reinterpretability concerns the capacity of later researchers to revisit evidence under different concepts, methods, questions, or historical knowledge. Chapter 6 treated preservation and re-epistemization as conditions of cumulative research. Relational reporting should therefore preserve more than the shortest route needed to reproduce the author's preferred conclusion. It should retain enough of the evidential and interpretive structure for later inquiry to ask questions that were not anticipated when the study was conducted.

Reinterpretability is distinct from reproducibility. Reproducibility asks whether a reported analytical pathway can be reconstructed. Reinterpretability asks whether the preserved research record permits a different warranted pathway to be explored. A code repository can support reproducibility while offering little reinterpretability if the underlying categories, exclusions, source context, and discarded alternatives are unavailable. Conversely, a richly documented historical archive can support reinterpretation even when the exact computational environment of the original study is no longer recoverable.

Definition 7.313 (Reinterpretability profile)**.** A *reinterpretability profile* records which evidential materials, contextual information, versions, alternative codings, rejected or unresolved interpretations, negative results, boundary and scale variants, and provenance records remain available for later inquiry, together with the ethical, legal, technical, and stewardship conditions governing their access.

Reinterpretability has particular importance in the AI era. Future systems may be able to inspect corpora, images, records, simulations, and relational structures in ways unavailable to the original researchers. Preserving only a polished conclusion can foreclose these later possibilities. Preserving evidence without adequate context can create a different problem by enabling decontextualized reinterpretation. The relevant objective is therefore contextualized recoverability.

This point also reconnects reporting to contingent encounter. A future researcher may encounter a minor anomaly, discarded category, unexplained residual, archival fragment, or alternative boundary that had little significance under the original research question. Aesthetic judgment can make that preserved remainder salient under a new intellectual context. Reinterpretability allows subsequent epistemic inquiry to determine whether the encounter supports a new relation, mechanism, or historical reconstruction. In this sense, reporting and preservation help construct the encounter surface available to future research communities.

Proposition 7.314 (Relational reporting adequacy)**.** *A reported relational claim becomes more reconstructable and cumulatively useful to the extent that its boundary, scale, representation, material assumptions, uncertainty, plausible alternatives, provenance, reproducibility conditions, and reinterpretability conditions remain explicit enough for readers to assess the inferential pathway, while ethical and access constraints remain visible.*

Proposition 7.314 treats reporting as part of methodology. It does not imply that each project should publish the same materials or disclose sensitive relational evidence. The reporting burden depends on claim type, consequence, data sensitivity, available infrastructure, and the forms of reconstruction that are ethically and legally appropriate. Epistemic humility therefore appears in reporting through calibrated claim scope, visible uncertainty, preserved alternatives, and recoverable provenance while permitting clear statement of well-supported findings.

Sections 167–197 have developed methods for identifying, characterizing, reconstructing, measuring, comparing, validating, ethically governing, and reporting relations. These achievements establish that a relation exists or has specified properties with a degree of warrant. A further methodological problem remains: the existence of a relation does not by itself establish what that relation generates. Section 198 therefore turns from relational identification toward consequences, mechanisms, trajectories, structural transformation, and the methodological threshold at which relational inquiry becomes generative relational inquiry.

7.32 From Relation to Generation

The preceding sections developed a methodology for identifying relations, characterizing their properties, reconstructing configurations, tracing their temporal and spatial organization, measuring them, evaluating missingness, triangulating evidence, validating claims, governing ethical consequences, and reporting the resulting inferential architecture. The role of the present section is to specify the point at which relational inquiry becomes a more demanding inquiry into generation. Its objective is to distinguish the existence of a relation from its consequences, generative effects, mechanisms, trajectories, structural transformations, and possible transformations of the rules through which later states become reachable. The discussion proceeds through these increasingly demanding forms of claim and concludes by defining the methodological transition from Chapter 7 to generative relational inquiry in Chapter 8.

This transition matters because relational evidence can support several kinds of inference whose evidential burdens differ substantially. A documented relation between two organizations can establish interaction without establishing a consequential effect. A consequential effect can alter an outcome without modifying later capacities or possibilities. A generative effect can change what becomes possible while leaving the underlying transition structure largely intact. Structural transformation can reorganize a configuration without demonstrating that the rules governing subsequent generation have themselves changed. Treating these claims as analytically continuous while preserving their differences allows the research programme to be-

Table 7.31: From relational identification to generative attribution

Claim form	Primary analytical question	Additional evidential burden	Characteristic risk
Relation existence	Is the specified relation sufficiently warranted?	Identification from manifestations, provenance, boundary, scale, time	Manifestation treated as relation
Relational consequence	Does the relation contribute to a specified difference or outcome?	Temporal ordering, comparison, causal or interpretive bridge	Association treated as consequence
Generative effect	Does the relation alter later capacities, constraints, configurations, or option spaces?	Evidence concerning changed future possibilities and their persistence	Immediate outcome treated as generation
Mechanism	Through which process is the generative effect produced?	Intermediate steps, enabling conditions, rival pathways, mechanism evidence	Mechanism inferred from endpoint pattern
Trajectory	How does generation unfold through sequence and time?	Ordered states, timing, feedback, branching, persistence, interruptions	Snapshot treated as developmental path
Structural transformation	Does the generative process reorganize the relational architecture itself?	Configuration-level change, boundary/scale sensitivity, continuity criteria	Local change treated as structural change
Generative-rule transformation	Does the process alter the transition conditions governing later possibilities?	Evidence that later state transitions differ because the generative architecture changed	Structural change treated as rule change
Transition to generative inquiry	Which methods can evaluate these stronger claims?	Integrated historical, empirical, formal, computational, and interpretive design	Methodological vocabulary outrunning evidence

come more ambitious without weakening its standards of warrant.

Definition 7.315 (Generative attribution ladder)**.** A *generative attribution ladder* is an ordered set of claim forms that distinguishes relation existence, relational consequence, generative effect, generative mechanism, generative trajectory, structural transformation, and transformation of the generative rule. Each level records the additional evidential and interpretive commitments required to move beyond the preceding level.

Definition 7.315 permits non-linear research pathways across these claim forms. Historical evidence may provide a trajectory before a mechanism is fully specified; an intervention may reveal a mechanism while long-run structural transformation remains uncertain; formal analysis may identify a possible rule transformation whose empirical relevance requires later investigation. The ladder provides a discipline of claim strength: it makes visible which kind of generative claim is being advanced and which inferential steps remain open.

Table 7.31 summarizes the transition developed below.

The distinctions in Table 7.31 carry forward the epistemic humility developed throughout the book. A study can make a strong contribution by establishing a relation or consequence without advancing a broader generative claim. Generative language becomes useful when it identifies a substantive change in later capacities, constraints, configurations, trajectories, or transition conditions and when the evidence supports that interpretation.

7.32.1 Existence of a Relation

The first level concerns whether the relation invoked by the inquiry is sufficiently warranted. Section 7.6 developed relation identification through directly observed, inferred, latent, symbolized, institutional, historical, negative, and absent relations. Sections 7.7 and 7.8 then separated relation existence from relation properties and from persistence through time. These distinctions remain foundational for generative inquiry because a claim about what a relation generates presupposes a sufficiently defensible account of the relation whose effects are being attributed.

The relation should therefore retain its identification profile when the inquiry moves toward generation. Its relata, semantics, direction where relevant, temporal interval, boundary, scale, manifestations, inferential bridge, and uncertainty remain part of the generative research record. If the relation itself is uncertain, later claims inherit that uncertainty. Generative analysis can sometimes proceed under several alternative relation specifications, with those alternatives remaining visible throughout the attribution process.

Relation existence also requires attention to the level of representation. A contractual relation, observed interaction, statistical dependence, network edge, institutional status, symbolic association, or field position can each support a relational claim, yet they represent different objects. Section 7.19 showed that an edge is an analytical construction whose semantics require specification, while Section 7.20 showed that jointly constituted relations can lose structure under pairwise reduction. Generative inquiry inherits these representational choices because later effects can depend on properties suppressed by the initial representation.

Claim 7.316 (Relation-existence discipline)**.** *A generative claim is most interpretable when the relation attributed with generative significance remains identifiable independently of the downstream effect used to motivate that attribution.*

Claim 7.316 guards against circular reconstruction. If a relation is inferred primarily because a later outcome occurred and the same outcome is then used as evidence that the relation was generative, the evidential architecture becomes difficult to evaluate. Independent documentary, observational, institutional, statistical, historical, or participant evidence can strengthen the identification of the relation before its generative consequences are assessed.

This discipline also leaves room for reciprocal revision. Evidence concerning consequences may reveal that the original relation was mischaracterized. A relation initially described as voluntary cooperation may later require reconstruction as constrained dependence; a network tie coded as information exchange may reveal an authorization structure; a formal institutional relation may prove weakly enacted. Generative inquiry therefore begins from relation identification while preserving the possibility that downstream evidence revises the object itself.

7.32.2 Consequences of a Relation

The second level concerns relational consequence. A relation can be well established while having limited relevance to the outcome under study. Consequence analysis asks whether the relation contributes to a specified difference in behavior, re-

source flow, interpretation, access, institutional operation, spatial pattern, temporal sequence, or another outcome. The inferential burden therefore moves from existence to contribution.

Consequences can be reconstructed through several methodological traditions. Historical comparison can identify sequence-sensitive changes associated with a relation; interviews and ethnography can show how participants experience or interpret its effects; legal inquiry can establish consequences produced through rights, duties, powers, or liabilities; statistical and causal methods can estimate contrasts under specified assumptions; network analysis can examine consequences associated with structural position; field analysis can identify distributed local conditions. The methodological pluralism of Sections 7.17–7.25 remains relevant because different consequences become visible through different evidential interfaces.

Definition 7.317 (Relational consequence profile)**.** A *relational consequence profile* records the focal relation, target consequence, temporal ordering, relevant comparison or counterfactual, mediating conditions, boundary, scale, alternative explanations, uncertainty, and the evidential pathway connecting the relation to the stated consequence.

A consequence profile keeps causal and non-causal claims distinguishable. A qualitative study may show that participants organize decisions around an institutional relation without estimating an average causal effect. A legal analysis may establish that a relation changes formal competence. A statistical design may estimate a treatment effect under explicit assumptions. These claims can be complementary while carrying different meanings and standards of warrant.

The distinction between consequence and generation is especially important. A relation can change an immediate outcome while leaving later capacities and possibilities largely unchanged. A subsidy can increase current consumption without changing productive capacity; a rule can alter one decision without changing the architecture through which later decisions are generated; a conversation can change an opinion without altering the participant's subsequent access to information or institutional position. Such consequences can be theoretically and practically important while remaining analytically narrower than a generative effect.

Consequences can also be negative, delayed, distributed, or displaced across scale. A relation that benefits one organizational unit may create burdens elsewhere; an intervention whose immediate effect appears limited can alter later coordination; a local relation can contribute to regional consequences through cross-scale pathways. Sections 7.5, 7.23, and 7.24 therefore remain active when consequence claims extend across spatial, temporal, or organizational resolutions.

7.32.3 Generative Effect

The third level concerns generative effect. Within the present framework, generative language is reserved for consequences that modify conditions of later possibility. The relevant change can concern capacities, constraints, relational configurations, option spaces, institutions, knowledge, infrastructures, evaluative repertoires, or other conditions through which subsequent states become reachable.

Definition 7.318 (Generative effect)**.** A *generative effect* is a relationally attributable change that alters later capacities, constraints, relational configurations, or reachable possibilities within a specified boundary, scale, and temporal horizon.

Definition 7.318 is intentionally broader than a favorable effect. Generation can expand some possibilities while contracting others. It can create capacities alongside dependencies, open one path while closing alternatives, stabilize a beneficial institution while making later exit more difficult, or enable coordination while concentrating authority. Normative evaluation therefore remains distinct from generative identification.

The definition also avoids equating novelty with generation. A novel event can leave later possibilities substantially unchanged, while a gradual and familiar process can cumulatively reorganize capacities or constraints. Generative inquiry asks what becomes differently possible, difficult, likely, accessible, or sustainable after the focal relation or process has operated.

Evidence for a generative effect consequently requires a temporal comparison. The researcher needs some account of the relevant possibility structure before and after the generative process, or across configurations that differ in the relevant generative condition. Direct enumeration of the option space may be infeasible. Evidence can therefore include newly available actions, changed barriers to entry or exit, altered institutional competence, durable skill formation, transformed network reachability, changed access to resources, new organizational routines, or other manifestations that bear on later capacity and constraint.

Definition 7.319 (Generative-effect profile)**.** A *generative-effect profile* records the focal relation or process, the later capacity, constraint, configuration, or option-space property claimed to change, the temporal horizon, persistence conditions, relevant comparison, boundary, scale, alternative explanations, and the evidence supporting the interpretation of the change as generative.

This profile keeps generative attribution proportionate. A short-lived change can still be generative within a short horizon when it changes reachable possibilities during that period. Longer-run claims require evidence concerning persistence, reinforcement, regeneration, or transmission. Later chapters will examine positive, negative, absent, and heterogeneous forms of generativity in greater detail.

7.32.4 Mechanism

A generative effect identifies a change in later possibility; a mechanism account asks how that change was produced. Mechanisms can include learning, resource accumulation, institutionalization, classification, network rewiring, legal authorization, feedback, coordination, imitation, infrastructural investment, expectation formation, symbolic recognition, exclusion, or other processes linking a relation to altered capacities and constraints.

Mechanism claims require more than naming an intuitively plausible process. The researcher should specify intermediate transformations and the conditions under which they operate. A training relation may generate later capability through repeated practice, feedback, access to tools, and recognized credentials. A credit re-

lation may expand productive options through liquidity while simultaneously generating repayment obligations and dependence. An institutional classification may generate later consequences through eligibility rules, administrative databases, professional expectations, and self-reinforcing categorization. In each case, the mechanism concerns a sequence or configuration of relational transformations that connects the initial relation to the endpoint.

Definition 7.320 (Generative mechanism profile)**.** A *generative mechanism profile* records the initial relation or configuration, intermediate relational transformations, enabling and constraining conditions, temporal ordering, relevant actors and infrastructures, competing pathways, expected observable implications, boundary and scale, and the uncertainty associated with the proposed mechanism.

Mechanism evidence can be heterogeneous. Process tracing can reconstruct intermediate events; experiments and quasi-experiments can discriminate among pathways when design permits; ethnography can expose tacit routines; archival inquiry can identify historical sequence; formal or computational models can clarify whether a proposed mechanism is internally coherent and what consequences follow under specified assumptions. Methodological disagreement can therefore help diagnose which part of the proposed mechanism remains weakly supported.

Mechanisms can also operate across scales. Individual learning can alter team routines; organizational routines can accumulate into institutional standards; institutional rules can reshape local interaction. The cross-scale bridge developed in Section 7.5 remains necessary because similarity between patterns at two scales provides limited evidence about the pathway connecting them.

Mechanism accounts should remain open to equifinality. Similar generative effects can arise through different mechanisms, and one mechanism can produce different effects under different relational configurations. The objective is therefore to identify a sufficiently supported pathway for the scoped claim while preserving plausible alternative generative processes compatible with the observed endpoint.

7.32.5 Trajectory

Generative processes unfold through time. A trajectory account asks how states, relations, capacities, constraints, and configurations change across an ordered sequence. This adds temporal organization to the mechanism claim and creates space for delayed effects, feedback, branching, reversals, lock-in, periods of dormancy, and changing rates of transformation.

Definition 7.321 (Generative trajectory)**.** A *generative trajectory* is a temporally ordered reconstruction of changes in relations, capacities, constraints, configurations, and reachable possibilities associated with a generative process within a specified boundary and scale.

A trajectory differs from a series of snapshots because the ordering and connection among states are part of the object. Section 7.24 showed that sequence, duration, rhythm, gaps, and historical continuity can carry substantive meaning. Generative trajectory reconstruction extends that temporal discipline by asking how earlier transformations condition later transitions.

The trajectory can branch. Similar initial relations can develop differently when they encounter different institutions, resources, shocks, interpretations, or feedback processes. A trajectory can also converge after different beginnings. Generative inquiry should therefore preserve alternative paths where the evidence supports them and avoid retrospective narratives that treat the observed path as uniquely available.

Trajectory reconstruction is especially sensitive to missingness. Archival gaps, attrition, platform changes, discontinuous observation, and selective preservation can produce apparent transitions that belong partly to the evidence system. Section 7.27 therefore remains relevant: gaps should be diagnosed through their production process before being interpreted as substantive breaks.

Definition 7.322 (Generative trajectory profile)**.** A *generative trajectory profile* records the initial configuration, ordered states or events, mechanism-relevant transitions, feedback, delays, branching points, interruptions, boundary and scale, observation gaps, alternative trajectories, and the evidence supporting continuity or transformation across the reconstructed path.

Trajectory analysis also creates a natural interface between historical-interpretive and formal-computational inquiry. Historical work can preserve sequence and category change; dynamical models can clarify possible transition structures; simulation can explore branching under explicit assumptions; qualitative evidence can reconstruct situated interpretation at critical points. Chapter 8 develops these combinations more directly.

7.32.6 Structural Transformation

Generative effects can accumulate until the relational architecture itself changes. Structural transformation concerns reorganization in the configuration through which relations are formed, maintained, constrained, or connected. Relevant changes can include new institutional roles, altered network topology, shifted field positions, transformed authority relations, changed infrastructures, different boundary permeability, new cross-scale couplings, or reorganization of higher-order relations.

Definition 7.323 (Structural transformation)**.** A *structural transformation* is a change in the organization of a relational configuration that materially alters the positions, relations, constraints, capacities, or pathways through which subsequent interaction and development occur.

Structural transformation is therefore stronger than a local outcome change. A rise in one organization's resources may leave the surrounding institutional architecture largely stable. The same resource change can become structural if it shifts gatekeeping authority, restructures dependency, creates a new intermediary position, changes network reachability, or reorganizes access across the field. The relevant criterion concerns change in relational architecture and its consequences for subsequent organization.

Structural claims require careful boundary and scale specification. A change can be structural within one organization while remaining local within a national system. A regional transformation may leave transnational architecture largely unchanged.

Conversely, a small local innovation can later propagate and contribute to a wider structural shift. Describing the relevant scale prevents structural language from expanding beyond the evidence.

The identity discipline of Section 7.8 also becomes important. Structural transformation can preserve historical continuity while changing several identity-bearing dimensions. A later configuration can remain recognizably descended from an earlier one without being adequately represented as unchanged. The research record should therefore preserve continuity carriers and transformation criteria together.

Definition 7.324 (Structural-transformation profile)**.** A *structural-transformation profile* records the pre-transformation configuration, altered relational architecture, affected positions and relations, continuity carriers, boundary, scale, temporal interval, mechanism, downstream possibilities, competing interpretations, and evidence concerning the persistence or reversibility of the transformation.

This profile also helps distinguish structural transformation from temporary disruption. A crisis can produce large short-run changes that later revert, while a quieter institutional modification can durably alter roles, expectations, and access. Persistence, reproduction, and later path dependence therefore become relevant evidence for the structural interpretation.

7.32.7 Transformation of the Generative Rule

The strongest claim considered in this section concerns transformation of the generative rule. Structural transformation changes the relational architecture in which later processes occur. Generative-rule transformation goes further by asking whether the conditions governing transitions among later states have changed. The same input, relation, or perturbation can then produce a different range or distribution of subsequent possibilities because the generative architecture itself has been altered.

Definition 7.325 (Generative rule)**.** Within a specified representation, a *generative rule* denotes the transition structure through which a relational configuration, together with relevant conditions and interventions, constrains or enables subsequent states and possibilities.

The term “rule” is representational and remains subject to the ontological suspension developed in Chapter 4. It can refer to a formal transition law in a dynamical model, an institutionalized procedure, a historically stabilized process, a mechanism family, a conditional probability structure, or another explicit representation of how later states become generated from earlier configurations. The analytical requirement is to state what transition structure is being represented and what evidence would indicate its change.

Definition 7.326 (Generative-rule transformation)**.** A *generative-rule transformation* is a change in the transition structure governing how specified configurations and conditions generate later states or reachable possibilities within a defined domain.

Several kinds of evidence can bear on such a claim. The same intervention can begin producing systematically different consequences after an institutional reorganization; a classification system can alter the behavior that later feeds the classifier; a technological infrastructure can change which network configurations are feasible;

a learning process can change how an actor responds to later information; a legal reform can change the pathways through which organizational decisions acquire authority. In these cases, the relevant claim concerns a change in the mapping from conditions to later possibilities, not only a change in the current state.

Generative-rule claims require substantial caution because several weaker explanations can produce apparent rule change. The underlying population may have changed; measurement may have changed; the boundary may have shifted; a hidden variable may have altered; the same rule may be operating in a different region of its state space; or the available evidence may cover different historical regimes. A robust analysis therefore compares these alternatives before attributing the observed change to transformation of the generative rule.

Definition 7.327 (Generative-rule transformation profile)**.** A *generative-rule transformation profile* records the pre-change and post-change transition structures, the representation in which they are specified, the evidence for changed transition conditions, boundary, scale, temporal regime, candidate mechanism, alternative explanations, uncertainty, and empirical or historical tests capable of distinguishing rule transformation from state change or measurement change.

This is one point at which formal, historical, and empirical methods can become especially complementary. Formalization can state what counts as a change in transition structure; historical inquiry can identify when institutional or conceptual conditions changed; empirical analysis can test whether comparable inputs now produce different responses; qualitative inquiry can reveal changes in practice or interpretation that are poorly represented by available variables. The claim remains strongest when these evidential pathways converge without sharing the same unexamined assumptions.

7.32.8 Transition to Generative Relational Inquiry

The progression developed in this section marks the boundary between the main task of Chapter 7 and the research problem of Chapter 8. Relational inquiry asks how relations are specified, observed, reconstructed, characterized, compared, measured, validated, and reported. Generative relational inquiry asks how relations and configurations contribute to later capacities, constraints, trajectories, structural transformations, and changes in transition structure.

Proposition 7.328 (Generative attribution discipline)**.** *A generative attribution gains warrant as the research design makes explicit the relation or configuration of interest, the later change being attributed, the temporal and cross-scale pathway, relevant comparison or counterfactual, mechanism evidence, alternative explanations, and the boundary within which the generative claim is intended to hold.*

Proposition 7.328 extends the claim-strength discipline developed throughout this chapter. A generative vocabulary can guide inquiry before each component is fully known, yet the final claim should preserve which components are strongly supported, which remain hypothetical, and which depend on a formal or interpretive representation. This allows exploratory generative reasoning without presenting it as completed attribution.

Definition 7.329 (Generative inquiry transition profile)**.** A *generative inquiry transition profile* records the established relational findings, candidate generative effects, mechanism hypotheses, temporal and cross-scale requirements, possible trajectories, structural or rule-level transformations under consideration, evidential gaps, and the methodological resources required for the next stage of inquiry.

The transition profile can also record where contingent encounter and aesthetic judgment enter the generative research process. A researcher can notice an unexpected relation, recurring form, anomaly, or cross-domain resemblance before its generative significance is known. Such salience can orient the next inquiry toward a candidate mechanism or trajectory. The methodological task is then to convert the encounter into a testable and reconstructable generative question, while retaining alternative interpretations and the possibility that the initial judgment proves unproductive.

This role becomes increasingly consequential under AI-assisted research. Generative systems can produce candidate mechanisms, simulations, explanatory pathways, and structural analogies at low marginal cost. The resulting abundance increases the importance of distinguishing a plausible generative story from an evidentially supported generative attribution. Human and collective research judgment therefore remains central in selecting which candidate pathways deserve investigation, deciding which external encounters bear on them, locating missing evidence, and determining whether a stronger generative claim is warranted.

Chapter 8 begins from this transition. It develops methods for formulating generative research questions, reconstructing mechanisms and trajectories, analyzing sequence, counterfactuals, co-generation, delay, propagation, feedback, branching, path dependence, attractors, criticality, structural transformation, capacity and constraint generation, option spaces, multiscale generation, dynamical and stochastic systems, fields, algebraic and category-theoretic structures, geometry, spacetime, simulation, intervention-based inquiry, negative and absent generativity, robustness, and reporting. The methodological burden becomes greater because the object of inquiry increasingly concerns the production of later relational possibilities across time, mechanisms, and scales.

The present chapter therefore closes with a scoped methodological claim. Relational inquiry provides the object specifications, evidential disciplines, ethical constraints, uncertainty profiles, validation procedures, and reporting architecture on which generative inquiry depends. Generative relational inquiry adds a further burden of temporal, mechanistic, counterfactual, multiscale, and transformational attribution. Preserving this distinction allows the research programme to investigate generation while keeping stronger statements proportionate to the evidence that supports them.

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