



THE NATION-SIDE DIGITAL INFRASTRUCTURE GAP

A NEW INSTITUTIONAL AND ECONOMIC MODEL
FOR DIGITAL INDIGENOUS ENGAGEMENT
INFRASTRUCTURE IN MAJOR PROJECTS

WHY FAIR DIGITAL MODERNIZATION REQUIRES PERSISTENT
NATION-CONTROLLED OPERATING CAPACITY, GOVERNED USE,
AND TRANSPARENT RECOGNITION OF VALUE

*"Every major project requires infrastructure.
The Nation's participation in that project should build infrastructure too."*

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Abstract

Canada is accelerating major-project development while digitizing the systems used to register, assess, approve, and administer those projects. The modernization is institutionally asymmetric: governments and proponents increasingly operate through persistent registries, data rooms, GIS, permitting, and compliance systems, while Indigenous Nations are often funded and equipped project by project. The result can be dispersed participation records, maps, studies, decisions, consultation history, and institutional knowledge rather than a durable Nation-side operating environment.

This paper calls that asymmetry the Nation-Side Digital Infrastructure Gap and develops a law-and-economics explanation for its persistence. The pattern is consistent with individually rational actors responding to prevailing rights, incentives, transaction costs, funding structures, and institutional arrangements. Project-specific funding can rationally support immediate deliverables while underproviding shared Nation-side capacity through collective-action, appropriability, and transaction-cost frictions. That explanation is a testable institutional hypothesis, not a claim of social efficiency or irrational conduct.[23][24][25][26]

Governance reform and infrastructure are complements. Governance determines who has authority; infrastructure determines whether valid authority can be exercised repeatedly, reliably, and at sustainable transaction cost. A legitimate Nation-Side Operating Layer should make rights, permissions, provenance, official institutional records, and economic interests operable without displacing applicable Indigenous law, Nation law or protocol, common law, statute, contract, privacy law, or intellectual-property law. Its scoped System-of-Record Function can establish what representation was made and what institutional position was formally adopted while preserving provenance, correction, challenge, dissent, and evidentiary qualification. Record authority is institutional and scoped, not objective truth or an externally binding legal determination.

The framework uses six separations: rights and legal interests; privacy and sensitivity; institutional governance; use authorization; official status and record authority; and economics. It distinguishes five economic flows: project or operational funding, professional and platform fees, Knowledge Holder honoraria, individual rights-linked value participation, and Nation or community economic participation. It neither forces Indigenous Knowledge into conventional copyright nor collapses individual and community interests. Protektant appears as one practical implementation of a vendor-neutral, empirically testable framework.

Scope

This paper develops the Nation-Side Infrastructure Framework, an analytical model for designing and evaluating Digital Indigenous Engagement Infrastructure in major projects, and presents Protektant as one implementation. Digital Indigenous Engagement Infrastructure means persistent, Indigenous-governed systems and institutional capabilities through which Nations and Indigenous Institutions govern participation, evidence, authorized use, official records, decisions, and value across projects. Within that category, a Nation-Side Operating Layer should perform a scoped System-of-Record Function for defined workflows, preserving the current authoritative institutional record and the history needed to understand provenance, permissions, governance state, official status, corrections, decisions, authorized outputs, commitments, and audit events. That authority establishes institutional status and history for the defined purpose; it does not determine objective truth.

This paper is not legal advice. Technology does not, by itself, discharge the Crown's duty to consult, determine consultation adequacy, create an entitlement to compensation, establish a contested fact, or guarantee project, regulatory, negotiation, or financial outcomes.[33] Nation-specific law, Indigenous legal orders, protocol, authority, and governance remain controlling in implementation. This public edition is prepared for academic, legal, policy, Indigenous-governance, and practitioner review; it has not been peer reviewed and is not presented as academic or legal consensus.

The economic architecture separates five flows: project or operational funding; professional and platform fees; Knowledge Holder honoraria; individual rights-linked value participation; and Nation or community economic participation. Its governing rule is simple: payment should track the distinct cost, service, right, governance contribution, or institutional value it is intended to address.

Nation or community economic participation is distinct from IBA compensation, impact compensation, accommodation, resource-revenue sharing, and payment for consent. No royalty or other payment arises automatically from contribution, storage, routing, retention, review, project linkage, or the Nation's own internal use. Individual and community interests remain distinct; the framework assumes neither Nation ownership of every individual contribution nor that individual authorization resolves every community governance question.

Terminology and authority. "Nation" and "Indigenous Institution" are analytical shorthand used in this paper. Section 35 of the Constitution Act, 1982 recognizes existing Aboriginal and treaty rights and defines "aboriginal peoples of Canada" for constitutional purposes; this paper's shorthand does not purport to determine constitutional identity or rights-holding status.[34] Nor does it determine representation, jurisdiction, or decision authority; those questions must be established under the applicable Indigenous legal order, treaty, constitution, statute, agreement, or other valid source of authority. Indigenous legal scholarship reinforces that those sources are plural, living, and internally constituted rather than supplied by an external digital architecture.[38][39][40] "Knowledge Holder" is likewise functional terminology; Nation-specific terms and protocols prevail. "Nation-controlled" and "Nation-governed" refer to validly authorized functional control within scope, not ownership of every record or unilateral authority over every rights-holder.

Method and analytical approach. This is a conceptual, institutional, and doctrinal synthesis, not an empirical causal estimate, systematic review, or meta-analysis. It draws purposively on Canadian legal and policy authorities, Indigenous data-governance and legal scholarship, law-and-economics, organizational-memory, impact-assessment, and digital-public-infrastructure literature to derive testable design propositions. Statutes and judgments support legal propositions; administrative guidance is treated as guidance; OCAP®, CARE, GIDA, Local Contexts, UNDRIP, and Nation-specific laws or protocols are not treated as interchangeable rules. Framework statements using 'should' or 'must' are normative unless an independent legal duty is identified. Empirical claims are limited to cited evidence, and the causal model remains subject to Section 16's research and falsification tests.

Literature position and contribution

The framework sits at the intersection of established literatures rather than claiming to originate their constituent ideas. Indigenous data-sovereignty scholarship links data governance to self-determination and challenges arrangements in which Indigenous data are governed primarily by external actors. Kukutai and Taylor, FNIGC's work on First Nations data sovereignty, the CARE Principles, and later CARE/FAIR implementation scholarship support the need for institutions that can operationalize authority, benefit, responsibility, and context.[35][37][13][36]

Indigenous legal scholarship likewise cautions against treating 'Indigenous law' as a single externally defined category. Borrows, Napoleon and Friedland, and Mills emphasize living, plural, internally constituted legal orders.[38][39][40] The implication for this paper is narrow but important: digital architecture may operationalize validly conferred authority, but it cannot supply the legitimacy, content, or hierarchy of Nation-specific law.

Impact-assessment scholarship has moved beyond generic participation toward rights-holder and Indigenous-led models. Darling, Harvey, and Hickey identify implementation problems despite formal participation and funding, while Keefer and colleagues examine both the potential and constraints of Indigenous-led impact assessment, including authority, capacity, funding, and state-process constraints.[42][43] This paper's narrower question is what persistent institutional machinery allows a Nation to carry governance, evidence, decisions, and continuity across repeated projects.

The economic mechanism draws from transaction-cost and institutional economics. Coase, North, Olson, Ostrom, and Williamson explain how rights allocation, transaction costs, collective-action problems, and governance structures affect investment and coordination.[23][24][25][26][41] Organizational-memory and project-based-organization research address retention, retrieval, knowledge transfer, and continuity.[17][18] This paper hypothesizes that repeated project turnover can amplify those problems where Nation-side continuity mechanisms are weak.

The paper's contribution is compositional and architectural. It integrates these literatures into a testable model built around the Nation-Side Digital Infrastructure Gap, a persistent Nation-Side Operating Layer, the Project-to-Capacity Conversion Principle, a scoped System-of-Record Function, the Six Separations, the five-flow Governed Reciprocity Model, and the Nation-Side Infrastructure Test. The originality claim lies in that synthesis and its application to repeated major-project activity, not in the constituent fields themselves.

Because this is a conceptual synthesis rather than a systematic review, its value should be judged by the precision, explanatory and predictive usefulness, governance compatibility, and empirical performance of the model. Pre-existing Indigenous-led systems are not treated as derivatives of this framework; where a credible alternative performs better, the framework should yield to the evidence.

Framework authorship and attribution

This paper introduces the Nation-Side Infrastructure Framework, developed by Jordon Lamontagne and Traditional Knowledge Inc. Its claimed contribution is the specific arrangement of persistent Nation-side operating capacity, enforceable governance, project-to-capacity conversion, rights-and-value separation, official-record discipline, distinct participation and value flows, governed external use, and a vendor-neutral infrastructure test.

The framework builds on Indigenous Knowledge, Indigenous laws and legal orders, Indigenous data-sovereignty principles, OCAP®, CARE, UNDRIP, community protocols, collective-benefit principles, and Nation governance. It claims no ownership over those sources or traditions. The authorship claim concerns this paper's original expression, definitions, analytical relationships, diagrams, selection, arrangement, and application.

Jordon Lamontagne and Traditional Knowledge Inc. request attribution when the framework's defined concepts, analytical relationships, or diagrams are used or adapted. Copyright protects the paper's original expression and arrangement, not underlying facts, ideas, methods, Indigenous laws, Indigenous Knowledge, or generic expressions.

Seven framework concepts defined in Paper 1

- 1. The Nation-Side Digital Infrastructure Gap:** the combined operating, governance-execution, and value-recognition asymmetry that arises when governments and proponents possess persistent systems while Nations are funded and equipped project by project.
- 2. Digital Indigenous Engagement Infrastructure:** the broader institutional-infrastructure category of persistent, governed digital systems and institutional capabilities through which an Indigenous Nation or Indigenous Institution performs authorized work across projects and time. It is not limited to a single consultation process, software module, or vendor.
- 3. The Nation-Side Operating Layer:** the persistent, governed operating environment within Digital Indigenous Engagement Infrastructure through which an Indigenous Nation or Indigenous Institution organizes evidence, decisions, authorized outputs, commitments, monitoring, and institutional memory, including a scoped System-of-Record Function for defined workflows.
- 4. The Project-to-Capacity Conversion Principle:** the requirement that temporary project funding produce both an immediate deliverable and a durable improvement in Nation-controlled institutional capability, subject to the empirical condition that continuity benefits justify lifecycle cost and governance burden.
- 5. The Rights-and-Value Separation Principle:** the requirement that six analytical dimensions remain independently understandable and enforceable: rights and legal interests; privacy and sensitivity; institutional governance; use authorization; official status and record authority; and economics.
- 6. The Governed Reciprocity Model:** the separation of five economic flows: project or operational funding; professional and platform fees; Knowledge Holder honoraria; individual rights-linked value participation; and Nation or community economic participation. The model prevents one payment category from silently purchasing or extinguishing another right, authority, or source of value.
- 7. The Nation-Side Infrastructure Test:** a vendor-neutral test for determining whether a platform, program, registry, or partnership qualifies as legitimate Digital Indigenous Engagement Infrastructure and creates durable Nation-side capacity without collapsing rights, authority, record status, or economics.

Supporting architectural terms

System-of-Record Function. Within a Nation-Side Operating Layer, Digital Indigenous Engagement Infrastructure should maintain a scoped authoritative institutional record for defined Nation-side workflows. The function identifies the current controlling state and preserves the canonical history necessary to understand

provenance, permissions, privacy and sensitivity state, governance conditions, versions, approvals, corrections, challenges, authorized outputs, commitments, and audit events.

Canonical Record. The current controlling version or state of a defined record within the System-of-Record Function, together with the metadata and history needed to establish what is current, what preceded it, which permissions and restrictions apply, what corrections or qualifications exist, and how the record became authoritative for the relevant institutional purpose.

Official status and institutional adoption. A record may have official status where an authorized process makes it the Nation's controlling institutional claim, finding, decision, qualification, or position, or the institutional record that an identified Knowledge Holder made a specified representation for a defined purpose. Official status describes scoped institutional authority and provenance. It does not make every underlying proposition incontrovertible, bind an external decision-maker, or prevent correction, dissent, challenge, supersession, or later decision.

Scoped record authority. System-of-record status is limited to the records, functions, parties, purposes, and period for which it has been validly designated. It does not transfer ownership, create new use rights, override Knowledge Holder choices or Nation law, determine objective truth, or make one platform authoritative for every purpose.

Portability and continuity. Export, migration, and continuity should preserve canonical history and allow the Nation to change systems or retain authorized internal copies without losing material governance context, permissions, official-status history, corrections, versions, or audit evidence.

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Executive Summary

The gap is not simply that some Indigenous Nations need more software. It is that the modern major-project economy increasingly depends on persistent digital operating infrastructure, while the rights-holding side of the relationship is often expected to participate through temporary funding, one-off studies, and processes designed around somebody else's project timeline. When the project closes, the Nation may retain reports and files, but not necessarily a governed, reusable operating layer that makes the next project easier.

The paper does not attribute the gap to simple market malfunction. Its institutional hypothesis is that participants respond to prevailing rights, incentives, transaction costs, funding structures, and governance arrangements. Project-specific investment can therefore be individually rational while persistent Nation-side capacity remains underprovided through collective-action, appropriability, financing, and transaction-cost constraints.[23][24][25][26] The hypothesis is empirical, not universal.

Individual rationality is not social efficiency. A project may rationally avoid the full cost of shared infrastructure when its appropriable project benefit is lower than that cost, even though cumulative project, continuity, and governance benefits could justify the investment. The implication is conditional: institutional architecture can explain persistent underinvestment, but persistence is worthwhile only where lifecycle benefits exceed lifecycle costs and risks.

This paper therefore argues for a complementary governance-and-infrastructure model. **Governance determines who has authority. Infrastructure determines whether that authority can be exercised repeatedly, reliably, and at sustainable transaction cost.** Legal and governance reform can define authority, obligations, rights, and protocols. Digital Indigenous Engagement Infrastructure provides institutional machinery through which those rules can be executed, evidenced, corrected, and carried across projects.

Persistence alone is insufficient. A Nation-Side Operating Layer should perform a scoped System-of-Record Function that identifies the current record for a defined workflow and preserves provenance, permissions, governance state, official status, corrections, decisions, and audit history. It can be authoritative as to what an identified Knowledge Holder represented and, separately, what institutional position the Nation adopted. That authority does not make the underlying proposition incontrovertible or bind an external decision-maker.[27]

The Rights-and-Value Separation Principle requires six questions to remain independently answerable: What rights and legal interests attach? Who may see the record? Who may make the Nation's institutional decision? What may a recipient do? What representation or institutional position is official for the defined purpose? Who is paid, by whom, and for what? A licence is not ownership. Visibility is not permission. Funding is not governance. Retention is not authorization. Official status is not objective truth. Payment for one source of value is not payment for another.

The economic architecture separates five flows: project or operational funding; professional and platform fees; Knowledge Holder honoraria; individual rights-linked value participation; and Nation or community economic participation. Honoraria support participation without buying knowledge, consent, ownership, privacy, use authorization, or a preferred answer. Rights-linked and community mechanisms require a valid legal, governance, or contractual basis and remain distinct from one another and from IBA compensation, impact compensation, accommodation, resource-revenue sharing, and payment for consent.

The framework imposes no abstract hierarchy between individual and community interests. It requires the system to preserve distinct claims and authorities so that an actual conflict can be resolved by the applicable legal or governance order rather than implicitly by software design.

The timing matters. Canada's current major-project agenda emphasizes shorter and more coordinated review timelines, early Indigenous participation, and capacity funding.[4][46] The 2025 First Nations Major Projects Summit What We Heard Report provides a government-recorded account of First Nations perspectives within

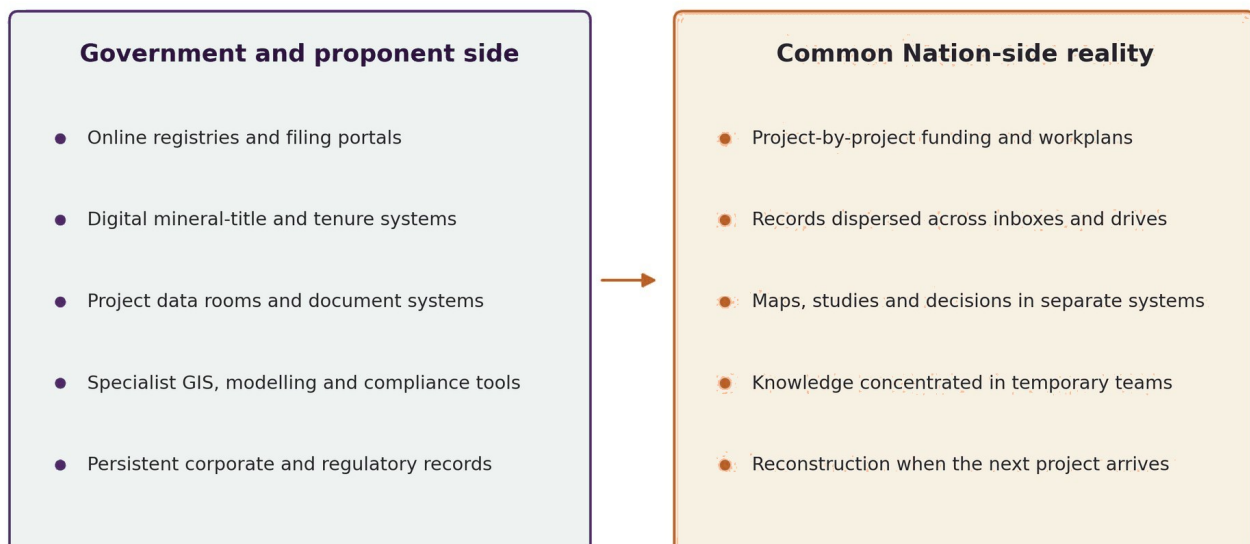
that major-project policy agenda.[5] IAAC's current policy direction emphasizes respect for Indigenous governance and knowledge systems, Indigenous leadership, and meaningful participation, while the federal Indigenous Knowledge Policy Framework establishes a principles-based approach to considering and protecting Indigenous Knowledge.[44][45][46] Capacity funding is necessary, but the form in which capacity is built matters. Temporary funding should not produce only temporary capacity.

Legitimate infrastructure must also avoid extraction, centralization, false certainty, and digital-only participation. OCAP®, CARE, UNDRIP, GIDA, Local Contexts, and Indigenous data-sovereignty scholarship support, in different ways and for different constituencies, authority, collective benefit, governance, privacy, and value on Indigenous terms.[12][13][14][20][21][22][35][37] The design task is to translate applicable principles into enforceable, portable, distinctions-based, hybrid, and testable operating controls.

Protektant, developed by Traditional Knowledge Inc., is presented as one implementation. The theory is vendor-neutral, and current product capability should be verified independently rather than inferred from a theoretical requirement.

Digital modernization is advancing unevenly

The project system is increasingly digital. Nation-side capacity often remains project-specific and fragmented.



The gap is not simply access to software. It is the absence of a persistent, governed Nation-Side Operating Layer with a scoped System-of-Record Function.

Figure 1. The Nation-Side Digital Infrastructure Gap includes the absence of a persistent Nation-Side Operating Layer with a scoped System-of-Record Function.

Twelve foundational propositions

1. Digital modernization is incomplete when it modernizes only the government and proponent side of major projects.
2. Market and institutional actors have largely produced the outcome that prevailing institutional arrangements made individually rational; that proposition does not establish social efficiency.
3. Governance reform and infrastructure are complements: governance defines authority, while infrastructure makes authority operable, persistent, auditable, and economically legible.
4. Digital Indigenous Engagement Infrastructure is an institutional-infrastructure category, not merely a consultation-software category.

5. Rights-holding Nations require persistent operating capacity where its continuity benefits justify lifecycle cost and governance burden, not only project-specific files, portals, and studies.
6. Grassroots digital participation can expand access and reduce avoidable marginal collection effort, but it must complement in-person, oral, ceremonial, assisted, and low-connectivity pathways.
7. Information becomes institutional capital only when it is governed, contextualized, retrievable, reusable under proper authority, maintained within a scoped authoritative record and canonical history, and retained across projects.
8. A System of Record can be authoritative as to what representation was made by an identified Knowledge Holder and under what recorded conditions, and separately as to a Nation-adopted institutional position, without determining objective truth, binding an external decision-maker, or eliminating correction, dissent, challenge, or evidentiary weight.
9. Rights and legal interests, privacy and sensitivity, institutional governance, use authorization, official status and record authority, and economics must remain separate.
10. Better evidence and continuity can strengthen assessment and negotiation readiness, but they do not guarantee legal adequacy, project approval, accommodation, consent, or commercial outcomes.
11. Knowledge Holder honoraria should materially offset reasonable participation costs, provide a meaningful non-outcome-contingent incentive, and recognize time and expertise without being framed as the purchase price for knowledge, consent, privacy, ownership, use authorization, or a preferred answer.
12. Economic participation should track distinct sources of value. Individual rights-linked value participation and Nation or community economic participation are separate from one another and from project funding, professional or platform fees, honoraria, IBA compensation, impact compensation, accommodation, resource-revenue sharing, and payment for consent.

1. The thesis: major-project digitization has a missing side

Digital modernization is not fair merely because every party can log in. It is fair only when rights-holding Nations have the institutional machinery to govern, interpret, act on, correct, and participate in the value created through the system.

Canadian major-project administration is increasingly digital while federal policy is pushing toward shorter and more coordinated assessment timelines.[1][2][3][46] The federal Impact Assessment Registry, Ontario's Mining Lands Administration System, and British Columbia's Mineral Titles Online illustrate persistent digital public administration in relevant project processes.[1][2][3] They do not establish uniform digitization across every permitting, engineering, environmental, or regulatory workflow.

Digital administrative systems of this kind can improve access to information and make complex processes more traceable, but this paper does not assume that each system empirically reduces transaction costs. The broader digital-public-infrastructure literature supports a narrower proposition: shared, secure, interoperable, and reusable digital building blocks can reduce duplication and support service delivery and coordination when well designed.[15][16]

But the institutional symmetry is weak. A proponent may have persistent project controls, document management, GIS, regulatory counsel, engineering databases, and dedicated staff. A regulator may have a registry, statutory timelines, technical departments, and recordkeeping obligations. A Nation may be asked to participate in the same project through a temporary contribution agreement, a consultant mandate, a series of meetings, a spreadsheet tracker, several inboxes, and a final report that is difficult to connect to the next file.

Within this framework, that asymmetry is defined as the **Nation-Side Digital Infrastructure Gap**. The gap has three related dimensions.

The first dimension is operating asymmetry: participating in another party's project system is not the same as possessing a persistent Nation-Side Operating Layer. For defined Nation-side workflows, its System-of-Record Function should identify what is current, preserve what preceded it, retain applicable permissions and governance state, and maintain the correction, approval, and audit history needed to understand institutional action over time.

The second is **governance-execution asymmetry**. Authority, protocol, privacy, sensitivity, and decision rights may be recognized in law, policy, agreement, or Nation governance yet remain difficult to exercise in the workflow. Roles, defaults, exports, acceptance language, or funder access can blur Knowledge Holder choices, Nation authority, recipient rights, and official status.

The third is **value-recognition asymmetry**. Knowledge Holders may contribute time, context, lived experience, place-based knowledge, and evidence; Nations may contribute governance, protocol, contextualization, official adoption, stewardship, aggregation, and continuity. These contributions can create project and institutional value, yet payment architecture may recognize only immediate deliverables and external invoices while leaving participant support, individual rights-linked value, and community-level institutional value undefined.

The law-and-economics proposition is not that participants irrationally ignored the gap. The model asks whether prevailing arrangements make short-horizon investment individually rational and whether clearer contracting, payment, and persistence mechanisms attract investment more readily than less institutionalized rights, permissions, and value channels.[23][24] That explanation neither defends the status quo nor establishes social efficiency; it identifies an institutional mechanism that can be changed.

The central claim is also not that every Nation should buy the same technology or adopt the same economic program. It is that fair modernization requires parity in three capabilities: a Nation-Side Operating Layer where persistent capacity is justified; enforceable governance over information and institutional decisions; and a

transparent architecture for recognizing distinct sources of value where value-producing use is expressly authorized.

Digital Indigenous Engagement Infrastructure is the broader category of persistent, governed systems and institutional capabilities supporting authorized Indigenous institutional work across projects and time. It requires scoped authoritative Nation-side recordkeeping and governed interoperability, not one universal database, process, feature set, or vendor.

Without legitimate Nation-side infrastructure, a faster external system can merely transfer more information, more deadlines, more uncompensated participation, and more administrative burden to Nations. With legitimate infrastructure, project activity can produce immediate work, lasting institutional capacity, enforceable governance, authoritative institutional records, and a transparent basis for distinct forms of economic recognition.

2. Why the gap matters now

As project timelines compress, persistent Nation-side capacity becomes more important, not less.

The gap is becoming more consequential as Canada seeks to advance more major projects on shorter, coordinated timelines. The Major Projects Office has committed \$40 million over two years to Indigenous capacity for early and consistent engagement, and IAAC's 2026-27 Departmental Plan emphasizes 'one project, one review,' two-year assessment timelines, early engagement, and meaningful Indigenous participation.[4][46] The 2025 First Nations Major Projects Summit report records First Nations perspectives within the same policy agenda.[5]

Federal consultation reporting also records Indigenous partner concerns about overlapping engagements, consultation fatigue, coordination, realistic timelines, accessible information, and capacity constraints.[6][7] These conditions affect whether a Nation can understand, assess, and respond to multiple complex processes at once.

Acceleration creates a structural tension: projects may move faster, but evidence and institutional capacity cannot be produced instantly. Capacity funding is necessary, but repeated funding that reconstructs the same records, remaps the same places, and produces another isolated report pays for activity without necessarily building a compounding institutional asset.

The better question is what remains after the funding period: a current project record, retrievable prior evidence, attached privacy and protocol context, traceable commitments, an intelligible decision history, and a governed baseline for the next file rather than another blank page.

The issue is sharper as federal policy moves toward greater Indigenous leadership. IAAC's Reconciliation Framework and 2026-27 Departmental Plan emphasize Indigenous governance, knowledge systems, leadership, and participation, while the Indigenous Knowledge Policy Framework guides consideration and protection of Indigenous Knowledge.[44][45][46] Leadership without durable operating capacity can become under-equipped responsibility.

3. The project-by-project reset problem

Major projects are temporary organizational environments even when the underlying asset operates for decades. Teams form around approvals, studies, construction phases, or funding periods; consultants are retained; staff and files move; deliverables are produced; then the project phase closes and the temporary team disperses.

Organizational-memory research examines how institutions acquire, retain, and retrieve information, while project-based-organization research identifies barriers to knowledge transfer and the role of organizational culture.[17][18] This paper hypothesizes that repeated project turnover magnifies those problems where continuity mechanisms are weak.

The same risk appears in Indigenous participation in major projects, but with higher stakes. The knowledge at issue may include land use, harvesting, cultural places, oral history, cumulative effects, community priorities, legal positions, prior accommodations, ecological observations, correspondence, maps, commitments, and the reasons underlying a Nation decision. Some of this knowledge is explicit and documentable. Some is relational, contextual, oral, or protocol-bound. Some should never enter a broad digital system at all.

A report archive is not institutional memory and is not necessarily a System of Record. A Nation can possess extensive prior studies yet still struggle to identify the current record, reconcile inconsistent names or methods, separate sensitive from public material, or recover context held in former staff or consultant files. The next project can therefore begin with costly retrieval and reconstruction before substantive analysis starts.

The reset consumes money that could support new evidence or expert judgment, community time through repeated collection, and institutional continuity when new decisions are disconnected from prior evidence, commitments, or cumulative effects.

The remedy is not one undifferentiated database. It is governed architecture linking source records, rights context, project geometry, analysis, decisions, authorized outputs, and follow-up while preserving the authoritative current state and canonical history of defined workflows. Institutional memory becomes operational when users can see what is current, what changed, who had authority, which permissions applied, and why the record changed.

Two economic models for project participation

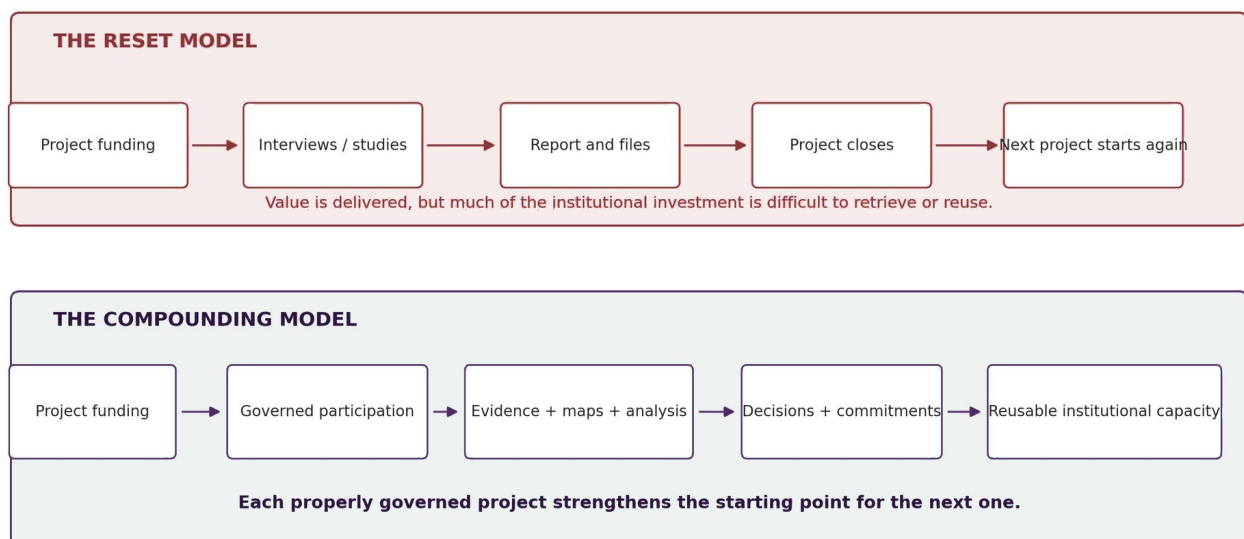


Figure 2. The reset model completes a project. The compounding model also strengthens the next starting point.

Why the gap is economically predictable

The model does not require irrational actors. Coase, North, Olson, Ostrom, and Williamson provide complementary lenses on transaction costs, rights allocation, incentives, collective action, and governance structures.[23][24][25][26][41] The paper applies those lenses to the major-project setting and tests whether prevailing funding and institutional arrangements can make project-specific investment rational while shared Nation-side capacity remains underprovided.

The major-project setting contains the elements of a recurring underinvestment problem. A project proponent is ordinarily organized and financed to advance a particular project. A government program may be appropriated for a defined statutory or program purpose. A consultant is paid for specified work. Each can rationally fund the portion of infrastructure whose benefit is sufficiently attributable to its mandate, while declining to bear the full cost of a persistent shared Nation-side foundation whose benefits extend beyond the immediate file.

Let C denote the full lifecycle cost of establishing and maintaining a persistent Nation-side infrastructure capability. Let b_j denote the project-specific benefit attributable to project j that the relevant project actor can recognize within its own mandate. Let R denote inter-project continuity benefits, including avoided reconstruction and preserved organizational memory. Let G denote broader governance and institutional benefits that are real but may not be appropriable by any single project.

An individual project may rationally decline to bear the full cost where $b_j < C$.

Yet the combined case for investment may satisfy: $\sum_{j=1}^n b_j + R + G > C$.

This is an illustrative conceptual inequality, not an estimated welfare function. It shows only how project-specific rationality can coexist with underprovision of shared capacity. It does not assume that all benefits are monetizable or measurable, that projects benefit equally, or that persistence is efficient in every case. Even if the inequality holds, social efficiency still depends on distribution, legitimacy, risk, opportunity cost, non-monetizable harms, and credible alternatives.

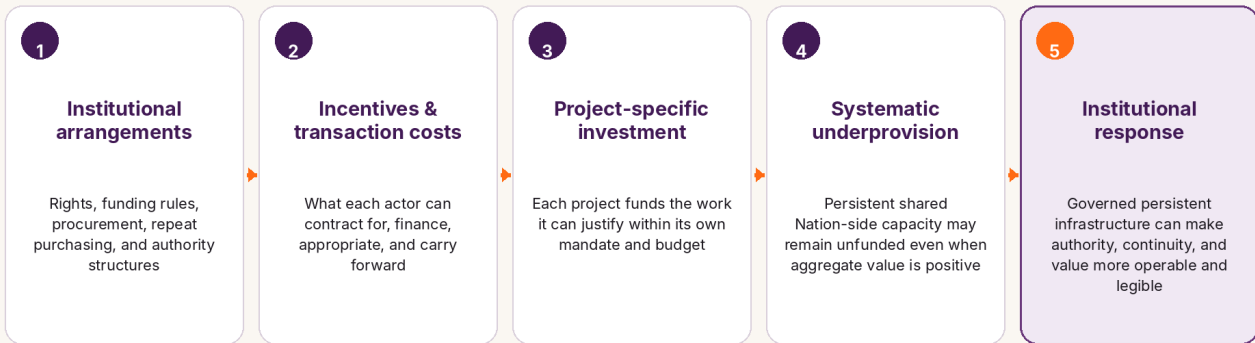
The same logic applies to market legibility. **Institutions can organize investment more readily where rights, authority, permitted use, payment triggers, and accountable recipients are sufficiently identifiable, governable, and enforceable.** That helps explain why project-specific services and deliverables may attract funding more readily than shared capacity whose benefits and rights are diffuse.

Rights architecture itself can function as economic infrastructure in the limited institutional sense used here: legible governance, permissions, official status, and value entitlements make transactions easier to organize. The proposition is testable and does not imply that legal form alone creates value, legitimacy, or marketability.

The policy implication is not to replace markets with exhortation. It is to change the institutional architecture within which market actors operate. Governance reform defines authority and rights. Infrastructure lowers the transaction cost of exercising them. Funding structures can then distinguish temporary project work from the persistent institutional capability that supports multiple projects over time.

Why the Gap Is Economically Predictable

Individually rational action can still underprovide shared Nation-side infrastructure.



Individual rationality does not establish social efficiency. The theory is testable, not a claim that persistent infrastructure is always superior.

Figure 3. The Nation-Side Digital Infrastructure Gap can arise from individually rational action under prevailing institutional arrangements; that explanation does not establish social efficiency or assume persistent infrastructure is always superior.

4. Grassroots access and the economics of participation

The objective is not digital-only engagement but more governed pathways to participate. Interviews, workshops, mapping sessions, travel, oral processes, ceremonies, deliberation, and trust-building remain essential in many contexts, especially where participants prefer or require non-digital methods. Scaling those methods across large territories, overlapping deadlines, or several simultaneous projects can be costly and difficult to coordinate.

Governed mobile and web channels can change the marginal economics of participation. Once infrastructure, protocols, and support exist, additional eligible participants can contribute without a separate interview or meeting for every record. The advantage is conditional: digital participation still requires facilitation, verification, translation, honoraria, cultural protocol, accessibility, professional review, and adequate connectivity.

Lower collection cost is not legitimate if it shifts unpaid work onto Knowledge Holders. Where honoraria are enabled, they should be budgeted separately from platform and professional fees and designed to offset reasonable participation costs, provide a meaningful non-outcome-contingent incentive, and recognize time and expertise without purchasing knowledge, consent, or a preferred answer.

The defensible claim is therefore modest: digital channels can broaden potential access without making collection effort rise proportionally with each additional participant. They may reach people who cannot attend scheduled meetings, live away from the community, work seasonally on the land, or prefer time to consider a contribution, and can capture observations closer to when they occur.

Broader, properly governed participation can surface more potentially relevant records. Those records can then be contextualized and connected to project interactions, improving the evidence base for assessment and negotiation. More submissions do not automatically produce a stronger claim.

'You cannot negotiate an impact nobody captured' is a statement about evidentiary readiness, not legal entitlement. Capture does not itself create rights, an honorarium, causation, valuation, a better IBA, or a preferred outcome. Those questions remain contextual and require Nation leadership and, often, professional judgment.

Digital inclusion has a hard limit: connectivity. The Auditor General reported that in 2021, 42.9 percent of households on First Nations reserves nationally had access to 50/10 Mbps service; the figure for First Nations reserves in Manitoba was 14.58 percent, while urban areas nationally were at 99.3 percent.[19] These are 2021 figures and should not be read as current coverage levels. The structural lesson remains: Nation-side systems must support hybrid participation and cannot make broadband, smartphones, or digital literacy a condition of being heard.

5. From information to institutional capital

Calling information an asset is easy; making it productive institutional capital is harder. Information creates lasting value only when the institution can identify its source, rights and restrictions, authorized uses, official status, decision context, and currentness.

For Nation-side major-project work, institutional capital can include at least six layers. The first is source evidence: contributions, studies, correspondence, media, maps, and observations. The second is governance context: authority, consent, privacy, masking, sensitivity, protocol, and permitted use. The third is project context: geometry, activities, timing, alternatives, effects pathways, and regulatory milestones. The fourth is analysis: rights context, values, impacts, concerns, findings, and uncertainty. The fifth is institutional action: decisions, positions, submissions, requests, accommodations, and commitments. The sixth is continuity: monitoring, follow-up, responses, amendments, lessons, corrections, and future reuse.

These layers become institutional capital when authoritative relationships among them are governable. A scoped System-of-Record Function should connect the current Canonical Record to provenance, permissions, governance state, official status, version history, corrections, decisions, authorized outputs, commitments, and audit history. The goal is not universal centralization but intelligible, current, contestable, and traceable records for defined workflows.

When the layers remain disconnected, the Nation repeatedly rebuilds meaning. When governed relationships persist, prior studies can become starting points, concerns can be linked to new project footprints, commitments can be traced to their evidentiary and decision basis, and new staff can recover institutional history without treating earlier records as immutable truth.

The governed value chain

The framework distinguishes five economically different relationships that are often collapsed together.

Project or operational funding pays for scoped project, program, study, assessment, submission, implementation, or monitoring work. It does not purchase Nation governance, protected knowledge, approval, consent, or decision authority.

Professional and platform fees pay for expert judgment, technology, security, hosting, implementation, administration, and related services. They should remain visible rather than absorbing participant or community value into an undifferentiated margin.

Knowledge Holder honoraria support eligible participation by offsetting reasonable burdens, providing a meaningful non-outcome-contingent incentive, and recognizing time and expertise. They are not a purchase price for knowledge, rights, consent, privacy, use authorization, or a preferred answer.

Individual rights-linked value may arise where an authorized use engages identifiable individual rights or specifically attributable downstream value. Any mechanism depends on the actual right, use, and governing authority; none arises automatically from contribution alone.

Nation or community institutional value may arise from collective governance, official adoption, contextualization, aggregation, stewardship, continuity, and other community-level contributions. A participation mechanism requires an applicable legal, governance, or contractual basis and does not imply Nation ownership of every individual contribution.

Payment should track the distinct cost, labour, service, right, governance contribution, or institutional value it is intended to address. Separating these sources prevents a project fee from being described as compensation for every contributor, prevents an honorarium from being used as blanket consideration for

unrestricted use, prevents a community payment from extinguishing individual interests, and prevents individual rights from being treated as if they eliminate legitimate collective governance.

The Project-to-Capacity Conversion Principle asks whether project funding can produce both a defined output and a durable improvement in Nation-side capability, such as a governed mapped record, reusable analytical structure, auditable decision, traceable commitment, or staff experience embedded in a repeatable workflow.

Reuse is not indiscriminate copying. It remains constrained by purpose, consent, relevance, currentness, sensitivity, authority, methodology, correction, and official status. Some knowledge may require renewed engagement, remain internal, or be inappropriate for reuse.

The reframing is conditional. Where a governed foundation reduces avoidable reconstruction and strengthens authority at reasonable lifecycle cost, consultation and assessment need not remain only recurring project expenses. Where maintenance, governance, dependency, or security costs outweigh continuity benefits, the case for persistence should be revised.

6. Data sovereignty must be operational, not rhetorical

Data sovereignty is not reducible to server location. Hosting can matter for jurisdiction, security, procurement, treaty or Nation policy, and practical risk, but sovereignty also requires clarity about who may decide, see, use, correct, govern, and share information, for what purpose, under what authority, with what accountability, official status, and economic terms.

Infrastructure is not sovereign merely because it is branded as such, hosted in a particular jurisdiction, or sold to an Indigenous customer. Indigenous data-sovereignty frameworks concern practical authority over collection, access, use, interpretation, correction, governance, and sharing.[12][13][21][22][35][37] Federal impact assessment also subjects confidential Indigenous Knowledge to process-specific statutory and administrative protections and disclosure rules.[11][32]

Governance and infrastructure are complementary. Validity and legitimacy arise within the applicable legal and governance order; a generic digital system cannot create them.[38][39][40] Infrastructure can, however, make valid authority easier to exercise repeatedly and at lower transaction cost. It is therefore an operating mechanism, not a substitute for Indigenous law, Nation law or protocol, statute, common law, treaty, contract, or governance reform.

OCAP® establishes ownership, control, access, and possession as foundations for First Nations information governance, expressed in accordance with each Nation's worldview, knowledge, and protocols.[12][37] It is specifically a First Nations framework and should not be universalized across Inuit, Métis, or other Indigenous contexts. The design lesson is distinctions-based configuration to the law, governance, and protocol of the institution operating the system.

CARE adds a complementary people-and-purpose orientation through Collective Benefit, Authority to Control, Responsibility, and Ethics.[13] Indigenous data-sovereignty scholarship and CARE/FAIR implementation work emphasize operational mechanisms across the data lifecycle.[35][36][37] GIDA links Collective Benefit to Indigenous value creation, while Local Contexts emphasizes Indigenous control over access, collection, ownership, application, governance, and benefit sharing.[21][22]

UNDRIP reinforces the institutional dimension. Articles 18 and 19 address participation through Indigenous representative institutions; article 31 concerns control and protection of cultural heritage, traditional knowledge, and traditional cultural expressions; and article 32 addresses priorities for lands and resources and consultation before project approval.[14] Canada's UN Declaration Act affirms the Declaration's application in Canadian law and requires federal measures and an action plan, in consultation and cooperation with Indigenous peoples, to advance consistency with the Declaration.[20]

System-of-record status answers a narrower question: what representation or institutional position is authoritative for a defined purpose at a particular time. It does not determine ownership, create new uses, or establish objective truth, and canonical history should preserve correction, challenge, dissent, and supersession.

Legal terms must match the public promise. Platform rights should be tied to stated functions, explained plainly, and preserve distinctions among rights, privacy, governance, use, official status, legitimate personal and cultural uses, community interests, and portability. Economic recognition cannot cure platform rights that exceed or obscure their stated purpose.

Sovereignty also requires exit and continuity planning. Before dependence forms, Nations should understand export, retention, deletion, migration, surviving governance and economic obligations, and what occurs if the service or provider changes. Portability should preserve enough canonical history, provenance, permissions, official-status history, corrections, governance context, and audit evidence to migrate the authoritative workflow.

7. The six separations: rights, privacy, governance, use, official status, and economics

A legitimate system must make six questions independently answerable: What rights and interests attach? Who may see? Who may decide? Who may use? What is official for the defined institutional purpose? Who is paid, and for what?

Digital systems create risk when one account role, click, privacy choice, or general licence is made to carry multiple consequences, such as collection consent, visibility, reuse, external disclosure, official adoption, and economic consideration. Even detailed legal drafting can leave those consequences operationally obscure.

The Nation-Side Infrastructure Framework therefore introduces the **Rights-and-Value Separation Principle**. Its six analytical dimensions are connected, but they are not interchangeable.

Dimension	Question it answers	Governing design rule
Rights and legal interests	What individual, collective, legal, contractual, cultural, or governance interests attach to the contribution or institutional material?	The system should identify applicable interests without assuming that every record is property, that every interest is copyright, or that a service licence is ownership.
Privacy and sensitivity	Who may see the record, in what form, and with what masking, confidentiality, or restriction?	Visibility must remain distinct from use, official status, and economics. Public, Masked, Private, and Restricted handling should not automatically determine every downstream permission.
Institutional governance	Who may set protocols, interpret evidence, approve findings, authorize outputs, and make the Nation's institutional decision?	Authority must be positive, explicit, and scoped. A funder, platform role, technical administrator, or recipient does not acquire Nation decision authority merely through payment or access.
Use authorization	What may a recipient do, for which purpose, project, duration, transformation, reliance scope, and onward-use condition?	Internal use, approved output access, external reliance, onward use, and value-producing use should be separately defined, recorded, and enforceable, while disclosures compelled or authorized by law remain separately identified and auditable.
Official status and record authority	What record of a representation, finding, qualification, decision, or position is authoritative for the defined institutional purpose, and what history supports that status?	Official status must preserve provenance, adoption, correction, challenge, dissent, versioning, and supersession. It is scoped institutional authority: it does not make the underlying proposition objective truth or bind an external decision-maker by its own force.
Economics	Who is paid, by whom, for which distinct cost, labour, service, right, governance contribution, or institutional value, and under which trigger?	Project funding, professional and platform fees, honoraria, individual rights-linked value participation, and Nation or community participation require separate purposes, budgets, triggers, and records.

Rights are broader than ownership. Depending on the record and context, relevant interests may include copyright, contract, privacy, confidentiality, performers' rights, cultural interests, Indigenous law, Nation protocol, or other legal and governance interests; some factual or traditional knowledge may not fit conventional property categories at all.

Privacy and sensitivity answer who may see a record and in what form; they do not determine every permitted use. Public visibility is not blanket commercial permission, masking is not the same as an expressly authorized external use, and a Private or Restricted contribution may remain relevant internally without becoming externally visible.

Institutional governance answers who may make the Nation's decisions, including contextual review, report readiness, authorized outputs, and institutional positions. It does not erase Knowledge Holder agency or make an administrator the controller of every individual's privacy or rights.

Use authorization answers what a recipient may do and should, where relevant, specify purpose, project, recipient, duration, transformations, reliance, onward use, and expiry. Retention for audit, legal hold, canonical history, or prior approved output does not create a new permission.

Official status identifies what representation or institutional position controls for a defined purpose at a particular time. A governed record can establish what an identified Knowledge Holder represented and under what conditions; a Nation may separately adopt a claim, finding, qualification, decision, or position. Neither status makes the underlying proposition incontrovertible, so provenance, challenge, dissent, correction, and supersession must remain visible.

Economics answers who is paid and why. Honoraria support participation; rights-linked payments address identifiable individual rights or attributable authorized use where applicable; Nation or community participation addresses a distinct collective or institutional contribution where recognized; project funding and professional or platform fees serve different functions again.

Six short rules follow:

- 1. A licence is not ownership.**
- 2. Visibility is not permission.**
- 3. Funding is not governance.**
- 4. Retention is not authorization.**
- 5. Official status is not objective truth.**
- 6. Payment for one source of value is not payment for another.**

If a conflict arises, the system should preserve the competing claims and authorities so the applicable legal or governance order can resolve it. The framework does not prescribe a universal hierarchy among Indigenous law, Nation law or protocol, common law, statute, contract, privacy law, intellectual-property law, or other applicable rules.

The requirement is functional, not a universal contract or consent screen: participants and authorized decision-makers should be able to understand and exercise each dimension without inferring it from another. A platform that cannot do so is structurally unfit for trusted Digital Indigenous Engagement Infrastructure.

The Six Separations

Rights, visibility, authority, use, official status, and economics must remain independently legible.

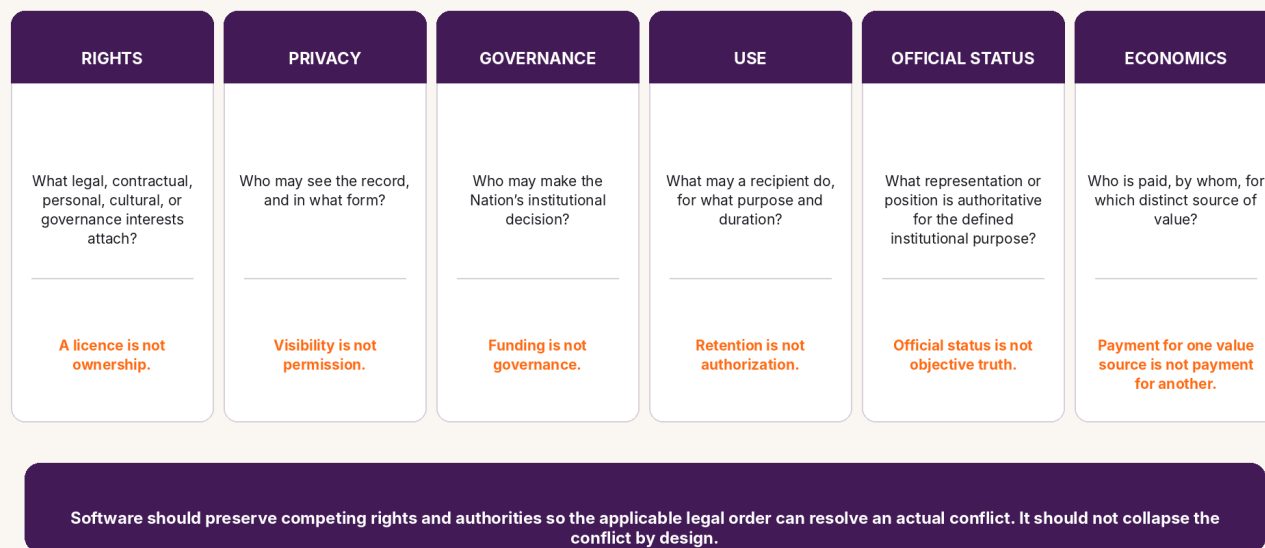


Figure 4. The Six Separations keep rights, visibility, institutional authority, permitted use, official record status, and economics independently legible.

8. Evidence, official records, decisions, and bargaining readiness

Digital Indigenous Engagement Infrastructure can improve preparation, continuity, and traceability, but it does not determine Aboriginal or treaty rights, consultation adequacy, required accommodation, causation, consent, or IBA terms.[33][34] Those remain legal, political, technical, evidentiary, and relational questions governed by the applicable law and facts.

What infrastructure can do is improve the conditions under which those questions are addressed. It can help the Nation identify relevant source records, connect project activities to places and values, preserve uncertainty, distinguish internal analysis from approved positions, document the reasons for decisions, and maintain a record of what was requested, offered, accepted, rejected, corrected, qualified, or left outstanding.

The federal Indigenous Knowledge Policy Framework and IAAC's Reconciliation Framework recognize the importance of Indigenous Knowledge, distinctions-based governance, confidentiality, community-specific processes, and Indigenous leadership.[44][45] Earlier IAAC practitioner guidance provides additional process detail on protocols, validation, collaboration, and protection of confidential knowledge.[8][9][10][11] Those materials are administrative guidance, not substitutes for the Impact Assessment Act, regulations, Indigenous law, or binding judicial authority.[32] Their relevance here is practical: they illustrate the need for a governed evidentiary process in which information can be received, contextualized, reviewed, protected, and used under appropriate authority.

Official claims, provenance, and evidentiary integrity

A System of Record can be authoritative as the institutional record that an identified Knowledge Holder made a particular representation and, separately, as to the institutional claim, finding, qualification, decision, or position

formally adopted by the Nation. The record should preserve source, context, privacy and use conditions, and attestation or review status. External masking may protect identity while internal provenance remains governed. Authority concerns institutional status and provenance, not the incontrovertible truth of the underlying assertion; correction, competing evidence, dissent, qualifications, and later decisions remain part of the canonical history.

Evidentiary value depends on more than storage, including authentication, provenance, system integrity, completeness, contemporaneity, methodology, context, admissibility, and weight. The federal **Canada Evidence Act** illustrates the importance of electronic-record integrity through ss. 31.1, 31.2, and 31.7, while preserving other admissibility rules beyond the authentication and best-evidence provisions addressed there.[27] A digital record architecture does not by itself establish admissibility or weight.

Nation-side record authority also has external limits. A Canonical Record does not by itself bind a regulator, court, tribunal, proponent, or other third party, become the statutory record, or override disclosure duties. Section 119 of the federal Impact Assessment Act protects confidential Indigenous knowledge subject to statutory exceptions, including procedural-fairness and legal-proceeding provisions, and requires consultation before fairness-based disclosure.[32] The design implication is to govern disclosure before submission and distinguish internal permissions from external legal obligations.

A mature System-of-Record Function should treat challenge and correction as first-class governance events, preserving what was asserted, by whom, on what basis, which decision-maker had authority, what version controlled, what changed, and whether a later record superseded rather than silently overwrote the earlier one.

This discipline can strengthen assessment and bargaining readiness by clarifying what matters, what evidence supports the Nation's position, what remains uncertain, which positions are official, and what measures remain outstanding. The proper claim is better preparation, traceability, and continuity, not guaranteed legal adequacy, consent, compensation, approval, or commercial result.

9. A new economic model: temporary funding, lasting capacity, governed reciprocity

Layered rights and fair value

Indigenous Knowledge and related observations, expressions, recordings, maps, narratives, and data may engage overlapping individual and collective rights and interests. Their legal character depends on the content, applicable Indigenous law and Nation protocol, statute, common law, contract, privacy and confidentiality rules, intellectual-property law, and actual use. The framework does not force all interests into copyright, property, or any single legal category.

Canadian copyright law protects qualifying original works and other subject matter within the Copyright Act. A compilation may be protected where statutory and originality requirements are met, and *CCH Canadian Ltd. v. Law Society of Upper Canada* requires originality grounded in skill and judgment while distinguishing protected expression from ideas.[28][29] Those rules do not make underlying knowledge, facts, ideas, observations, or unoriginal data copyrightable merely because they are culturally important or economically valuable; the relevant formulation is **compilation copyright, contractual or database-related rights where applicable**, not a generalized Canadian sui generis database right.

Depending on the facts and jurisdiction, a Knowledge Holder may have copyright, performers' or moral rights, privacy or confidentiality interests, contractual or property interests, and personality, image, voice, or likeness interests **where legally recognized**. A Nation or community may have distinct governance, stewardship,

protocol, confidentiality, contractual, compilation, institutional, or other collective interests. Neither layer should be presumed to extinguish the other.

A qualified Aboriginal-title analogy

Aboriginal title is not Indigenous Knowledge, and title doctrine does not automatically attach to knowledge, cultural expression, data, or a Knowledge Holder contribution. The paper uses title doctrine only as a qualified analogy, not as a direct source of ownership or economic entitlement.

The analogy is institutional, not doctrinal transposition. *Delgamuukw* and *Tsilhqot'in Nation* illustrate that Canadian law can recognize sui generis, collective, and intergenerational interests that do not map neatly onto ordinary alienable private property.[30][31] That observation supports careful separation of individual and community interests; whether any particular Indigenous Knowledge interest exists, who holds it, and what follows requires the applicable Indigenous and Canadian legal analysis.

Economic reconciliation, market legibility, and rights architecture

This paper uses **economic reconciliation** descriptively to refer to institutional arrangements through which Indigenous Peoples can participate fairly in economic value, capacity, governance, and opportunity. It is not presented as a freestanding Supreme Court of Canada doctrine. Any legal proposition about rights, consultation, title, treaty obligations, or compensation must stand on its own applicable authority.

Within this institutional-economics model, moral salience alone does not create a payment mechanism. **Interests are easier to price and finance where institutions make them identifiable, governable, enforceable, and capable of receiving value.** That is an inference from transaction-cost and institutional analysis, not a claim that markets cannot price uncertainty or that Coase or North studied Indigenous Knowledge markets directly.[23][24]

Rights architecture itself can be economic infrastructure. Distinguishing rights, governance, permitted use, official status, payment triggers, and accountable recipients can make an interest easier to contract around without reducing it to a commodity. The objective is not to monetize every form of Indigenous Knowledge, but to avoid architectures in which value is created while the relevant rights and recipients remain undefined.

Economic legibility includes a legible refusal to transact. Under the applicable law, Indigenous law, Nation protocol, or valid individual authority, knowledge or uses may be non-commercial, non-transferable, restricted, sacred, or otherwise unavailable for value-producing use. 'No external use' or 'no commercialization' is therefore a valid governed outcome.

The funder supports the work; the Nation directs it. Project, government, regulator, proponent, or other eligible funding may activate defined operational work without purchasing the Nation's interpretation, protected knowledge, individual privacy choices, official position, or decision authority.

Five distinct economic flows

Economic flow	Legitimate purpose	What it must not mean
Project or operational funding	Pays for scoped participation, implementation, studies, workflows, and support associated with a defined project or program.	The payer acquires Nation governance, protected knowledge, approval, consent, or decision authority.
Professional and platform fees	Sustain expert judgment, technology, security, hosting, implementation, administration, and product or service delivery.	Knowledge Holder or community value is absorbed invisibly into a vendor or advisor fee.
Knowledge Holder honoraria	Offset reasonable participation costs, provide a meaningful non-outcome-contingent incentive, and recognize eligible time and expertise.	Knowledge, consent, ownership, privacy, use authorization, an individual right, or a preferred answer has been purchased, or the honorarium exhausts separately warranted value-sharing.

Economic flow	Legitimate purpose	What it must not mean
Individual rights-linked value participation	Addresses an authorized use that engages identifiable individual rights or creates specifically attributable downstream value where the governing law, protocol, or agreement warrants a separate mechanism.	Every contribution automatically generates a royalty, or a community payment extinguishes an individual right or payment claim.
Nation or community economic participation	Addresses collective governance, official institutional adoption, contextualization, stewardship, aggregation, continuity, or other community-level value where an applicable framework recognizes economic participation.	IBA compensation, impact compensation, accommodation, resource-revenue sharing, payment for consent, ownership of every individual contribution, or automatic payment from storage or internal Nation use.

Knowledge Holder honoraria: cost coverage, incentive, and recognition

A Knowledge Holder honorarium is a participation payment with three distinct functions:

1. **Cost coverage.** It should offset reasonable costs and burdens of participating, which may include time, travel, connectivity, childcare, equipment, cultural or ceremonial preparation, lost work, and other opportunity costs appropriate to the context.
2. **Participation incentive.** It should provide a meaningful non-outcome-contingent incentive aimed at reducing practical barriers and unequal burdens of participation, not influencing the content of a contribution or overcoming a reasoned refusal to participate. The amount and design must remain appropriate to the context.
3. **Recognition.** It should recognize the participant's time, expertise, and contribution.

Recognition alone is insufficient. Amount, timing, eligibility, and payment method should materially offset reasonable participation costs, reduce practical barriers, and recognize the burden involved; the label 'honorarium' does not make an inadequate payment fair.

An honorarium remains distinct from wages, reimbursement, purchase price, payment for consent, impact compensation, IBA benefits, and royalties. It should never depend on a preferred answer or surrender of privacy, consent, rights, or cultural interests, and should be transparent, timely, funded before activation, proportionate to burden and expertise, and designed to avoid coercion or viewpoint dependence.

Eligibility should not depend on public visibility or a preferred viewpoint. Private or Restricted status should not automatically disqualify otherwise eligible participation, but availability of an honorarium does not guarantee eligibility or a minimum payment.

Individual rights-linked value participation

Where an approved use engages identifiable individual rights or specifically attributable downstream value, a separate rights-linked mechanism may be warranted, such as a licence fee, royalty, revenue share, or another arrangement suited to the actual right and use. Its recipient, amount, trigger, and authority must arise from applicable law, Indigenous law or protocol, contract, or other valid source; contribution, storage, or institutional relevance alone creates no payment obligation.

Individual rights-linked participation is analytically separate from the honorarium. The honorarium addresses the burden and value of eligible participation. A rights-linked mechanism addresses a different legal or economic relationship created by an authorized use. Payment under one category should not be presented as satisfying the other unless the governing instrument expressly and lawfully does so.

Nation or community economic participation

Nation or community economic participation addresses collective or institutional value arising from governance, official adoption, contextualization, aggregation, stewardship, and continuity. Those activities can create community-level value even where the Nation does not own every underlying individual contribution.

Where applicable legal, governance, or contractual architecture recognizes an economic interest in that contribution, an agreement may provide a royalty, licence-related payment, revenue share, service-linked participation, or another mechanism. A platform-derived Nation royalty is one possibility, not the definition of the interest or a required feature of Digital Indigenous Engagement Infrastructure.

Nation or community participation remains distinct from IBA compensation, impact compensation, accommodation, resource-revenue sharing, and payment for consent, and it does not extinguish separately applicable individual rights or value-sharing obligations.

No community payment should arise by surprise from contribution, storage, retention, routing, review, project linkage, or the Nation's own internal use. Any mechanism should define authority, payer, recipient, value base, calculation, duration, permitted use, reporting, audit, dispute, onward-use, and termination terms before activation.

The framework creates neither retroactive payment obligations nor implied licences merely by identifying a category of value. Payable mechanisms require applicable law, Indigenous law or protocol, or an agreement with defined authority and triggers before the relevant value-producing use, unless governing law provides otherwise. Payment creates no use rights beyond those actually authorized.

The model creates a conditional economic case for persistence. A low-friction persistent core can reduce the risk that institutional continuity disappears when a project or grant ends, while project activation can make costs compatible with project funding. But persistent infrastructure is not inherently superior. Secure hosting, governance, support, implementation, maintenance, migration, and security have real costs. Where those costs or dependency risks exceed continuity benefits, the institutional architecture should be revised rather than defended as a matter of principle.

The intended shift is from temporary activity to durable capability and from opaque value capture to governed reciprocity. Project funding can support immediate work and, where justified, strengthen the institutional foundation; Knowledge Holders can be supported without commodifying knowledge; individual and community interests can remain distinct; and authorized value-producing uses can identify who should receive value and why.

Five Distinct Economic Flows

Payment should track the cost, labour, service, right, governance contribution, or institutional value it is intended to address.

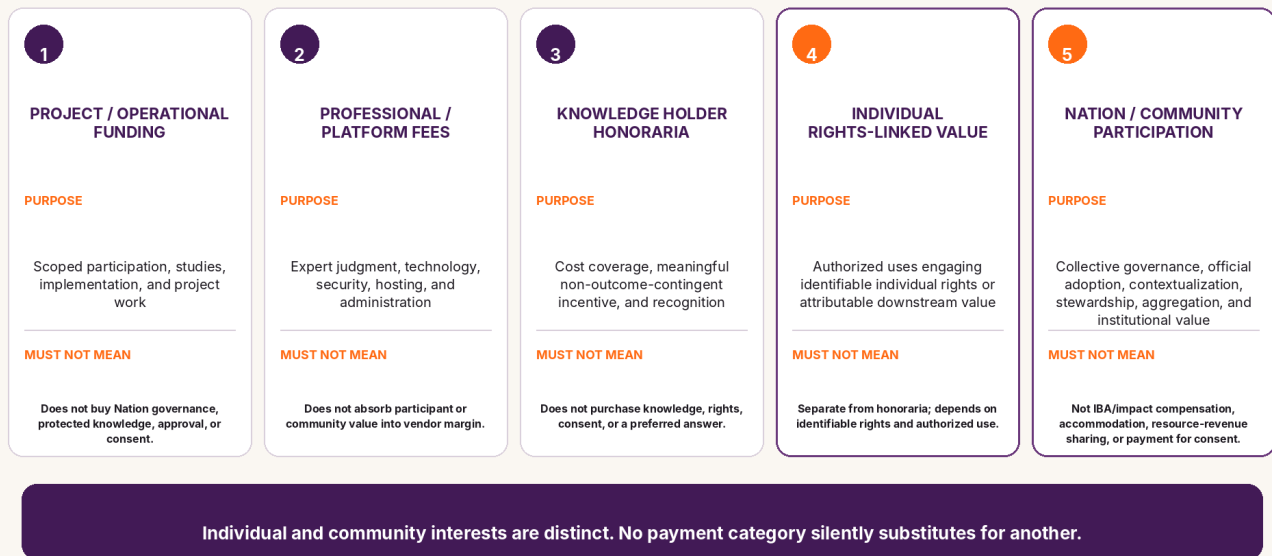


Figure 5. The Governed Reciprocity Model separates five economic flows so that payment tracks distinct costs, services, rights, governance contributions, and institutional value.

10. Design requirements for legitimate Digital Indigenous Engagement Infrastructure

The argument for Digital Indigenous Engagement Infrastructure is vendor-neutral. Any product, government program, Indigenous-led system, data trust, registry, shared service, or partnership claiming to fill the Nation-Side Digital Infrastructure Gap should be evaluated against substantive requirements rather than a feature list. The framework yields twenty-eight requirements.

- 1. Positive, scoped authority.** Authority to bind a Nation, approve a position, access a sensitive record, change another person's privacy setting, or authorize an external use must be established positively and within scope. A job title, account role, funding relationship, or directory listing is not enough.
- 2. Individual and institutional separation.** The system must distinguish Knowledge Holder agency from institutional governance. Individual privacy, masking, consent, and rights should not be silently controlled by institutional roles, while an individual permission should not be treated as automatically displacing a valid Nation law, protocol, or governance rule.
- 3. The Six Separations.** Rights and legal interests, privacy and sensitivity, institutional governance, use authorization, official status and record authority, and economics must remain independently understandable and enforceable.
- 4. Hybrid participation.** Mobile and web tools should expand access, but oral, facilitated, paper, offline, ceremonial, assisted, and in-person pathways must remain possible. The digital divide is a design constraint, not a burden to be shifted onto participants.
- 5. Provenance and context.** Source, date, authority, sensitivity, scale, purpose, method, interpretation, uncertainty, and relevant restrictions should travel with the record. A mapped point or extracted statement without context can be materially misleading.

6. Scoped System-of-Record Function. For defined Nation-side workflows, authorized users should be able to determine which record is current, why it is authoritative, what preceded it, which permissions and governance conditions apply, and what audit events establish the institutional history.

7. Official-status discipline. The system should distinguish a source representation, a reviewed record, a draft finding, and a formally adopted Nation claim, qualification, decision, or position. Official status should record institutional authority without presenting the underlying proposition as objective truth.

8. Correction, challenge, dissent, and supersession. A mature record architecture should preserve competing evidence, dissent, corrections, qualifications, and later decisions. A superseding record should not silently erase the earlier authoritative state or the reason it changed.

9. Source, draft, decision, and output separation. Internal discovery should not equal report readiness. Candidate evidence should not equal an approved finding. A draft report should not equal the Nation's position. An approved submission should not automatically expose its source records.

10. Purpose- and recipient-specific use authorization. Internal use, approved output access, external reliance, onward use, and value-producing use should be separately scoped, recorded, and enforced, with recipient, purpose, duration, permitted transformations, and termination conditions where relevant. The system must also distinguish consensual or contractual use limits from disclosures compelled or authorized by applicable law and preserve the legal basis, scope, consultation, and conditions associated with any such disclosure.

11. Retention-use separation. Audit evidence, consent history, legal holds, prior approved outputs, canonical history, and payment records may require retention. Retention must not silently authorize a new recipient, purpose, or economic use.

12. Security as ongoing risk management. Role-based access, named accounts, least privilege, multifactor authentication, logging, backup, incident response, restricted-content handling, vulnerability management, and recovery controls should be verified. No provider should promise perfect security.

13. Governed interoperability. The Nation should be able to receive project information, work with authorized experts, integrate specialist tools, and provide approved outputs without converting interoperability into unrestricted extraction or another party's system into the universal authority for Nation-side records.

14. Institutional memory. The infrastructure should preserve enough context across staff, consultants, projects, and phases to reconstruct what the Nation knew, what it decided, why it decided it, which record and authority controlled, and what happened afterward.

15. Institutional extensibility without functional centralization. A governed foundation may support additional authorized work without turning each function into a new silo, but extensibility does not mean every record becomes available for every purpose or that one vendor should control every institutional function.

16. Distinctions-based configuration. First Nations, Inuit Governments, Métis Governments, Designated Inuit Organizations, Treaty Organizations, Regional Inuit Associations, and other Indigenous Institutions may hold different mandates, laws, protocols, and authority structures. A single default cannot substitute for those differences.

17. Measurable capacity creation. Success should include staff capability, time to retrieve records, time to prepare work product, reduction in repeated collection, workflow continuity, commitment follow-through, and readiness for a later project. Login counts are not sufficient.

18. Human judgment and review. Automation may organize, surface, compare, summarize, or draft. It should not decide the Nation's position. Material outputs should retain provenance, review status, assumptions, limitations, and responsible human approval.

19. Intellectual-property and platform-rights legibility. Knowledge Holder rights, Nation governance and stewardship interests, platform intellectual property, professional work product, recipient rights, and system-of-

record authority should not be collapsed into a vague 'data ownership' claim. Platform rights should be proportionate to stated functions and explained in plain language.

20. Project or operational funding separation. Funding for scoped project work should have a defined purpose and should not imply that the payer acquires governance, protected knowledge, approval, consent, or decision authority.

21. Professional and platform fee separation. Fees for expert services, technology, security, hosting, implementation, and administration should be transparent and should not absorb Knowledge Holder or community value invisibly.

22. Honoraria integrity. Where enabled, Knowledge Holder honoraria should materially offset reasonable participation costs, provide a meaningful non-outcome-contingent incentive, and recognize time and expertise. They must not purchase knowledge, rights, consent, privacy choices, use authorization, or a preferred answer.

23. Individual rights-linked value discipline. Where an authorized use engages identifiable individual rights or creates specifically attributable downstream value, any additional individual mechanism should identify the right, authorized use, payer, recipient, trigger, calculation, duration, and governing authority. It should not arise automatically from contribution.

24. Nation or community economic-participation discipline. Any community mechanism should identify the collective or institutional value on which it is based, remain distinct from individual rights, and be expressly separated from IBA compensation, impact compensation, accommodation, resource-revenue sharing, and payment for consent.

25. Funder-governor separation. The funder supports the work; the Nation directs it. Technical administration, procurement leverage, or payment should not create substantive governance authority unless validly authorized through the applicable governance structure.

26. Exit, portability, and continuity before dependence. Migration, export, retention, deletion, continued reliance, surviving permissions, surviving economic obligations, and transfer of canonical history should be understandable before a contract ends or a service changes. Portability should preserve material provenance, governance state, official-status history, corrections, permissions, versions, and audit evidence.

27. Auditability, dispute, and appeal. Material governance, authorization, official-status, and economic events should be auditable. Where a program can materially affect rights, access, payment, or official status, correction, dispute, appeal, or review pathways should be defined rather than improvised after a conflict occurs.

28. Empirical proportionality and revisability. The infrastructure should expose enough evidence to test whether continuity benefits exceed lifecycle cost, whether transaction costs are actually reduced, whether participation quality is maintained, whether dependency increases, whether authorization latency and governance overhead remain proportionate, and whether the rights-and-value architecture remains usable. A design that fails those tests should be revised rather than protected by theory.

11. Implications for governments and regulators

Governments and regulators should treat Digital Indigenous Engagement Infrastructure as part of the enabling environment for meaningful participation, not as an optional technology purchase. When public systems become faster and more data-intensive, rights-holders need corresponding capacity to receive, assess, and respond to information.

This has procurement and program-design implications. Capacity funding should allow investments in persistent governance, data, and workflow infrastructure, not only project-specific consultant hours and final deliverables. Funding conditions should permit the Nation to retain the institutional foundation, records, and capabilities built through the project. Reporting requirements should not force sensitive source information into external systems when an approved output would suffice.

Government digital modernization should also be designed with an interface for Nation-led processes. The objective is not to make every Nation adopt a government portal or to make a government registry authoritative for Nation-side evidence. It is to support exchange between separate Systems of Record under clear authority: project descriptions in, questions and approved submissions out, receipt and response events recorded, and protected knowledge remaining governed on the Nation side. Each system should remain authoritative only within its defined institutional scope.

Regulators should recognize that better records can improve reviewability without converting consultation into a checklist. Academic work on rights-holder participation and Indigenous-led impact assessment likewise cautions that formal opportunities to participate do not by themselves resolve questions of authority, implementation, capacity, or institutional constraint.[42][43] A structured record can show what information was provided, what concerns were raised, how responses changed, what remains outstanding, and what commitments were made. It cannot by itself establish that consultation was meaningful or legally adequate.

A regulator-facing interface must also preserve public-law constraints. Where a Nation asks a regulator to rely on an approved output, the material made available must be sufficient for the regulator to discharge its statutory mandate and applicable procedural-fairness obligations. Confidentiality and source protection should be managed through the protections, consultation mechanisms, protective conditions, and disclosure rules available under the governing process rather than assumed from Nation-side platform settings alone.[32]

Finally, governments should avoid creating digital participation mandates that assume universal connectivity. The Auditor General's findings make clear that infrastructure and affordability remain uneven.[19] Programs should fund devices, connectivity, facilitation, translation, training, and hybrid methods where required.

12. Implications for project proponents and capital providers

Project proponents may initially see Digital Indigenous Engagement Infrastructure as belonging outside their operating model. In practice, stronger Nation-side capacity can create project value without transferring control of Indigenous Knowledge.

A better organized Nation-side process can improve the clarity of requests, the continuity of discussions, the traceability of commitments, and the ability to identify issues earlier. It can reduce the risk that a new proponent team unknowingly repeats a prior mistake or that a commitment becomes detached from the concern it was meant to address. It can also provide a more disciplined channel for approved Nation submissions and responses.

The commercial boundary must be explicit. Funding Nation-side work should not by itself purchase source data, Knowledge Holder identities, precise locations, or decision authority. The proponent may fund participation or receive an approved output under an agreement, subject to any independent legal disclosure or process requirements. The Nation remains responsible for its interpretation and authorized position. This separation is not an obstacle to partnership; it is a condition for trust and commercial clarity.

Digital Indigenous Engagement Infrastructure may contribute to institutional risk management by improving continuity, traceability, and visibility into unresolved issues and commitments. Better evidence and follow-through do not guarantee consent, approval, or schedule certainty. Their potential value is especially relevant across portfolios and long-lived assets where engagement continues through amendments, construction, operation, monitoring, and closure.

The long-term model is not one shared database. It is an interoperable ecosystem of authoritative Systems of Record. The proponent may maintain the authoritative project record for its activities; the regulator maintains the statutory record; and the Nation maintains its governed System of Record for Nation-side evidence, analysis, decisions, authorized outputs, commitments, and institutional memory. Each system is authoritative only within its defined scope, and information moves between them through authorized interfaces and governed outputs. Digital fairness requires compatible systems with respected boundaries, not one universal source of truth.

13. Implications for professional advisors

Digital Indigenous Engagement Infrastructure should make lawyers, scientists, planners, GIS professionals, archaeologists, biologists, negotiators, and Indigenous Knowledge practitioners more effective, not be presented as replacing them.

In complex projects, professional effort can be consumed by locating files, reconciling versions, rebuilding project history, reformatting evidence, recreating standard structures, and coordinating handoffs. Those tasks may be necessary, but they are not where expert judgment creates the most value. A governed system can reduce avoidable reconstruction so advisors can focus on interpretation, methodology, strategy, technical review, legal advice, and negotiation.

The expert-facing proposition is therefore not "consultants are too expensive." It is "pay experts to think, not to rebuild the file." Authorized advisors should be able to work within the Nation's governed System-of-Record context under Nation-granted permissions, without acquiring independent rights to the records. Where the Nation and the relevant professional determine that preservation is appropriate, authorized work product may become part of the Nation's canonical institutional history under controls designed to preserve applicable privilege, confidentiality, ownership, and use restrictions. The framework does not prescribe storage of privileged material or imply that platform access cannot affect privilege or waiver analysis. Their work should strengthen the Nation's institutional memory rather than remaining only in the advisor's own systems.

This model can also improve professional continuity. A future advisor can see the evidence and rationale underlying prior work, subject to privilege and confidentiality. An expert can reuse approved structures across projects without copying client-specific sensitive content. Handoffs can be documented rather than reconstructed from email threads.

Professional bodies and advisors should still scrutinize automation. Draft generation, classification, and mapping can support expert work, but they can also create false confidence. Every material output needs clear provenance, review status, assumptions, limitations, and responsible human approval.

14. Protektant as a practical implementation

Protektant is not the theory. It is one practical implementation of the Nation-Side Infrastructure Framework.

Protektant is developed by Traditional Knowledge Inc. as Nation-controlled digital infrastructure for consultation, Indigenous Knowledge governance, impact assessment, and related institutional workflows. It is one implementation of a broader vendor-neutral framework against which Protektant and alternatives should be tested.

The intended System-of-Record role is scoped to records and workflows for which Protektant has been validly designated. In that role, the implementation objective is to preserve canonical history, provenance, permissions, privacy and sensitivity state, governance state, official status, corrections, approvals, authorized outputs, commitments, delivery events, and audit history without treating record authority as ownership, blanket use authorization, or objective truth.

The implementation objective also includes portability and governed interoperability. A Nation should be able to preserve authorized internal copies, migrate the relevant canonical history, and work with external systems without surrendering the Nation-side governance context or making Protektant authoritative for unrelated institutional purposes.

Traditional Knowledge Inc.'s public operating model contemplates a persistent Nation-side institutional foundation with scoped project activation. That commercial architecture is intended to support continuity while preserving payer-governor separation. The governing principle is that project or other eligible funding may support Nation-side work without conferring access to protected Indigenous Knowledge, Knowledge Holder identities, the Nation's interpretation, official position, or decision authority merely by virtue of payment.

This paper does not rely on any claim that a particular Protektant feature is currently production-ready or that any economic mechanism is currently available. Product capability, security, availability, contractual terms, implementation readiness, and any honoraria, royalty, payment, or value-sharing functionality can change and should be verified against current documentation, demonstrations, contracts, and technical evidence. This section describes implementation direction and framework alignment, not a warranty that every theoretical requirement is live.

Protektant's implementation should be evaluated against the same requirements applied to any other system: positive authority, the Six Separations, a scoped System-of-Record Function, correction and challenge, verified security controls, hybrid participation, portability and continuity, governed interoperability, source-to-output separation, platform-rights transparency, economic separation, and measurable capacity creation. If it does not meet those requirements, the theory does not excuse the implementation.

The Digital Indigenous Engagement Infrastructure chain

A persistent operating layer should connect the lifecycle without collapsing distinct governance decisions.

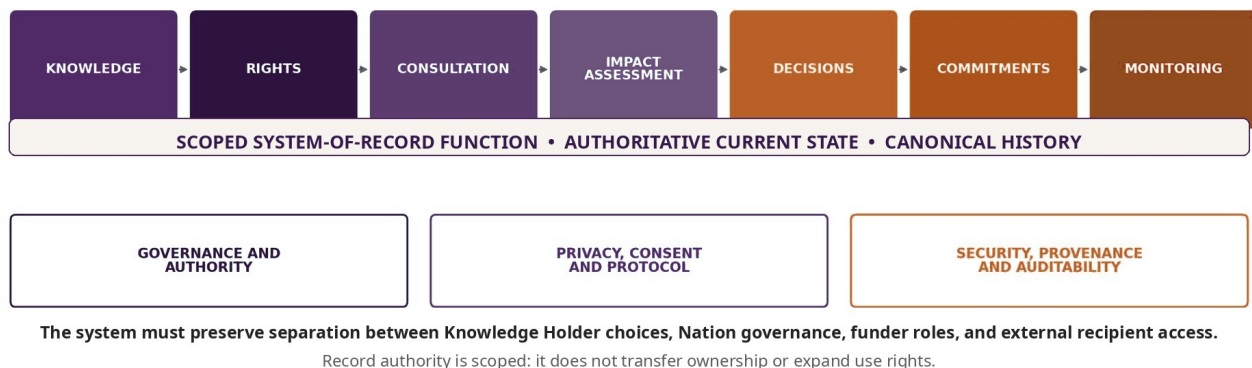


Figure 6. The Digital Indigenous Engagement Infrastructure chain links the project lifecycle through a scoped System-of-Record Function without collapsing distinct governance decisions.

15. What this model does not claim

A strong framework is partly defined by its limits. Digital Indigenous Engagement Infrastructure does not substitute for the Crown's duty to consult or legally required accommodation,[33] nor for Indigenous law, treaty implementation, Nation governance, legal or technical advice, relationship-building, ceremony, or political decision-making.

The model does not treat a rationally produced allocation as socially optimal. Individually rational action can coexist with underinvestment, collective-action, appropriability, financing, or transaction-cost problems.[23][24][25][26] The market-forces argument is causal and institutional, not a defence of the status quo.

It does not claim that persistent infrastructure is always economically superior. A durable platform has lifecycle costs, maintenance obligations, governance burden, security requirements, migration risk, and dependency risk. If those costs exceed continuity and transaction-cost benefits in a particular context, the recommendation should change.

The framework does not guarantee consultation adequacy, free, prior, and informed consent, project approval, a better IBA, increased compensation, stronger rights recognition, accommodation, or a regulatory result. Better information and workflow can improve readiness and traceability; outcomes still depend on law, facts, power, relationships, project design, evidence, and decisions by multiple parties.

It does not claim that all Indigenous Knowledge is copyright or that copyright is the natural legal container for Indigenous Knowledge. Copyright may protect qualifying original expression and other protected subject matter; compilations may receive protection where statutory and originality requirements are met.[28][29] Facts, ideas, knowledge, observations, cultural interests, protocols, privacy, confidentiality, Indigenous law, and contractual interests require their own analysis.

It does not claim that Aboriginal-title law directly governs Indigenous Knowledge. *Delgamuukw* and *Tsilhqot'in Nation* are used only as a qualified analogy showing that Canadian law can recognize collective and intergenerational interests that do not map neatly onto ordinary alienable private property.[30][31]

It does not claim that **economic reconciliation** is a freestanding Supreme Court of Canada doctrine. The term is used descriptively as an institutional and policy concept. Legal propositions about title, treaty rights, consultation, compensation, and Crown obligations must be grounded in their applicable authorities.

It does not claim that a Nation necessarily owns every individual Knowledge Holder contribution or that individual authorization necessarily resolves every community governance issue. Individual and community interests may coexist, overlap, or conflict. The system should preserve the competing interests and allow the governing legal order to resolve an actual conflict.

A System of Record does not determine objective truth. It can establish what representation was made, what version controlled, who had authority, and what position the Nation formally adopted, while preserving corrections, competing evidence, dissent, qualifications, and later decisions. Admissibility and evidentiary weight remain questions for the applicable law and forum.[27]

The framework creates no universal entitlement to an honorarium, individual royalty, Nation or community payment, or other value share. Each mechanism depends on applicable rights, authority, funding, agreement, governance approval, and legal or financial conditions; contribution, storage, retention, routing, review, project linkage, or internal Nation use alone does not create an entitlement.

An honorarium is not the purchase price for Indigenous Knowledge, consent, privacy, rights, a preferred answer, or unrestricted use. Nation or community participation is not IBA compensation, impact compensation, accommodation, resource-revenue sharing, or payment for consent. Neither community nor individual payment silently extinguishes the other's applicable interests.

It does not mean more data is always better. Sensitive, sacred, family-controlled, protocol-bound, disputed, or irrelevant information may need to be excluded, restricted, generalized, corrected, or retained outside the platform. A system that encourages indiscriminate collection can create more risk than value.

It does not justify digital-only engagement. Connectivity, language, accessibility, trust, cultural practice, and participant preference require hybrid methods. Technology should expand pathways, not narrow them.

It does not remove the need for professional judgment. Automated drafts and analytical tools must remain reviewable, explainable, and subordinate to human authority. The Nation decides what becomes its official position.

It does not mean one System of Record or one vendor should control every institutional record, function, or purpose. Record authority is scoped. Interoperability, portability, procurement discipline, governance, and exit planning remain essential.

Finally, the author-defined terminology does not appropriate Indigenous law, knowledge, or governance. It is an analytical vocabulary for a specific structural problem, and its legitimacy depends on whether Indigenous rights-holders find it accurate, useful, empirically defensible, and adaptable to their own laws and priorities.

16. A research and measurement agenda

The Nation-Side Infrastructure Framework should be tested empirically through a disciplined evidence program built with participating Nations and Indigenous Institutions. The objective is not to accumulate favourable anecdotes. It is to determine whether the causal theory, governance architecture, and economic distinctions survive real-world use.

First, measure the reset cost. Establish baseline staff time spent locating prior records, consultant time spent reconstructing context, repeated interviews, duplicate mapping, number of systems used, time from project notice to a usable internal draft, and the proportion of prior work that can be retrieved and applied responsibly.

Second, measure transaction cost and investment behaviour. Test whether a persistent Nation-side foundation changes the amount of reconstruction required, the speed of project activation, procurement burden, coordination cost, authorization latency, time from an external request to an approved output, duplicated approval steps, and the share of project funding that can shift from rebuilding infrastructure to new substantive work. The market-underinvestment theory should be examined rather than assumed.[23][24][25][26]

Third, measure participation access. Track who was able to participate through mobile, web, facilitated, paper, offline, oral, and in-person pathways; what barriers remained; how long participation took; and whether digital options broadened access without excluding people who prefer other methods.

Fourth, measure evidence quality, not only volume. Examine provenance completeness, contextual review, relevance, privacy handling, map accuracy, uncertainty, duplicate records, correction rates, challenge rates, and the extent to which evidence can be connected to project interactions and assessment findings.

Fifth, measure capacity creation. Track staff training, workflow independence, continuity after consultant departure, ability to onboard new staff, time to retrieve prior decisions, ability to track commitments, and adoption of a second authorized workflow or project without rebuilding the core environment.

Sixth, measure the Six Separations. Test whether participants and administrators can distinguish rights and legal interests, privacy and sensitivity, institutional governance, use authorization, official status and record authority, and economics; whether role boundaries are technically enforced; whether the distinctions remain understandable under real operational pressure; and whether the resulting governance steps create delay or administrative burden proportionate to the risks they are intended to control.

Seventh, measure System-of-Record integrity. Test whether authorized users can identify the Canonical Record, reconstruct provenance and version history, determine the permissions and governance state that applied, see why a record became official, trace corrections and challenges, distinguish supersession from deletion, and recover the institutional history without treating official status as objective truth.

Eighth, measure trust and governance. Evaluate whether Knowledge Holders understand privacy, rights, use, and official-status choices; whether Nations understand institutional controls; whether funder roles remain bounded; whether disputes occur; whether those disputes can be resolved through defined processes; and whether the architecture increases or reduces perceived dependency.

Ninth, measure economic legibility across all five flows. Track project funding, professional and platform fees, Knowledge Holder honoraria, individual rights-linked value participation, and Nation or community economic participation separately. Where payments exist, test whether budgets, authority, triggers, calculations, tax or administrative burden, payment timing, disputes, audit trails, and recipient understanding preserve the intended distinction.

Tenth, measure honoraria adequacy and neutrality. Determine whether honoraria materially offset reasonable participation costs, provide a meaningful non-outcome-contingent incentive, recognize time and expertise, remain viewpoint-neutral, and avoid becoming coercive or functionally tied to a preferred answer.

Eleventh, measure operational sustainability and portability. Evaluate security, hosting, implementation, maintenance, governance burden, user support, migration, exit, continuity, vendor dependency, and the total lifecycle cost required to preserve a trustworthy institutional foundation.

Twelfth, compare alternatives. Test the framework against existing Indigenous-led models, non-digital institutional arrangements, shared services, data trusts, registries, consultant-led approaches, and other technology architectures. The relevant question is not whether this framework can produce benefits. It is whether it performs better on the outcomes that matter than credible alternatives.

Falsification and revision conditions

The framework should be revised, narrowed, or rejected where credible evidence shows that any of the following conditions persist after reasonable implementation maturity:

1. Persistence does not materially reduce reconstruction, coordination, or transaction cost across projects.
2. Maintenance, governance, security, or migration costs exceed the continuity benefits that persistence creates.
3. Digital participation reduces evidence quality, trust, accessibility, or meaningful participation relative to feasible alternatives.
4. The infrastructure increases dependency, centralization, or vendor control in ways that weaken Nation authority or practical exit.
5. The Six Separations prove too complex, unstable, or operationally unusable to preserve under real-world conditions, or create authorization delay and governance burden disproportionate to the risks they control.
6. System-of-Record authority creates false certainty, suppresses dissent or correction, or causes decision-makers to confuse official status with objective truth.
7. Honoraria or other economic mechanisms distort participation, create outcome-contingent incentives, obscure rights, or produce more governance burden than value.
8. Existing Indigenous-led or alternative institutional models solve the identified problem more effectively, with lower cost, stronger legitimacy, or better governance outcomes.

Results should be published only with appropriate authority and without disclosing protected knowledge. Anonymous workflow evidence may be useful before named case studies are possible. The intellectual standard should be symmetrical: evidence that supports the framework should strengthen it, and evidence that contradicts the framework should change it.

17. Conclusion: every project should leave the Nation stronger

Canada's major-project system is becoming more digital, data-intensive, and time-compressed. That transition can improve administration and coordination, but it can deepen asymmetry if governments and proponents gain stronger persistent systems while Nations receive more deadlines, portals, project-specific work, and requests for knowledge without a durable institutional foundation.

The paper's causal theory is deliberately different from a simple market-failure narrative. **Institutional arrangements shape rights, incentives, transaction costs, funding, and therefore investment.** Project-specific rationality can underprovide shared Nation-side capacity, making Digital Indigenous Engagement Infrastructure a proposed market-enabling institutional response rather than evidence of irrational conduct.[23][24][25][26]

That theory also disciplines the solution. **Governance determines who has authority; infrastructure determines whether valid authority can be exercised repeatedly, reliably, and at sustainable transaction cost.** Infrastructure cannot legitimate invalid authority, and governance that cannot be executed in the workflow may remain nominal. Fair modernization requires both.

The long-term architecture is an interoperable ecosystem of scoped Systems of Record, not one universal database. Proponents, regulators, and Nations may each maintain authoritative records for different responsibilities, while the Nation-Side Operating Layer preserves the Canonical Record and history for defined Nation-side workflows and exchanges only authorized information externally.

System-of-record authority must remain precise. It can establish what an identified Knowledge Holder represented and what institutional position the Nation adopted, but it cannot make software an arbiter of objective truth, bind external decision-makers, or displace applicable admissibility and disclosure rules. Correction, dissent, competing evidence, qualifications, and later decisions remain part of the governed record.[27][32]

The Six Separations apply the same discipline to rights and legal interests, privacy and sensitivity, institutional governance, use authorization, official status and record authority, and economics. The framework neither forces Indigenous Knowledge into copyright nor assumes Nation ownership of every individual contribution, and its use of Aboriginal-title doctrine remains a qualified analogy rather than a doctrine directly governing Indigenous Knowledge.[28][29][30][31]

The economic architecture likewise keeps five flows distinct: project or operational funding, professional and platform fees, Knowledge Holder honoraria, individual rights-linked value participation, and Nation or community economic participation. **Payment should track the cost, service, right, governance contribution, or institutional value it addresses; no category silently purchases or extinguishes another.**

The model should ultimately be judged by evidence: whether persistence reduces reconstruction and transaction cost, strengthens rather than weakens Nation authority, expands practical participation without reducing evidence quality, preserves correction and dissent, keeps the five economic flows understandable, and creates lifecycle benefits exceeding lifecycle costs. If not, the framework should change.

Every major project requires infrastructure. The Nation's participation in that project should build infrastructure too, where the evidence shows that doing so creates durable net institutional value.

That is the Nation-Side Infrastructure Framework. Its central test remains simple: **every project should leave the Nation stronger.**

Nation-Side Infrastructure Test

The following questions provide a vendor-neutral test for any platform, program, data trust, registry, shared service, or digital partnership claiming to provide Digital Indigenous Engagement Infrastructure.

Test	Core question
Authority	Who is authorized to act, for which function, territory, project, data class, and period, what establishes that authority, and does the system avoid determining rights-holding or representative status by software default?
Knowledge Holder agency	Can individual privacy, masking, contribution, consent, and applicable rights choices be exercised and enforced at record level?
Nation governance	Can the Nation govern protocol, contextual review, interpretation, report readiness, official adoption, authorized outputs, and institutional decisions?
Funder-governor separation	Can an external funder support the work without buying access, interpretation, approval, consent, protected knowledge, or decision authority?
Six Separations	Are rights and legal interests, privacy and sensitivity, institutional governance, use authorization, official status and record authority, and economics separately defined and understandable?
Use authorization	Are internal use, approved output access, external reliance, onward use, and value-producing use separately scoped, recorded, and enforced, while disclosures compelled or authorized by law are separately identified and governed?
Retention discipline	Can the system retain lawful audit or canonical history without treating retention as authorization for a new use?
Official-status discipline	Can users distinguish a source representation, reviewed record, draft, formal Nation finding or position, correction, challenge, dissent, and superseding decision?
System-of-record integrity	For defined workflows, is there a scoped authoritative current record with canonical history, provenance, permissions, governance state, versions, corrections, approvals, outputs, and audit events?
Truth-status discipline	Does the system avoid representing official institutional status as conclusive objective truth or as externally binding by its own force while preserving evidentiary provenance and weight?
Provenance	Does each material record retain source, date, purpose, restrictions, version, context, method, and uncertainty appropriate to its use?
Source-output separation	Are raw records, candidate evidence, drafts, approved findings, official positions, and external outputs distinct?
Challenge and correction	Can errors, competing evidence, dissent, and qualifications be recorded and resolved without erasing the prior institutional history?
Security	Are access, least privilege, authentication, logging, backups, incident response, vulnerability management, and restricted-content controls verified?
Hybrid participation	Can mobile, web, offline, paper, facilitated, oral, assisted, ceremonial, and in-person pathways coexist?
Interoperability	Can the system exchange authorized project information and outputs without creating unrestricted extraction or surrendering Nation-side record authority?
Regulatory and legal interface	Does the design distinguish Nation-side permissions from statutory disclosure, procedural-fairness, natural-justice, evidentiary, recordkeeping, and regulator-facing obligations, while using available confidentiality and consultation protections where applicable?
Institutional extensibility	Can the governed foundation support additional authorized work without creating new silos, broad new permissions, or functional centralization?

Test	Core question
Continuity	Does the institutional foundation survive staff turnover, consultant departure, and the end of project funding where persistence remains justified?
Capacity	Does use measurably improve staff capability, retrieval time, project readiness, follow-through, and responsible reuse?
Lifecycle economics	Do avoided reconstruction, continuity, governance, and project benefits justify total lifecycle cost, maintenance burden, security requirements, dependency risk, authorization latency, and governance overhead?
Platform-rights proportionality	Are platform rights tied to stated functions, explained in plain language, and bounded by applicable rights, privacy, governance, use authorization, official status, and portability?
Copyright and legal-category discipline	Does the system avoid assuming that all Indigenous Knowledge is copyright or that every relevant interest is a conventional property right?
Economic separation	Are project funding, professional and platform fees, Knowledge Holder honoraria, individual rights-linked value participation, and Nation or community participation separately defined, budgeted, triggered, recorded, and explained?
Honoraria integrity	Where enabled, do honoraria materially offset reasonable participation costs, provide a meaningful non-outcome-contingent incentive, and recognize time and expertise without purchasing rights, consent, privacy, use authorization, or a preferred answer?
Individual rights-linked value	Where an authorized use engages identifiable individual rights or creates attributable downstream value, is any additional mechanism grounded in the actual right, authorization, payer, recipient, and trigger without relying on an implied retroactive obligation?
Nation/community value	Where community economic participation exists, is the collective governance or institutional value identified without assuming ownership of every individual contribution or creating an implied retroactive payment obligation?
IBA and consent separation	Is Nation or community economic participation clearly distinct from IBA compensation, impact compensation, accommodation, resource-revenue sharing, and payment for consent?
Non-substitution	Does payment under one category avoid silently extinguishing another individual's or community's rights, authority, or legitimate value claim?
Exit and portability	Are migration, export, retention, deletion, surviving governance, surviving use rights, surviving economic obligations, and transfer of canonical history defined before exit?
Dispute and appeal	Are material disputes about rights, privacy, authority, use, official status, or payment capable of correction, review, appeal, or other governed resolution?
Human judgment	Are automated outputs subordinate to accountable human review and Nation decision-making, with assumptions and limitations visible?
Empirical revisability	Does the implementation generate evidence capable of falsifying its own claims about transaction cost, capacity, participation, trust, continuity, and economic value?

Notes and Sources

Sources establish the constitutional and legal-policy context, Indigenous data-governance and Indigenous-law scholarship, impact-assessment research, digital and major-project infrastructure, connectivity constraints, organizational-memory theory, law-and-economics foundations, electronic-record law, copyright law, the qualified Aboriginal-title analogy, and the regulatory confidentiality and disclosure boundary used in the paper. Accessed August 27, 2026. This is a purposive source architecture for a conceptual synthesis, not a systematic review. Sources [8]-[11] are IAAC practitioner-guidance materials and are cited as guidance, not as substitutes for governing legislation, regulation, Indigenous law, or binding judicial authority. As accessed August 27, 2026, IAAC cautions on its Indigenous Knowledge practitioner page that its guidance environment is being updated and may not reflect current practice; current policy direction in this paper is therefore cross-checked against the federal Indigenous Knowledge Policy Framework [44], IAAC Reconciliation Framework [45], and IAAC 2026-27 Departmental Plan [46]. Legal propositions are grounded primarily in statutes, constitutional text, and judgments where the paper makes a legal claim. Where a source supports only a general mechanism rather than the paper's specific Canadian application, the text identifies the application as a hypothesis, inference, analogy, or recommendation rather than attributing it directly to that source.

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