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Making Deliverables Auditable: Faceted Taxonomy for Building Information Modelling in Indigenous health infrastructure

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Abstract

Building Information Modelling in public procurement is increasingly linked to Artificial Intelligence for information retrieval, compliance checking, and audit analytics. These AI-enabled expectations, however, depend on the basic condition that many projects still lack consistently described and traceable deliverables. In practice, outputs are produced by multiple actors, stored across heterogeneous environments, and labeled inconsistently, undermining verification, acceptance, and reuse. The stakes are higher in Indigenous health and sanitation infrastructure, where territorial access constraints, participation records, continuity of essential services, and protection of sensitive contexts are central governance requirements. This paper presents a faceted taxonomy for Building Information Modelling grounded in the International Organization for Standardization (ISO) 19650 information management workflow and tailored to lifecycle governance in Indigenous health infrastructure. The scheme comprises twelve facets with explicit codes, preferred labels, and scope notes intended for implementation as metadata fields or tags in Common Data Environments and repositories. A worked example from an Indigenous health post indexes a deliverable package across facets, showing how stakeholders can retrieve the same evidence from different entry points. The contribution is a faceted taxonomy designed to strengthen auditability, support graded disclosure of sensitive information, and enable supervised, transparent AI-assisted retrieval under human oversight within a Knowledge Organization System.

Keywords: Faceted Taxonomy. Building Information Modelling. Indigenous health.

1.0 Introduction

The current wave of Artificial Intelligence (AI) is reshaping how information is produced, interpreted, and acted upon in socio-technical systems. In the built environment, Building Information Modelling (BIM) is often presented as a digital backbone for interoperability, analytics, and automation across design, construction, and operations (Sacks et al. 2018). Yet AI does not eliminate information problems; it tends to amplify them. AI-assisted retrieval, compliance checking, and audit analytics only work when project deliverables are traceable, consistently described, and governed through controlled terminology. When

deliverables are produced by multiple actors, stored across heterogeneous environments, and labelled inconsistently, evidence becomes difficult to locate, compare, and validate—making accountability slower and more costly.

In Brazil, federal policies reinforce expectations for BIM adoption in public works and engineering services (Brazil 2020, 2024b). However, the day-to-day reality of procurement and contract delivery in public works (Brazil 2021) still depends on models, reports, checklists, certificates, registers, and logs that are fragmented and weakly organized. This creates a persistent controversy: BIM is expected to standardize information flows, but the deliverables that embody those flows often remain hard to retrieve and verify. As a result, audits, evidence-based acceptance, and post-handover reuse are undermined by avoidable fragmentation.

When projects involve Indigenous health and sanitation infrastructure, the stakes are higher. Here, the problem is not only technical; it is also political and ethical. Choices about representation and organization can reduce the visibility of territorial realities and participation records, while inadequate controls can expose sensitive information when security is treated as an afterthought (Brazil 2011, 2018; ISO 2020b). In Indigenous territories, governance and accountability are inseparable from access logistics, continuity of essential services, and constraints on operation and maintenance, dimensions that must be documented and retrievable as evidence, not treated as peripheral paperwork.

In Brazil, Indigenous health infrastructure is framed by the National Policy for Health Care of Indigenous Peoples, established by Ministry of Health Ordinance No. 254/2002 (Brazil 2002), and by the federal Pluriannual Plan 2024–2027, which positions Indigenous peoples as a transversal agenda linking health, sanitation, and infrastructure goals and aligning national planning with the 2030 Agenda (Brazil 2024a, 2024c). Internationally, human rights instruments recognize health and well-being as fundamental rights and affirm Indigenous peoples' rights to their traditional medicines and to the highest attainable standard of physical and mental health (United Nations 1948, 2007). These commitments align with the 2030 Agenda pledge to "leave no one behind" and its explicit recognition of Indigenous peoples as key stakeholders in sustainable development (United Nations 2015). Meeting such commitments requires not only building facilities and systems, but also producing and governing information deliverables that function as verifiable evidence of decisions, responsibilities, safeguards, and compliance.

This is where ISO 19650 became relevant. The ISO 19650 series provides an information management framework for the built environment, buildings and civil engineering works, using BIM, including concepts and principles, delivery and operational phases, information exchange, security-minded information management, and health and safety information (ISO 2018a, 2018b, 2020a, 2020b, 2022, 2025). While ISO 19650 defines workflows, responsibilities, and controlled delivery states, it does not, by itself, provide an operational taxonomy for indexing and retrieving deliverables across governance, lifecycle decision points, security constraints, and contractual evidence needs. This is precisely where Knowledge Organization (KO) can contribute in an applied way by translating standards and

contextual requirements for a usable Knowledge Organization System (KOS) that supports retrieval, verification, and accountability.

The objective of this article is to present a faceted taxonomy for Building Information Modelling grounded in the ISO 19650 information management workflow and tailored to lifecycle governance in Indigenous health infrastructure. The taxonomy is designed to be implemented as tags or metadata fields in Common Data Environments, repositories, or metadata schemas, enabling consistent classification while making critical dimensions explicit, such as participation records, territorial constraints, sensitive-context controls, and contractual evidence.

The justification is twofold. First, the taxonomy addresses an applied KO challenge, namely, building a domain-specific vocabulary that remains interoperable with international standards and exchange specifications. Second, it responds to critical KO concerns by treating classification not as a neutral technical layer, but as a governance mechanism that shapes what becomes visible, searchable, and auditable in high-stakes public procurement contexts (Bourdieu 1991; Bowker and Star 1999). In other words, taxonomy is designed to make accountability retrievable by design, not reconstructed after the fact.

2.0 Knowledge Organization as an applied and critical layer in BIM information management

KO is not limited to libraries or scholarly communication; it also shapes how institutions govern complex realities through categories, metadata, and workflow structures. Classifications can function as boundary objects, coordinating heterogeneous actors while masking the negotiations embedded in the categories themselves (Bowker and Star 1999). In public procurement, this boundary role is especially visible. Engineers, procurement and contract managers, supervisors, auditors, and end users must coordinate through shared information artefacts even when their responsibilities, vocabularies, and evaluative criteria differ.

At the same time, classification carries symbolic power; it can legitimize some perspectives and marginalize others by defining what counts as relevant, mandatory, or “out of scope” (Bourdieu 1991; Olson and Schlegl 2001). A critical KO perspective therefore asks not only whether a Knowledge Organization System (KOS) improves retrieval, but also whether it sustains plural epistemologies and avoids systematic invisibilization of subordinated knowledge (Santos 2018). In Indigenous health infrastructure, this becomes a concrete governance risk. If consultation records, culturally appropriate communication outputs, territorial access constraints, and operation-and-maintenance readiness are treated as peripheral, they become harder to retrieve, easier to overlook during acceptance, and more likely to be framed as non-essential in oversight and decision-making.

This is where the “applied” and the “critical” converge. Deliverables in BIM-based delivery are inherently multi-dimensional. A single package simultaneously belongs to a lifecycle

phase, an accountable role, an exchange format, a quality requirement, and a contractual evidence chain. Phenomenon-based approaches help represent complex domains by organizing knowledge around phenomena rather than only around disciplinary or institutional categories (Gnoli 2016). Faceted approaches, in turn, make this multiplicity operational by separating classificatory dimensions and enabling multi-aspect indexing (Gnoli et al. 2024; Szostak 2024). Such a logic is particularly relevant for auditable governance because it connects retrieval to explicit accountability questions: What evidence supports acceptance? Which records are authoritative for handover? Which information requires restricted access? Retrieval, in this sense, is not left to file names, informal memory, or ad hoc local practices, but is encoded in the indexing structure itself.

Faceted analysis, however, is not epistemologically neutral. It has been criticized for carrying rationalist or universalizing assumptions that may impose a single "logic of the world" and underrepresent situated knowledge. This paper addresses that risk in three ways. First, faceted construction is grounded in documentary warrant. The ISO 19650 workflow and the Indigenous health documentary corpus determine what must be retrievable and accountable, rather than an abstract claim of universality. Second, Indigenous-specific dimensions (e.g., participation records, territorial logistics, sensitive-context handling) are treated as first-class facets to prevent their relegation to "optional" documentation. Third, the scheme is positioned as a pragmatic, applied indexing device for traceability and auditability, not as an ontology of reality, whose maintenance should remain open to participatory revision when retrieval failures, disputes, or stakeholder feedback reveal bias or omissions.

Finally, this governed semantic structure matters for AI-assisted practices. Automated retrieval and classification do not fix fragmented deliverables; they often scale inconsistency. By contrast, a controlled, scope-noted facet structure constrains labeling, makes automated support reviewable, and strengthens accountability in high-stakes procurement settings where evidence, security, and rights-sensitive documentation must remain visible and governable.

3.0 Methodology

This study adopts a qualitative, exploratory, and design-oriented approach of an applied nature. It treats the faceted taxonomy as a Knowledge Organization System (KOS) artefact: a controlled vocabulary designed to address concrete governance and information retrieval problems while remaining theoretically grounded to address concrete governance and information retrieval problem while remaining theoretically grounded in Knowledge Organization (KO) and critical concerns about visibility, accountability, and sensitive-context handling (Smit and Kobashi 2003). The research is bibliographic and documentary, following established social research procedures to delimit a corpus, construct categories, and validate analytical constructs (Lakatos and Marconi 2003; Quivy and Van Campenhoudt 2005).

The documentary corpus was intentionally constructed from two converging sources. First, the taxonomy is derived from the ISO 19650 information management workflow as the normative backbone, using its concepts of lifecycle decision points, information containers, roles and responsibilities, delivery states, and security-minded requirements (International Organization for Standardization 2018a, 2018b, 2020a, 2020b, 2022, 2025). Second, the Indigenous health infrastructure context was operationalized through SESAI District Health Plans 2024–2027, which provide documentary evidence of territorial constraints, participation records, continuity requirements, and governance needs that shape what must become retrievable and auditable in Indigenous territories (Ministério da Saúde [Brazil] 2024). To support tools' antic-consistency and reduce term collision between standards language and field vocabularies, NotebookLM was used as a source-grounded assistive tool to surface recurring expressions and label variants and to compare terminology across documents (Google n.d.). NotebookLM outputs were treated strictly as decision support. Candidate terms and groupings were accepted only when confirmed by cited passages in the corpus; preferred labels, facet boundaries, subclasses, and scope notes were finalized through researchers' judgment and documentary verification.

Taxonomy development was consolidated into three steps. First, requirements and candidate terms were extracted from ISO 19650 and the Indigenous health documentary corpus, generating a preliminary inventory of deliverable types, decision points, responsibilities, and sensitive-context controls. Second, facet modeling and normalization defined independent classificatory dimensions with explicit codes, preferred labels, and scope notes aligned with ISO 19650, adding Indigenous health-specific classes when required (e.g., consultation records, territorial access and logistics, remote operation and maintenance readiness, and graded sensitive-context handling). Third, the taxonomy was iteratively tested through pilot indexing representative deliverable packages and retrieval scenarios spanning procurement, coordination, acceptance, and handover. Overlaps, ambiguities, and retrieval gaps were recorded as design issues and used to refine facet boundaries and scope notes, strengthening audit-oriented evidence mapping and controlled disclosure in sensitive contexts.

4.0 Results and Discussion

The taxonomy (Figure 1) is presented as a faceted classification table with explicit codes, preferred labels, and scope notes, designed to be developed as tags or metadata fields. In practice, a given piece of information is not placed into a single class; it is indexed through multiple independent facets and applied only when it increases the accuracy of retrieval. This multifaceted indexing transforms results management from a file-centric habit to an evidence-driven workflow, improving traceability at all stages: acquisition, collaborative production, accessibility, and delivery. As an applied KOS, the taxonomy offers a shared classification language for BIM, representing the information management concepts of ISO 19650 and compatible with interoperable exchange formats (ISO 2018a, 2018b, 2020a, 2020b, 2022, 2025). Since the facet boundaries are explicit, implementers can map the schema to system fields (or SKOS properties) and build retrieval interfaces that address

real governance issues, such as what evidence supports accessibility, what outcomes contain sensitive territorial information, and what is missing from the transfer.

Figure 1 organizes the scheme into twelve facets (F1–F12). Because facet boundaries are explicit, implementers can map the scheme to system fields or SKOS properties and build retrieval views aligned with governance questions: what evidence supports acceptance, which deliverables contain sensitive territorial information, and what remains missing for handover. From a critical Knowledge Organization perspective, this design choice is relevant because classification systems help define what becomes visible, retrievable, and actionable in practice (Bowker and Star 1999). It is also relevant because classificatory schemes participate in symbolic ordering, shaping how categories, distinctions, and institutional priorities are recognized as legitimate (Bourdieu 1991).

Code	Subclass	Scope note
Facet/Class 1: Information lifecycle phase International Organization for Standardization (ISO) 19650 workflow. Scope note: Classifies when the deliverable is produced and which decision(s) it supports.		
1.1	Assessment & Need	Baseline studies and constraints that define the information problem: territorial diagnosis, service needs, site constraints, access/logistics conditions, lessons learned from prior projects.
1.2	Invitation to tender & Procurement Package	Documents that structure the competition and bind information requirements to the contract: Terms of Reference, technical specifications, draft contract clauses, risk matrix, evaluation criteria, BIM requirements.
1.3	Tender Response & Selection	Bidder's technical and commercial submissions, including capability evidence and an initial approach to information management and mobilization plan.
1.4	Appointment, Contract Award & Formalization	Signed contract, notice to proceed, formal role assignment, post-award BIM Execution Plan (BEP), governance and communication plan.
1.5	Mobilisation	Common Data Environment (CDE) setup, standards/templates, software validation, onboarding/training, information quality plan, naming/classification rules.
1.6	Collaborative Production of Information	Day-to-day information production and coordination: discipline models, federated coordination, issue logs, coordination meeting outputs, and progress records.
1.7	Information Model Delivery, Milestones & Data Drops	Formal information deliveries per milestone, including verification/validation packages, acceptance evidence, model/document bundles.
1.8	Project Close-out & Archival	Final dossier, acceptance certificates, as-built model, Linking Asset Information Model (AIM) handover, Construction-Operations Building information exchange (COBie), warranties, Operations and Maintenance (O&M) manuals, lessons learned.
Facet/Class 2: Governance, roles and team structures. Scope note: Classifies who is accountable for producing, reviewing, approving, and curating information.		
2.1	Appointing Party, Client & Employer	Defines information needs and acceptance criteria; commissions services; approves and accepts deliverables; owns the "why/for what purpose" of information.
2.2	Lead Appointed Party & Lead Delivery Coordinator	Coordinates the delivery team; integrates deliverables; ensures quality, coherence, and alignment with requirements.
2.3	Appointed Parties & Delivery Contributors	Discipline designers, contractors, supervisors, manufacturers, specialist consultants producing information containers.
2.4	Teams by layer	Project organization by team layers, separating governance, delivery coordination, and discipline production units.
2.4.1	Project Team	Governance and client interface.
2.4.2	Delivery Team	Coordinated group delivering the information model.
2.4.3	Task Teams	Discipline-based production units.
Facet/Class 3 — Information requirements and Building Information Modelling (BIM) planning deliverables. Scope note: Deliverables that govern production: what must be delivered, when, in what form, and with what quality.		
3.1	Exchange requirements, delivery milestones & Data Drops	Definition of information deliverables per milestone, including minimum content and acceptance evidence.
3.2	Employer/Client information requirements and BIM contractual requirements	Requirements for structure, classification, formats, quality, security, responsibilities, review/acceptance processes.
3.3	BIM Execution Plan (BEP)	The operational plan explaining how information management will be executed by the delivery team.
3.3.1	Pre-award BEP	Bidder's proposed approach.
3.3.2	Post-award BEP	Executable commitment aligned to the contract.
3.4	Information management strategy	Classification, version control, auditability, retention/archival, preservation and continuity of information.
Facet/Class 4 — Common Data Environment (CDE), traceability, and digital evidence. Scope note: Deliverables and mechanisms that ensure audit trails, chain-of-custody, and controlled workflows.		
4.1	CDE setup and operation	Tool + workflow + permissions + states of information containers.
4.2	Information containers	Any package that holds project information: models, documents, spreadsheets, datasets, reports, images, certificates.
4.3	Issue management and coordination records	Issue logs, coordination comments, decision traces.
4.4	Change control	Change requests, impact assessments, approvals, version history.
Facet/Class 5 — Project Information Model (PIM) deliverables - design & construction information. Scope note: Deliverables that compose the PIM during design and construction.		
5.1	Single discipline models	Discipline-specific information models produced by task teams.
5.1.1	Architecture	Discipline model for architectural scope.
5.1.2	Structure	Discipline model for structural scope.
5.1.3	Electrical & data	Discipline model for electrical and Information and Communication Technology (ICT) scope.
5.1.4	Water, wastewater and sanitation	Discipline model for water supply, sewage, and sanitation scope.
5.1.5	Heating, Ventilation and Air Conditioning (HVAC)	Discipline model for HVAC/ventilation scope when applicable.
5.1.6	External infrastructure and access	Discipline model for external networks and access scope.
5.2	Federated model & coordination view	Coordinated linkage of discipline models for clash detection and integration without merging databases.
5.3	Model-derived technical documentation	Drawings, specifications, quantity take-offs, coordination reports, design narratives.
5.4	4D/5D/6D/7D deliverables when contracted	Schedule, cost, sustainability/performance, facilities/asset deliverables linked to the model.
5.5	Work planning and measurement linked to construction	Site logs, progress measurement, inspection reports, photo records (geo-tagged when relevant).
Facet/Class 6 — Asset Information Model (AIM) deliverables - operations & maintenance handover. Scope note: Deliverables for operations, forming the AIM.		
6.1	As-built model	Verified representation of what was actually built, including final specifications and locations.
6.2	COBie handover	Structured dataset for facilities management handover - often spreadsheet-based.
6.2.1	COBie content buckets	Spaces, systems, components, types, contacts, documents, resources, jobs/tasks, spares.
6.3	Operations and Maintenance - manuals, warranties & commissioning evidence	Manuals, maintenance plans, training materials, warranties, punch lists and close-out evidence.
6.4	Integration with enterprise systems	AIM to maintenance and operational systems, inventory and work orders.
Facet/Class 7 — Interoperability and exchange formats. Scope note: Deliverables that ensure reuse, portability, and long-term access to information.		
7.1	Industry Foundation Classes	Open standard data model for exchanging built environment information across software.
7.2	OpenBIM approach	Collaboration and exchange using open standards and agreed workflows.
7.3	Validation rules and model viewing outputs	Checking reports, compliance validation outputs, viewer packages for audit/inspection.
Facet/Class 8 — Information quality, verification, and acceptance criteria. Scope note: What makes a deliverable "acceptable" and how quality is evidenced.		
8.1	Levels of development and information	Completeness, reliability, and non-graphical information depth by phase/milestone.
8.2	Clash detection and coordination verification	Interference reports, resolution logs, sign-off evidence.
8.3	Information compliance checklist	Requirement-to-evidence mapping: "requirement x file/package x CDE location x status."
8.4	Acceptance and sign-off records	Provisional/final acceptance, nonconformities, punch lists, closure proof, CDE archiving.
Facet/Class 9 — Information security and sensitive-context handling. Scope note: Controls for sensitive information (territory, access routes, critical infrastructure details, images, etc.).		
9.1	Information classification & access control	Access control rules based on information sensitivity.
9.2	Intellectual property and authorship protection	Controls for ownership, authorship, and permitted reuse.
9.3	Secure exchanges and auditable logs	Secure transfer and logging for traceability.
9.4	Continuity, retention, and digital preservation	Retention rules, archival, and preservation planning.
Facet/Class 10 — Health & Safety information as a managed deliverable set. Scope note: Safety information is treated as structured, traceable information across the lifecycle.		
10.1	Hazard and risk registers hazard log	Registers of hazards and associated risk information.
10.2	Mitigation plans and evidence	Plans and evidence demonstrated risk mitigation actions.
10.3	Safe operation guidance	Guidance for safe use and operation across lifecycle.
10.4	Training and risk communication outputs	Training materials and risk communication deliverables.
Facet/Class 11 — Indigenous health facility procurement and territorial realities. Scope note: Deliverables that make the project viable in Indigenous territories — not "generic BIM".		
11.1	Territorial access & logistics	Access routes, seasonality, transport constraints, storage, site mobilization constraints.
11.2	Participation, consultation, and local governance records	Records of consultation and agreements, culturally appropriate communication, validation of solutions with real use scenarios.
11.3	Essential infrastructure	Minimum service continuity planning and design evidence aligned to local conditions (water, sanitation, energy, connectivity).
11.4	Remote operations & maintenance readiness	Maintenance plans compatible with remote supply chains, critical spares planning, local capacity-building (strong link to COBie).
11.5	Sustainability and performance evidence	Durability, climate resilience, material choices, energy efficiency, lifecycle considerations.
Facet/Class 12 — Contractual, legal, and evidentiary deliverables (works & services). Scope note: Ties BIM information to procurement, supervision, measurement, change, responsibility, acceptance, and audit.		
12.1	Procurement instruments	Terms of Reference/Technical Specs, contractual annexes, risk matrix, measurement criteria, acceptance criteria.
12.2	Contract administration & supervision outputs	Notices, instructions, supervision reports, progress measurement, approvals, change records.
12.3	Technical and legal compliance evidence	Permits/authorizations, test reports, certificates, mandatory logs and compliance with evidence (site and works).
12.4	Acceptance, warranties, and close-out dossier	Provisional/final acceptance, commissioning evidence, warranties, final dossier, AIM handover package.

Figure 1. Faceted Taxonomy for Building Information Modelling in Indigenous Territories grounded in the ISO 19650

The resulting faceted taxonomy mitigates cognitive load and avoids inconsistencies, specifically regarding indigenous territorial realities and security restrictions. This ensures ethical governance while making the complex classification process efficient, manageable, and auditable (Figure 1).

Deliverable package (what it is)	Typical question it answers	Facet assignments (codes you would tag in the system)	Example files inside the package (illustrative)
A. Territorial Access and Mobilization Package (routes, seasonality, transport limits, storage, site setup)	"Can we actually reach the site and mobilize safely and on time?"	• F1: 1.1, 1.5 • F2: 2.1, 2.2, 2.3 • F4: 4.2, 4.4 • F9: 9.1, 9.3 • F11: 11.1 • F12: 12.2	Access_Route_Map.pdf Seasonality_Logistics_Plan.xlsx Mobilization_Checklist.docx Site_Storage_Plan.pdf
B. Consultation and Local Governance Records Package (meetings, agreements, culturally appropriate communication, validation of use scenarios)	"What was agreed with the community, and where is the evidence?"	• F1: 1.1, 1.6 • F2: 2.1, 2.2, 2.4.1 • F4: 4.2, 4.3 • F9: 9.1, 9.4 • F11: 11.2 • F12: 12.2, 12.3	Consultation_Minutes.pdf Agreement_Summary.pdf Community_Feedback_Log.xlsx Validation_Photos.zip (restricted)
C. Design Coordination and Procurement Issue Package (federated model coordination, issue logs, model-derived docs used to procure works/services)	"Is the design coordinated enough to procure and build without surprises?"	• F1: 1.2, 1.6 • F2: 2.2, 2.4.2, 2.4.3 • F3: 3.1, 3.2, 3.3.2 • F4: 4.2, 4.3, 4.4 • F5: 5.2, 5.3 (and relevant 5.1.x) • F7: 7.1, 7.3 • F8: 8.2, 8.3 • F12: 12.1	Federated_Model.ifc Clash_Report.pdf Issue_Log.csv Procurement_Drawings.pdf Technical_Specs.docx
D. Health and Safety Risk Package (hazard log, mitigation evidence, safe operation guidance, training outputs)	"What are the key risks and what proof do we have that they were managed?"	• F1: 1.6, 1.7 • F2: 2.2, 2.3 • F4: 4.2, 4.3 • F8: 8.4 • F9: 9.1 • F10: 10.1, 10.2, 10.3, 10.4 • F12: 12.3	Hazard_Log.xlsx Mitigation_Evidence_Photos.zip Safe_Operation_Guide.pdf Training_Materials.pdf Signoff_Record.pdf
E. Acceptance and Handover Package (clinic close-out) (as-built model + asset dataset + operation and maintenance docs + warranties + commissioning + acceptance proof)	"Is the clinic ready to accept, operate, and maintain long-term, with audit-ready evidence?"	• F1: 1.7, 1.8 • F2: 2.1, 2.2, 2.4.2 • F3: 3.1, 3.4 • F4: 4.2, 4.4 • F6: 6.1, 6.2, 6.3 • F7: 7.1 • F8: 8.3, 8.4 • F9: 9.1, 9.4 • F11: 11.3, 11.4 • F12: 12.4	AsBuilt_Model.ifc Asset_Handover_COBie.xlsx OandM_Manuals.pdf Warranties.pdf Commissioning_Certs.pdf Final_Acceptance_Term.pdf

Figure 2. Worked example for Indigenous Health Post (clinic) deliverables indexed with the 12-facet taxonomy

Figure 2 illustrates the application through an Indigenous health post, where five purposively selected deliverable packages (A–E) were indexed across facets to cover key lifecycle moments (mobilization, coordination/procurement, risk management, and handover) and higher-risk governance needs (consultation, territorial constraints, and sensitive-context handling). Indexing was conducted in two passes: an initial tagging round followed by a refinement round in which ambiguous labels, overlaps, and retrieval gaps were recorded and used to adjust facet assignments and scope notes. A simple retrieval check was then performed by running typical stakeholder questions (e.g., "acceptance evidence," "consultation proof," "territorial access constraints") and confirming that the expected package and its key evidence files were retrievable through the intended facet entry points. For example, acceptance and handover evidence (Package E) becomes retrievable via quality and sign-off facets (F8) and is linkable to contractual close-out documentation (F12). Likewise, territorial access/logistics and consultation records (Packages A–B) are retrieved through the Indigenous-territory facet (F11) and governed through the security facet (F9), supporting controlled access and auditable traces.

A key governance tension in public infrastructure is balancing transparency requirements with the protection of sensitive territorial information. The proposed scheme supports a graded disclosure logic: metadata can remain visible for oversight (e.g., "consultation record delivered/verified"), while access to sensitive content is restricted through

permission rules associated with security tags (F9), preserving auditability without exposing protected information (Figure 2).

5.0 Conclusion

This article presents a faceted taxonomy for Building Information Modelling, grounded in the ISO 19650 information management workflow. Deliverables are treated as information containers indexed through multiple independent facets, rather than as loosely named files. By providing explicit codes, preferred labels, and scope notes, the faceted taxonomy is intended to support more consistent naming, indexing, and retrieval across the asset lifecycle, from procurement and collaborative production to acceptance, close-out, handover, and long-term use.

The main contribution is the possibility of application in a Knowledge Organization System designed for public procurement settings in which auditability, accountability, and evidentiary traceability are essential. By explicitly modelling governance roles, information requirements, traceability mechanisms, quality and acceptance evidence, and security-minded controls, the faceted taxonomy aims to reframe deliverables management as information governance rather than mere document storage. In Indigenous health infrastructure, this matters in a distinctive way: documentation often treated as peripheral, such as consultation records, territorial access and logistics constraints, and culturally appropriate communication outputs, is represented as core, auditable deliverables.

This is an intentionally critical design choice. Classification shapes visibility and, therefore, what becomes easier to retrieve, verify, and act upon during oversight and acceptance. Making Indigenous territorial realities first-class classificatory dimensions helps reduce the risk that these records become “out of scope” in practice. The faceted taxonomy also clarifies what “AI-enabled” work can responsibly mean in this domain. Automated support for retrieval or tagging is only reviewable when it operates under stable semantic constraints. Controlled labels, explicit facet boundaries, and scope notes can enable supervised assistance under human oversight rather than opaque automation.

A key limitation is that no taxonomy can, by itself, resolve power asymmetries embedded in public procurement and technical governance. To avoid turning the scheme into a rigid checklist, maintenance should be participatory and iterative, with terms and scope notes evolving through documented retrieval failures, dispute cases, and stakeholder feedback, especially for consultation and sensitive territorial records. Future work can focus on implementation and evaluation, including mapping facets to metadata fields in Common Data Environments and repositories, piloting the scheme in real projects, and testing indexing consistency across professional profiles.

Declaration of AI use: The authors used NotebookLM (Google) as a source-grounded assistive tool to identify recurring expressions and label variants and to compare terminology across the documentary corpus. Its outputs were treated strictly as decision support: candidate terms and groupings were accepted only when confirmed by cited passages in the source documents. Preferred labels, facet boundaries, subclasses, and scope notes were finalized by the authors through documentary verification and scholarly judgment. The authors take full responsibility for the taxonomy, the interpretations presented, and the accuracy and integrity of this article.

References

Bourdieu, Pierre. 1991. Language and Symbolic Power. Cambridge, MA: Harvard University Press.

Bowker, Geoffrey C., and Susan Leigh Star. 1999. Sorting Things Out: Classification and Its Consequences. Cambridge, MA: MIT Press. https://doi.org/10.7551/mitpress/6352.001.0001.

Brazil. 2002. Portaria nº 254, de 31 de janeiro de 2002. Aprova a Política Nacional de Atenção à Saúde dos Povos Indígenas (PNASPI). Brasília: Ministério da Saúde.

Brazil. 2011. Lei nº 12.527, de 18 de novembro de 2011 (Lei de Acesso à Informação). Brasília: Presidência da República.

Brazil. 2018. Lei nº 13.709, de 14 de agosto de 2018 (Lei Geral de Proteção de Dados Pessoais). Brasília: Presidência da República.

Brazil. 2020. Decreto nº 10.306, de 2 de abril de 2020. Estabelece a utilização do Building Information Modelling na execução direta ou indireta de obras e serviços de engenharia realizada pelos órgãos e pelas entidades da administração pública federal. Brasília: Presidência da República.

Brazil. 2021. Lei nº 14.133, de 1º de abril de 2021 (Lei de Licitações e Contratos Administrativos). Brasília: Presidência da República.

Brazil. 2024a. Agenda Transversal Povos Indígenas: Plano Plurianual 2024–2027. Brasília: Ministério do Planejamento e Orçamento.

Brazil. 2024b. Decreto nº 11.888, de 22 de janeiro de 2024. Dispõe sobre a Estratégia Nacional de Disseminação do Building Information Modelling no Brasil (Estratégia BIM BR) e institui o Comitê Gestor da Estratégia do BIM BR. Brasília: Presidência da República.

Brazil. 2024c. Lei nº 14.802, de 10 de janeiro de 2024. Institui o Plano Plurianual da União para o período de 2024 a 2027. Brasília: Presidência da República.

Gnoli, Claudio. 2016. “Classifying Phenomena Part 1: Dimensions.” Knowledge Organization 43: 403–415. https://doi.org/10.5771/0943-7444-2016-6-403.

Gnoli, Claudio, Richard P. Smiraglia, and Rick Szostak. 2024. "Phenomenon-Based Classification: An Annual Review of Information Science and Technology (ARIST) Paper." Journal of the Association for Information Science and Technology 75: 324–343. https://doi.org/10.1002/asi.24865.

Google. n.d. "NotebookLM." Accessed February 15, 2026. https://workspace.google.com/intl/pt-BR/products/notebooklm/.

ISO. 2018a. ISO 19650-1:2018. Organization and Digitization of Information about Buildings and Civil Engineering Works, Including Building Information Modelling (BIM)—Information Management Using Building Information Modelling—Part 1: Concepts and Principles. Geneva: ISO.

ISO. 2018b. ISO 19650-2:2018. Organization and Digitization of Information about Buildings and Civil Engineering Works, Including Building Information Modelling (BIM)—Information Management Using Building Information Modelling—Part 2: Delivery Phase of the Assets. Geneva: ISO.

ISO. 2020a. ISO 19650-3:2020. Organization and Digitization of Information about Buildings and Civil Engineering Works, Including Building Information Modelling (BIM)—Information Management Using Building Information Modelling—Part 3: Operational Phase of the Assets. Geneva: ISO.

ISO. 2020b. ISO 19650-5:2020. Organization and Digitization of Information about Buildings and Civil Engineering Works, Including Building Information Modelling (BIM)—Information Management Using Building Information Modelling—Part 5: Security-Minded Approach to Information Management. Geneva: ISO.

ISO. 2022. ISO 19650-4:2022. Organization and Digitization of Information about Buildings and Civil Engineering Works, Including Building Information Modelling (BIM)—Information Management Using Building Information Modelling—Part 4: Information Exchange. Geneva: ISO.

ISO. 2025. ISO 19650-6:2025. Organization and Digitization of Information about Buildings and Civil Engineering Works, Including Building Information Modelling (BIM)—Information Management Using Building Information Modelling—Part 6: Health and Safety Information. Geneva: ISO.

Lakatos, Eva Maria, and Marina de Andrade Marconi. 2003. Fundamentos de Metodologia Científica. 5th ed. São Paulo: Atlas.

Ministério da Saúde (Brasil). 2024. "Planos Distritais 2024–2027." Secretaria Especial de Saúde Indígena (SESAI). Published July 23, 2024; updated August 5, 2024. https://www.gov.br/saude/pt-br/composicao/sesai/planos-distritais-2024-2027.

Olson, Hope A., and Rose Schlegl. 2001. "Standardization, Objectivity, and User Focus: A Meta-Analysis of Subject Access Critiques." Cataloging & Classification Quarterly 32, no. 2: 61–80. https://doi.org/10.1300/J104v32n02_06.

Quivy, Raymond, and Luc Van Campenhoudt. 2005. Manual de Investigação em Ciências Sociais. 4th ed. Lisboa: Gradiva.

Sacks, Rafael, Chuck Eastman, Ghang Lee, and Paul Teicholz. 2018. BIM Handbook: A Guide to Building Information Modeling for Owners, Designers, Engineers, Contractors, and Facility Managers. 3rd ed. Hoboken, NJ: Wiley.

Santos, Boaventura de Sousa. 2018. A gramática do tempo: Para uma nova cultura política. 3rd ed. São Paulo: Cortez.

Smit, Johanna Wilhelmina and Nair Yumiko Kobashi. 2003. Como elaborar vocabulário controlado para aplicação em arquivos. São Paulo: Arquivo do Estado de São Paulo; Imprensa Oficial do Estado de São Paulo.

Szostak, Rick. 2024. "Additional Purposes of Knowledge Organization." Knowledge Organization 51: 371–380. https://doi.org/10.5771/0943-7444-2024-5-371.

United Nations. 1948. Universal Declaration of Human Rights. https://www.un.org/en/about-us/universal-declaration-of-human-rights.

United Nations. 2007. United Nations Declaration on the Rights of Indigenous Peoples. https://www.ohchr.org/sites/default/files/Documents/Issues/IPeoples/UNDRIP/UNDRIP_E.pdf.

United Nations. 2015. Transforming Our World: The 2030 Agenda for Sustainable Development (A/RES/70/1). https://docs.un.org/en/A/RES/70/1.