BIM Harambee Africa 2026

BIM Book 2026

BIM in South Africa – Projects, People and Practices

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Raising the BIM tide

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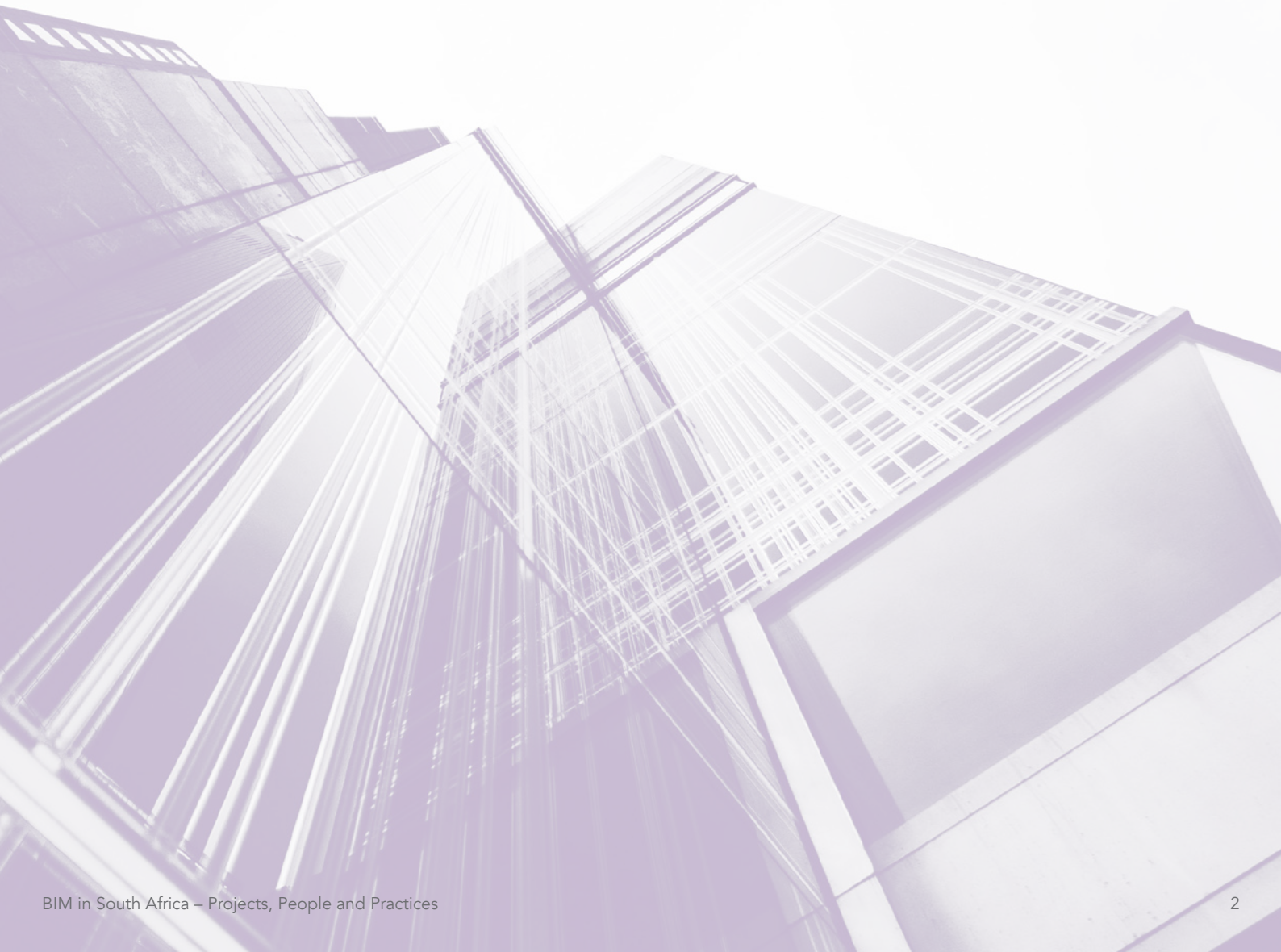
This digital BIM Book aims to document and celebrate how BIM is being applied within the **South African built environmen**t, highlighting both achievements and challenges. It explores not only project delivery, but also:

- The impact of **organisational culture** on digital transformation
- The development of **skills and local BIM** capability
- Practical approaches to **information management** in a developing BIM landscape

The goal is to create a resource that reflects the **real state of BIM in South Africa**, offering lessons that are relevant, practical, and locally grounded.

We thank all of our contributors, who generously shared their insights with us.



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Content

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The Quiet Revolution: How Cape Town Turned Data into a BIM Framework and Pilot Strategy

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There is a particular silence that settles over many public-sector meeting rooms when someone mentions "Building Information Modelling" or BIM.

Someone shifts in their chair. Another glances at the budget spreadsheet projected onto the wall. Questions begin to surface almost immediately: *How much will this cost? Who will manage it? Is this simply another software trend?*

For many municipalities, BIM still appears distant and abstract associated more with expensive technology and complex 3D modelling than with practical service delivery. Yet in a quiet corner of the City of Cape Town's administration overlooking Table Bay, the conversation has gradually changed.

Here, BIM is not being introduced as a technological revolution. It is emerging as the natural progression of something the City has been building for years: an institutional culture that treats information as critical infrastructure.

The City of Cape Town is now preparing to launch its first structured BIM pilot projects. Importantly, this readiness did not begin with software procurement or consultant presentations. It began with a much quieter transformation — the long-term integration of smart systems, improvements in data governance, and a growing recognition that cities function as much through information flows as through physical infrastructure.

Over time, more than twenty-one smart systems have been integrated across the municipal environment. Geographic Information Systems (GIS), asset management platforms, customer systems, real-time utility monitoring tools, spatial planning systems, and operational databases increasingly contribute to a broader ecosystem of connected municipal information.

This evolution aligns closely with Cape Town's broader institutional vision of being a "Beacon of Hope", grounded in the values of Caring, Accountability, Openness and Transparency, Innovation, and Service Excellence.

While many municipalities across South Africa are still discussing BIM conceptually, Cape Town has quietly positioned itself to move toward implementation. Not through declarations of digital transformation, but through years of foundational preparation.

That distinction matters.

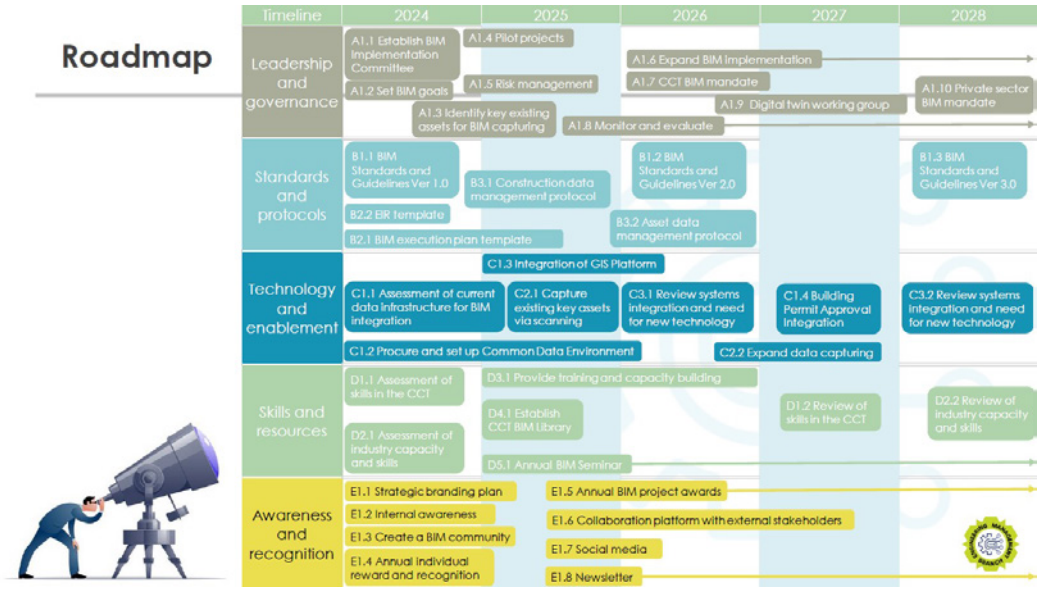
The Foundation Beneath the Visible City

Modern cities are often understood through what can be seen: roads, pipelines, substations, housing developments, treatment works, transport corridors, and public buildings.

Yet increasingly, cities succeed or fail because of what cannot be seen.

Every municipal service depends on information. Water infrastructure depends on accurate asset records. Electricity operations depend on real-time monitoring data. Spatial planning depends on integrated zoning, engineering, environmental, and utility information. Maintenance depends on reliable histories of repairs, conditions, and operational performance.

Without reliable information, even well-funded infrastructure systems become reactive and inefficient.
Cape Town's digital maturity emerged gradually through institutional necessity rather than technological ambition alone. Over many years, municipal teams confronted a simple operational reality: infrastructure cannot be managed effectively if information remains fragmented, inconsistent, or inaccessible.



This recognition drove a series of incremental but important changes.

Asset registers were cleaned and standardised. Spatial information systems expanded in sophistication. Operational systems became increasingly interconnected. Governance processes were introduced to improve data quality and accountability. Slowly, information management began evolving from an administrative support function into a strategic operational capability.

The City's 2022 infrastructure assessments highlighted the importance of reliable municipal information systems in sustaining long-term infrastructure resilience. In 2023, this direction was reinforced through the adoption of a formal Data Strategy that positioned data as a civic asset rather than merely a by-product of administration.

Importantly, the strategy recognised that digital transformation is not fundamentally about software. It is about governance.

The difficult work was never purchasing systems. The difficult work involved standardising naming conventions, aligning departments, improving data quality, integrating workflows, and creating a culture where information is treated with the same seriousness as physical infrastructure investment.

That work is rarely visible to the public. Yet it is precisely this invisible institutional groundwork that has now created the conditions necessary for BIM adoption.

Cape Town is therefore not "starting BIM". It is extending an already maturing information ecosystem into the infrastructure lifecycle itself.

From Drawings to Data: Why BIM Matters

Traditional infrastructure delivery processes often lose valuable knowledge at every transition point.

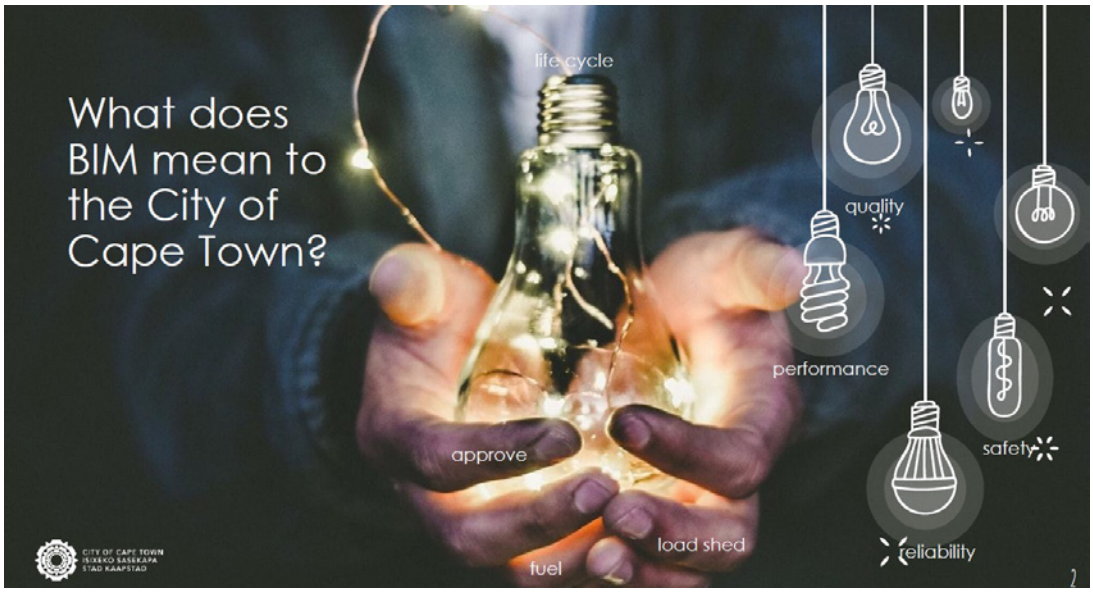
A consultant designs a pump station, pipeline, road, or public facility. Drawings are produced. Specifications are approved. Construction takes place. At handover, documents are archived often as disconnected PDFs, marked-up drawings, spreadsheets, and technical reports.

Then the project effectively resets.

Years later, operational teams searching for maintenance histories, buried services, valve locations, material specifications, or construction changes frequently struggle to locate reliable information. Institutional memory becomes fragmented. Maintenance becomes reactive. Costs rise quietly over time.

BIM seeks to address this problem by creating continuity of information throughout the lifecycle of an asset. At its core, BIM is not about producing visually impressive 3D models. It is about ensuring that the information created during planning, design, and construction remains structured, usable, and connected long after construction is complete.

For Cape Town, this continuity is the real value proposition.



A model used by consultants during coordination and clash detection can ultimately contribute information to GIS environments, asset management systems, maintenance planning processes, and operational decision-making tools. Instead of ending with static documents, projects conclude with structured datasets capable of supporting the long-term management of infrastructure assets.

This becomes particularly important in municipal environments where infrastructure lifecycles often extend across decades and multiple generations of officials, engineers, contractors, and service providers. The City's BIM readiness emerged less from technology adoption than from a gradual cultural shift toward treating information governance as a shared organisational responsibility.

The question facing the City is therefore not whether BIM models look sophisticated. The real question is whether infrastructure information can flow reliably from project conception to long-term operations.

That is the challenge the City's BIM Pilot Strategy is designed to test.

The Pilot Strategy: Learning Before Scaling

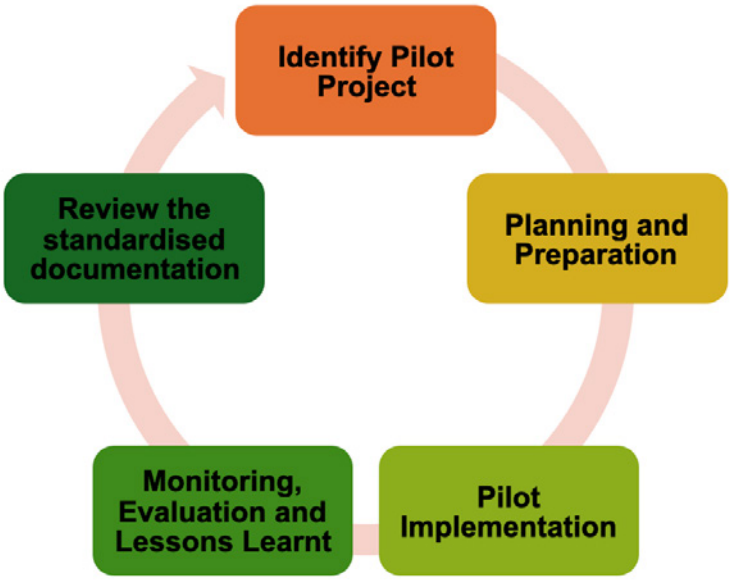
One of the most notable aspects of Cape Town's BIM approach is its restraint.

Rather than attempting rapid, large-scale implementation, the City has adopted a deliberately measured strategy centred on learning, evaluation, and institutional readiness.

The BIM Pilot Strategy now in its second iteration defines pilots as low- to medium-risk initiatives capable of being implemented within manageable timeframes using collaborative and willing project teams. Some pilots may focus only on clash detection workflows. Others may test digital handover processes into GIS or asset management environments. Several may simply evaluate whether information standards can be applied consistently across project participants.

This measured approach reflects an important institutional understanding: digital transformation in government rarely succeeds through abrupt technological disruption. It succeeds through gradual operational integration.

The City has therefore set realistic ambitions. Early pilots are not expected to achieve global best practice immediately. Instead, the objective is to generate credible operational evidence, identify constraints, refine standards, and establish institutional learning pathways over time.



BIM Pilot Project Strategy Process Flow Diagram

Perhaps the most innovative element of the strategy is the internally developed BIM Pilot Assessment Matrix.

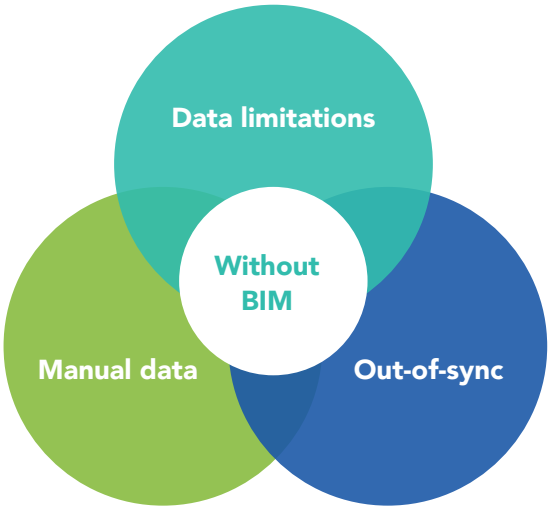
Unlike conventional performance tools that focus primarily on success metrics, the matrix explicitly creates space for identifying weaknesses, failures, and operational constraints. Pilot outcomes may be rated "Strong", "Fair", or "Poor", accompanied by explanations of what failed, why it failed, and what corrective measures should be considered in future applications.

This may appear simple, but institutionally it is significant.

Public-sector environments often struggle with innovation because failure is perceived as organisational risk rather than as a source of learning. By contrast, Cape Town's approach acknowledges that controlled experimentation is essential for long-term capability development.

What are the risks of not adopting BIM?

- Inability to utilise technology and data analytics to improve asset creation and management - data limitations;
- Increased manual data handling in an ever-digitalising world;
- Being "out-of-sync" with the construction industry players;
- Increased building lifecycle costs;
- Missing the IR4 bus.



Teams are not expected to produce perfection. They are expected to produce evidence, reflection, and improvement. Know the risk of doing nothing has major impacts.
That cultural shift may ultimately prove more important than the technology itself.

Information as Infrastructure

Among members of the City's engineering and digital governance teams, a phrase has increasingly shaped strategic thinking:

"Information is infrastructure."

The phrase sounds conceptual, but its implications are profoundly practical.

Physical infrastructure forms the visible city. Information forms the invisible city that enables it to function.

Without reliable information, roads are resurfaced without understanding underlying utility conflicts. Maintenance becomes reactive instead of preventative. Capital planning loses continuity. Infrastructure knowledge disappears when staff retire, consultants change, or projects conclude.

Treating information as infrastructure changes the logic of project delivery.

It means recognising that every project should leave behind not only a completed physical asset, but also validated, structured, and reusable information capable of supporting future operations and decision-making.

This philosophy aligns closely with broader concepts of projectisation within public infrastructure management — the idea that projects should continuously contribute to institutional knowledge, operational intelligence, and long-term organisational learning.

From this perspective, BIM is not merely a design methodology. It is an operational governance framework for managing infrastructure information across the asset lifecycle.

That distinction is critical.

Cities do not become "smart" because they purchase advanced technologies. They become smart when they stop losing knowledge between projects.

The South African Municipal Context

Across South Africa, municipalities are increasingly recognising the importance of digital transformation, integrated planning, and improved infrastructure governance. Several have initiated BIM discussions, established exploratory working groups, or begun investigating digital delivery frameworks.

Yet many remain at the early stages of readiness.

This is not due to a lack of ambition. In most cases, the challenge is foundational. BIM implementation depends heavily on data maturity, governance capability, systems integration, interoperability standards, procurement alignment, and institutional capacity.

Without these foundations, BIM risks becoming isolated modelling activity disconnected from municipal operations.

Cape Town's relative progress reflects the fact that much of this foundational work began years earlier. Investments in GIS capability, smart systems integration, operational data environments, and governance processes created conditions that now support more advanced lifecycle information management.

Importantly, the City's experience offers a broader lesson for local government.

The lesson is not that municipalities should immediately replicate BIM specifications or procurement templates. The lesson is that sequence matters.

- First establish reliable data governance.
- Then improve interoperability and systems integration.
- Then develop institutional information standards.
- Only thereafter does BIM become operationally meaningful.

In this sense, Cape Town's BIM pilots are less a technological leap than the continuation of a much longer institutional journey.

Leadership Through Collaboration

One of the clearest indicators of the initiative's maturity is that the BIM Pilot Strategy has not remained isolated within a single technology unit. Importantly, the City approached BIM adoption as an organisational change process rather than a technology rollout. This required alignment across technical, operational, procurement, and governance environments, supported by gradual implementation and shared ownership across directorates.

The strategy received endorsement across multiple directorates, including Water, Energy, Transport, Spatial Planning, and Supply Chain Management. This cross-functional support is important because digital transformation efforts in government frequently fail when they are perceived as departmental experiments rather than organisational priorities.

Equally significant is the City's emphasis on openness and collaboration.

There is no institutional expectation that every pilot must succeed perfectly. Teams are encouraged to document lessons honestly, identify constraints transparently, and share findings across departments. This reduces organisational fear and creates conditions for practical learning.

In many public-sector environments, the greatest obstacle to innovation is not technology it is institutional risk aversion.

Cape Town's approach attempts to address this directly by normalising iterative learning rather than demanding immediate perfection.

That may ultimately become one of the City's most important contributions to municipal digital transformation practice.

Early Signs of Transformation

Although the formal BIM pilot programme is still emerging, elements of this transformation are already visible across several municipal initiatives. Like many municipalities, Cape Town also faces structural barriers to BIM adoption. Traditional procurement models, fragmented consultant deliverables, legacy systems, and established project workflows were not originally designed for integrated lifecycle information management. In some cases, organisational resistance emerged not from opposition to innovation itself, but from uncertainty regarding new responsibilities, standards, and collaborative ways of working.

Projects such as the Green Point Education Dome explored intersections between digital design, fabrication methodologies, and heritage-sensitive urban development. Infrastructure initiatives including the Bellville Wastewater Treatment Plant and the Milnerton Bulk Sewer upgrade have begun testing more integrated coordination and information management approaches within complex operational environments.

Simultaneously, systems such as the Development Application Management System and the Wayleave Management System are increasingly linking approvals, permits, and spatial information through connected digital workflows.

These initiatives are not presented as finished success stories. They remain active learning environments. Some workflows still require refinement. Naming standards continue evolving. Interoperability challenges remain. Skills development and consultant readiness vary across projects. Legacy systems continue to create integration complexities.

Yet these challenges are precisely why the pilot approach matters.

Institutional maturity is rarely achieved through a single breakthrough moment. More often, it emerges gradually through repeated cycles of implementation, evaluation, adjustment, and learning.

A city that learns consistently eventually becomes a city that leads.

The Quiet Revolution

On the surface, many of Cape Town's BIM activities appear modest.

A coordination workshop for a small pump station upgrade. A discussion about naming conventions. A pilot testing digital handover into GIS. An issue log being reviewed between engineering and operations teams.

None of it appears revolutionary.

Yet beneath these incremental activities lies something far more significant: institutional readiness.

Within South Africa's constrained municipal environment characterised by aging infrastructure, uneven digital maturity, procurement complexity, and growing service delivery pressures the ability to manage infrastructure information effectively is becoming increasingly strategic.

The City has spent years building governance structures, integrating systems, improving data quality, strengthening operational collaboration, and embedding information management into municipal processes. The emerging BIM pilots are therefore not isolated technology experiments. They are the natural continuation of a broader transformation toward data-led infrastructure governance.

Cape Town is not claiming perfection. Its pilots will encounter technical, organisational, procurement, and operational challenges. Some initiatives may underperform. Others may need redesign. That is expected.

What distinguishes the City is not flawless implementation, but its willingness to learn systematically, evaluate honestly, and improve incrementally.

That may ultimately be the real quiet revolution underway in Cape Town.

Not the adoption of BIM itself, but the recognition that the future resilience of cities depends as much on how they govern information as on how they construct infrastructure.

In the end, the future smart city may be defined less by the technology it purchases, and more by the knowledge it chooses not to lose.

Where Are You Starting From?

The missing question in South African BIM adoption

Machiel Odendaal - PSAT | Digital Reframe (Pty) Ltd

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1. The Wrong Question

Any firm looking to grow faces three co-dependent types of transformation. Business transformation sets the operational direction: what kind of firm are you, how do you create and capture value.
Experience transformation shapes the client interface: who are your clients, how do they encounter what you offer. Digital transformation enables the delivery machinery: how do your technologies create value for the firm and its clients. Business has primacy — it governs direction — but any domain can be the trigger for change. A new technology can reshape the experience, which then demands a different business operation. Checkers didn't try to become a tech company. They kept their physical stores, added a digital layer alongside, and let it serve the business model rather than lead it. Most AEC firms are in a similar position: they weren't born digital; they have to bridge into it. This article focuses on the digital domain, because that's where the diagnostic question lives. But without business transformation anchoring it and experience transformation expressing it, digital investment has no strategic direction and no market expression. The result is expensive tools and unchanged outcomes.

Most conversations about digital transformation in the AEC industry start in the wrong place. They start with a tool or process: "we need to implement Revit properly", "we should be doing BIM on all our projects", "we need to figure out AI." That's not a strategy. That's a procurement decision dressed up as one.

The instinct is familiar. When firms start talking about going digital, the first question is the price. They buy the software, often begrudgingly, and then make do with it. The question "what does this enable us to do better for our clients?" is rarely asked before the purchase. It gets asked afterwards, usually when the implementation has stalled and someone needs to justify the investment.

The result, in firm after firm, is what it looks like when you graft a new tool or methodology onto an unchanged practice. The tool is technically present. Nobody is quite sure why it's there. Adoption is patchy. The person who champions it carries the whole thing on their own shoulders. And the firm continues to win or lose work on the same basis it always did. The tool changed. The practice didn't.

This isn't a criticism of BIM or the technologies that enable it. It's a criticism of the way adoption gets framed: as a technology or process problem that requires a technology or process solution, rather than a practice problem that requires a practice question first. Digital transformation fails when the prescription comes before the diagnosis.

2. What is a Digital Practice?

Before we can talk about what type of digital practice a firm needs, we should be clear about what a digital practice actually is. And what it isn't.

A digital practice is not your BIM team. It's not your visualisation department. It's not the person who knows Revit the best. It's none of those things and all of them.

The digital practice is the design and delivery technology side of a firm. It covers the modelling tools, the collaboration platforms, the design and documentation workflows. It is distinct from IT, which manages the operational infrastructure: cloud systems, file management, communication tools, security. These are different

domains, often managed by different people, and the tension between them is real. Where they overlap, technologies serve both sides: a CDE is a delivery tool and an infrastructure asset. But the digital practice itself sits on the design and delivery side.

This distinction matters because most firms conflate the two. They think investing in a better Revit workflow is digital transformation. It's a delivery improvement, which is part of the digital practice. But the digital practice also depends on whether the firm can absorb and sustain change. Whether the culture allows it. Whether knowledge stays when people leave. Those conditions sit underneath both sides.

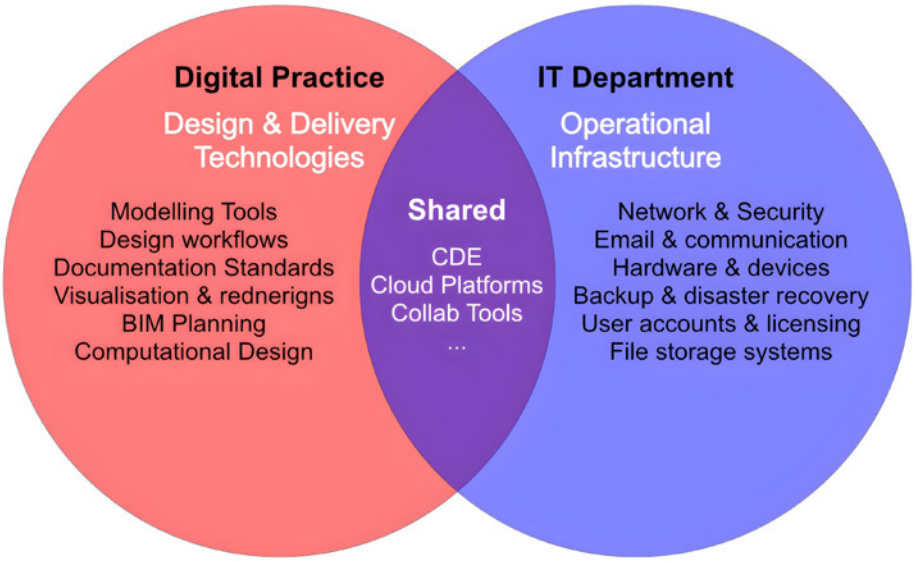

Figure 1: The Digital Practice vs IT Departments.

3. What Kind of Practice Are You?

Not all firms are the same, and not all digital transformation looks the same. Before any firm can make meaningful decisions about tools, processes, or standards, it needs to answer a more fundamental question: why do we do what we do, and how do we believe buildings should be created and delivered?

Every firm has an answer to this, whether articulated or not. It's embedded in the portfolio, the client relationships, the hiring decisions, the project selection. It shows up in which projects a firm pursues, which it turns away, and how it defines success. The difference between firms is not whether they have this identity, but whether they've made it explicit, and whether it matches the one that's actually driving decisions. This is the firm's core identity, and it shapes everything that follows — including what digital transformation should look like.

From a digital practice perspective, three broad types of firms emerge. A novel practice approaches every project as a new problem. The design proposition is the value. Technology in this type of firm needs to be situational, responsive to the specific demands of each project, adaptable, and often experimental. An experienced practice draws on deep expertise to solve similar kinds of problems with increasing skill. Technology here supports repeatable quality and refinement: tools that help the firm do what it already does well, faster and more reliably. A repeatable practice is optimised for consistent delivery at scale. Technology in this context is about efficiency, standardisation, and measurable output.

	Novel Every project is new	Experienced Deep expertise, refined delivery	Repeatable Consistent delivery at scale
Value	The design idea	The refined solution	The reliable outcome
Tech Role	Situational, adaptive	Supportive, deepening	Standardising, optimising
Approach	Exploratory	Methodical	Systematic
Between Projects	Tools may change	Tools deepen	Tools stay constant
Risk If Misaligned	Over-standardised	Under-invested	Over-engineered
Example	Bespoke residence	Healthcare specialist	Multi-housing developer
Upskilling	Evaluate & adapt	Deepen & refine	Standardise & optimise

These are not stages. They are different configurations, optimised for different value creation context.

Figure 2: The Practice Types.

These aren't stages. A novel practice is not immature and a repeatable practice is not advanced.
They're different configurations, optimised for different value creation contexts. A firm designing experiential, once-off residences for elite clients has a different tool calculus than a firm running five repeat multi-housing projects simultaneously. Neither is doing it wrong.

The mistake, and the one I see repeated across the South African industry, is applying one firm's digital playbook to another without understanding what kind of value each is trying to create.
Technology and process should be in a supportive role, not a leading one. But you have to be intentional about it, because every day a new tool or methodology appears, and if you start jumping between them, you lose sight of what you're actually trying to do.

4. Why Culture Eats Tools for Breakfast

Over the years, working with firms across South Africa's built environment, certain patterns have become impossible to ignore.

Most firms don't have a digital transformation strategy. They don't have a cloud strategy. They don't have roadmaps that they plan or structure. Most firms just let their culture naturally form. And culture, it turns out, is the thing that determines whether digital tools and processes stick or get abandoned.

A 62-study meta-analysis covering over 11,000 subjects found that organisational culture is the most crucial factor in technology adoption in AEC firms, more important than technology access, training, or management commitment as standalone factors (Wang et al., 2025).

What does that look like in a South African firm? The person responsible for digital strategy, typically the BIM manager or equivalent, is also required to be a billable production resource. They must "pay for their seat."
The result is a role focused almost exclusively on production: how do we do Revit better? Not: how do we work differently? Non-billable learning time is culturally illegitimate.

Knowledge lives in senior people's heads. No one can really show you where the processes are, or whether they were communicated to new staff. When someone builds a template or a standard, it often gets abandoned because there's no system to maintain it.

Then there's what I call Hero Dependency, where all digital capability concentrates in one or two people. Every firm I've presented this pattern to recognises it immediately. Nobody disputes it. If your BIM champion leaves tomorrow, your capability leaves with them.

These aren't problems a better platform will solve. They're structural conditions: psychological safety, learning orientation, adaptive capacity, resource slack. These are the things that determine whether any investment in tools or processes will take hold.

Upskilling that works isn't generic BIM training applied uniformly across the firm. It's training aligned to the practice type. A novel practice needs people who can evaluate and adapt tools situationally. An experienced practice needs people who can deepen and refine existing workflows. A repeatable practice needs people who can standardise and optimise. The skills agenda follows the practice type, not the other way around.

5. Standards Are the Destination, Not the Entry Point

BIM is fundamentally about information management: structured, findable, consistent information flowing across disciplines and project stages. That's not a technology capability. It's an organisational one. And the gap between adopting BIM tools and actually managing information well is where most South African firms find themselves stuck.

The adoption picture is uneven. Most architects have adopted BIM in some form, but often in a limited way: clash detection, standard coordination items. Very few quantity surveyors have adopted BIM pricing. Most contractors don't have standard cloud technologies available to them. BIM execution plans are frequently written on a need-to-know basis, sometimes Googled, sometimes AI-generated, and not necessarily aligned to ISO 19650.

When firms treat standards compliance as a checkbox — performing alignment without understanding the information management principles underneath — that's compliance theatre. It produces documentation that satisfies a procurement requirement but doesn't change how information actually flows through a project.

This is why the firm-level question has to come before the project-level one. A project-level digital transformation is structurally constrained from the start: by the time the project is underway, the appointments are fixed, the collaboration model is set, and the scope of value creation has already been decided. The value conversation belongs at the firm level, before appointments are confirmed: what kind of practice are we, and does our current model support the kind of work we want to deliver?

6. Alignment, Not Maturity

Most conversations about BIM adoption default to a maturity model: foundational, intermediate, advanced. It's a familiar way of thinking and it creates shared vocabulary. But maturity models carry risks.

They assume what "mature" looks like, often reflecting the consultant's preferred operating mode rather than what's right for the firm. They assume firms should move through stages in a fixed sequence, ignoring that some stages are inappropriate for some firms. And they create aspiration inflation: firms benchmark against the top of the model and set unrealistic goals that generate frustration rather than momentum.

The approach I'm describing is different. It's not a maturity scale. It's an alignment. The question is not "how do I get to the top?" but "what configuration is right for the way I work and the clients I serve?" Who you serve and how you serve them places you. Understanding where you are and where you might want to go as an aspiration gives you the roadmap.

There is no "advanced" or "mature" state in this framing, only states that are more or less coherent with the firm's own goals. You are measured to your own standards. And once a firm knows where it is, it can decide how it wants to move: whether to grow steadily, evolve deliberately, or transform fundamentally. Those are different types of movement with different costs and different demands. But the starting point has to be honest.

7. Five Questions Before You Buy Anything

If I could give every firm five questions to answer honestly before making any digital implementation decision, they would be these.

Can a new team member find last year's project documents without asking someone? This tests whether your knowledge lives in systems or in people's heads.

When you finish a project, does anything you learned make it into the next one? This tests your learning orientation. If lessons can't travel between projects, any capability you build on one project stays trapped there.

Does your firm have a structured system for how project information is organised, named, and shared? This tests process discipline and information management readiness. If the system exists on paper but not in practice, no platform will fix that.

If your most digitally capable person leaves tomorrow, does your capability leave with them? If all digital capability is concentrated in one person, you don't have a digital practice. You have a digital person.

Digital Practice Self-Check

- ☐ **Q1:** Can a new team member find last year's project documents without asking someone?
- ☐ **Q2:** When you finish a project, does anything you learn make it into the next one?
- ☐ **Q3:** Does your firm have a structured system for how project information is organised, named, and shared?
- ☐ **Q4:** If your most digitally capable person leaves tomorrow, does your capability leave with them?
- ☐ **Q5:** Could you describe, in one sentence, what kind of clients you are trying to serve and why?

Digital Reframe quick-check list.

Could you describe, in one sentence, what kind of clients you are trying to serve and why? This tests whether the firm's identity is explicit enough to guide decisions. If you can't articulate it clearly, your digital investments won't be anchored to anything.

The point isn't to produce a score. It's to close the gap between where you think you are and where you actually are. Honest but encouraging — not "you're failing" but "you're starting from here, and that's a clear starting point."

8. Honest Is Not Pessimistic

When I presented this approach to a client, I framed it simply: "it's not bad or good, it's just understanding what the company looks like so that we know how to scale things." His response was that it made things "more manageable once you sort of define it."

Most firms, and most vendors selling to them, frame digital transformation as a financial efficiency play: better tools, better throughput, better margins. That framing is incomplete. It creates unrealistic expectations, which leads to disillusionment when the margins don't move. Digital practice coherence is worth doing because it makes the work better and the firm more intentional, regardless of whether it moves the profit line this quarter.

The point isn't to slow down BIM adoption in South Africa. It's to make it stick. Firms that know their starting position move faster and waste less. They make informed decisions about the tools and processes they invest in, the people they hire, and the capabilities they build. The ones that skip the diagnosis, that start with the tool instead of the practice, are the ones still asking the same questions three years from now.

The digital practice is the foundation layer. Understand what yours looks like. Understand what kind of practice you are. Then decide where you want to go.

The most expensive gap in your practice is the one between where you think you are and where you actually are.

If your most capable digital person left tomorrow — would the capability leave with them?

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The Missing Link: BIM for Construction

Why software matters less than structure — and structure matters less than purpose

Werner Pretorius - Technical Manager, Stefanutti Stocks

Introduction

In the BIM conversation, software often takes centre stage. We compare platforms, debate interoperability, and chase the next digital capability that promises to transform project delivery. Yet on construction projects, the real problem is seldom the absence of software. More often, it is the absence of structure. And deeper still, it is the absence of clarity about what information is actually needed.

This is the missing link in BIM for construction.

From a contractor's perspective, BIM only becomes valuable when information can be used to plan work, measure progress, allocate resources, forecast cost, and support delivery on site. A model may be visually impressive, highly detailed, and technically sophisticated, but if its information cannot be extracted, grouped, linked, and reused for construction purposes, then it remains disconnected from the realities of project execution.

In principle, this is exactly what ISO 19650 calls for: not the production of more information, but the production of the right information; not unstructured model content, but information that is organized, retrievable, and fit for purpose.

This article deliberately concentrates on the conceptual architecture and underlying logic required for effective information management in construction, leaving the translation of these principles into project-specific workflows or case studies to the practitioner's own context and tools.

BIM promises a single source of truth — but construction often inherits silos

In theory, BIM offers an integrated environment where geometry, data, time, cost, and performance can coexist in a coordinated digital representation. In practice, however, contractors often receive fragmented information.

The design model may contain geometric definition, but scheduling lives in one platform, costing in another, procurement in another, and site planning somewhere else entirely. Different teams own different datasets, each with its own logic, naming conventions, levels of detail, and classification systems. The result is a digital workflow that appears connected on the surface but behaves like a collection of silos underneath.

This is why "having a model" does not automatically produce 4D or 5D outcomes. Cost and programme information do not become integrated merely because a 3D model exists. They only align when the information structure allows them to align.

The contractor's question is always practical

For a contractor, BIM is not an abstract digital ideal. It must answer practical questions:

- What are we building?
- How will it be broken into deliverable work packages?
- What resources are required?
- What will it cost?
- How will it be built, sequenced, and tracked?

These questions sound simple, but they require a model that is structured in a way that supports construction logic rather than design intent alone.

Design models are often organized by discipline, system, or documentation need. Contractors, however, need to think in terms of zones, pours, sequences, work packages, temporary works, access constraints, procurement packages, and payment items. Unless model information is prepared with these uses in mind, construction teams are forced to rebuild logic outside the model, usually manually, and often repeatedly.

That is where BIM begins to fail — not because the software is weak, but because the information framework does not serve the delivery process.

ISO 19650-2: begin with the need, not the model

A key strength of ISO 19650-2 is that it shifts the conversation away from generic data production toward defined information requirements. It establishes an information management framework for the delivery phase of assets and requires project teams to be deliberate about what information is needed, when it is needed, by whom, and for what purpose.

This matters enormously for contractors.

The standard does not advocate producing every possible piece of information that could be attached to a model. Instead, it encourages teams to define the minimum information necessary to support decision-making and delivery. In other words, information should exist because it has a use.

This principle is especially important in construction, where information overload can be just as damaging as information gaps. A model filled with poorly structured or irrelevant data becomes difficult to trust and even harder to use. On the other hand, a model containing the right information, consistently classified and properly managed, becomes a powerful operational asset during delivery.

The contractor therefore benefits most when information requirements are developed around use cases such as planning, costing, sequencing, progress measurement, procurement, logistics, and handover.

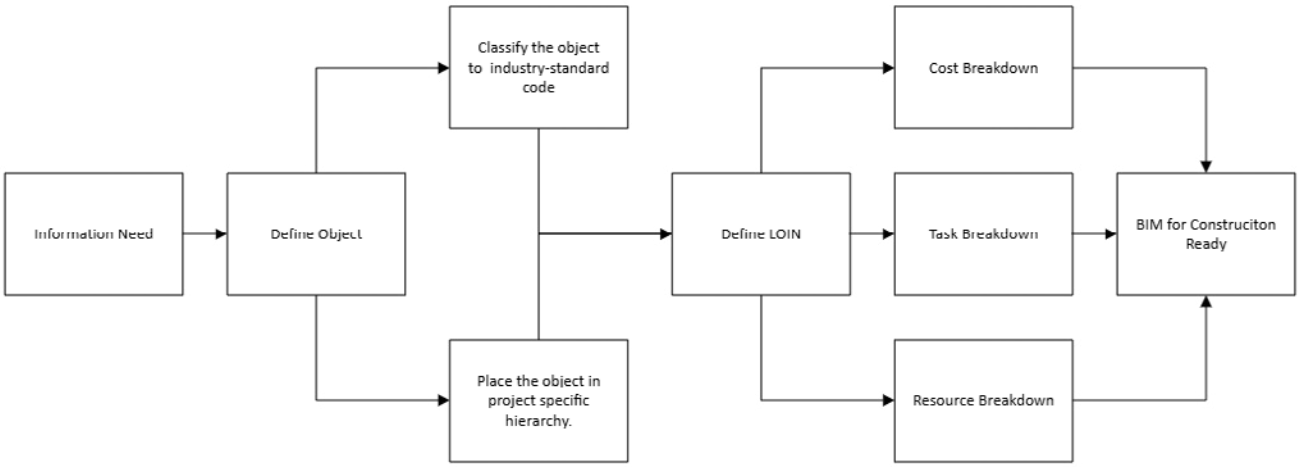
Software enables BIM — structure operationalizes it

Software remains essential. Without authoring tools, coordination platforms, quantity extraction applications, scheduling software, and cost systems, there is no digital workflow to speak of. But software only enables the process; it does not solve the underlying information problem.

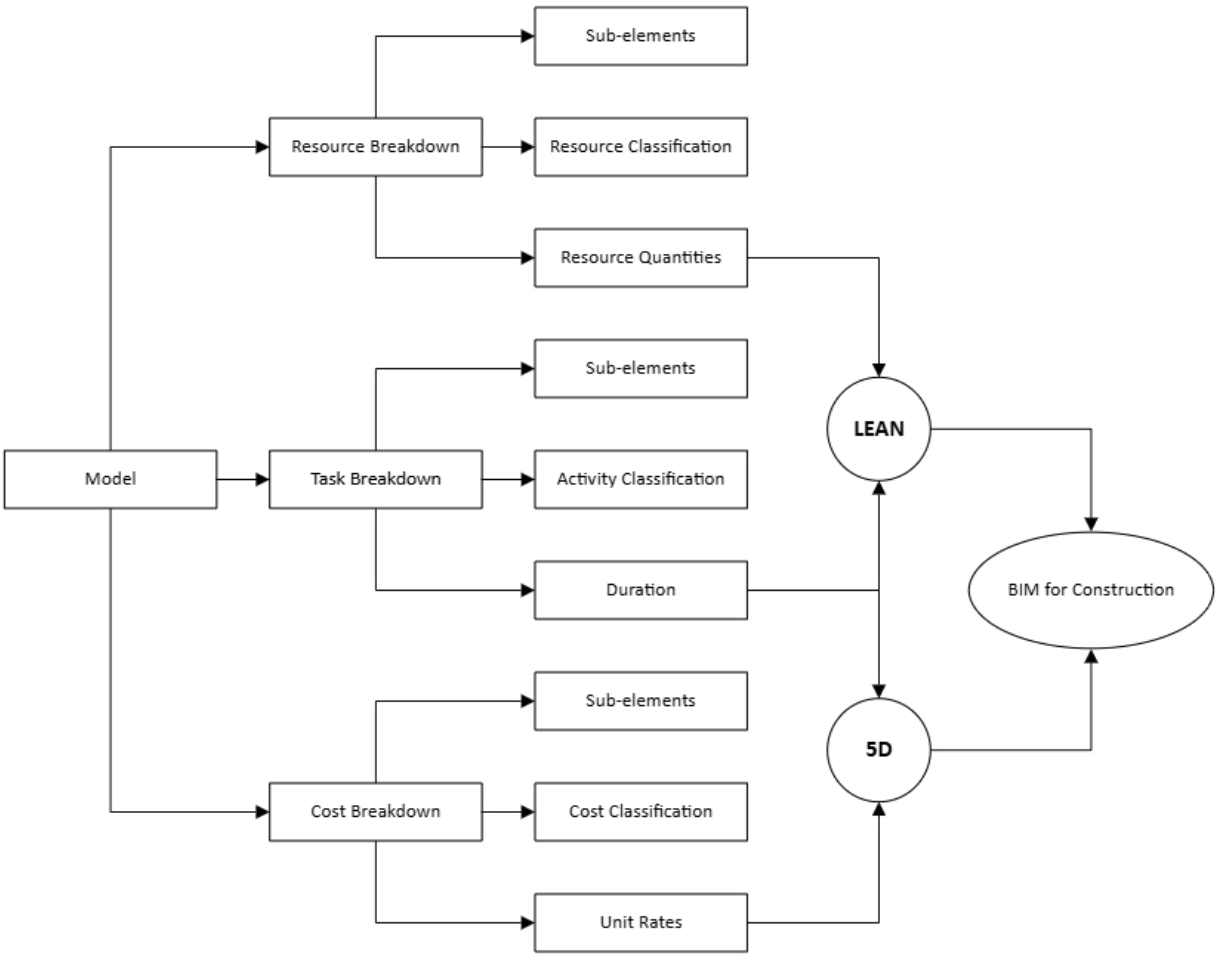
A model without structure is simply expensive chaos.

To turn digital information into decisions, the contractor needs a framework that organizes information across several interdependent structures. These can be understood as a chain of logic; each part plays a specific role:

From Information need to creating a BIM for Construction Ready Model:



From Model to BIM for Construction:



1. Model Breakdown Structure: creating order in the model

The first requirement is a Model Breakdown Structure (MBS). This defines how the model is organized spatially, logically, or by discipline. It may include systems, levels, zones, packages, model partitions, or other agreed divisions.

For the contractor, this structure is not merely administrative. It is the first step in making the model usable. If model elements are not consistently organized and classified, downstream use becomes unreliable. Extraction, filtering, grouping, and mapping all become difficult.

The MBS provides the framework within which model elements receive a consistent identity. It allows the project team to understand not only what an object is, but where it belongs in the larger construction context.

2. Level of Information Need: defining what matters

If the MBS creates order, the Level of Information Need (LOIN) defines relevance.

LOIN is often misunderstood as a simple measure of detail. In reality, it is more useful to see it as a disciplined definition of the geometric, alphanumeric, and documentary information needed for a specific purpose at a specific stage.

For contractors, this is critical. The value of model information lies not in how much data an element contains, but in whether the data supports construction decisions. For example, if a contractor wants to automate quantity take-off, sequence activities, or assign cost items, then the model elements must contain the right properties and classifications to enable that workflow.

This is the point at which the most important principle emerges: before deciding how to structure information, one must first know what information is important, and that answer is never universal, it differs:

- from organization to organization,
- from discipline to discipline,
- and from project to project.

A civil contractor, a specialist subcontractor, a healthcare client, and an infrastructure operator may all require different information structures for legitimate reasons. ISO 19650 accommodates this reality by requiring information needs to be explicitly defined rather than assumed.

3. Work Breakdown Structure: translating design into deliverable work

The Work Breakdown Structure (WBS) is where the model begins to align with construction execution.

Contractors do not build “the wall” as a single digital object. They build sections of work in a sequence, within zones, by crews, in relation to programme constraints and procurement realities. A monolithic element in the model is rarely a monolithic activity on site.

The WBS therefore breaks model elements into meaningful work packages such as pours, phases, areas, zones, lifts, or sequences. These work packages can then be assigned as alphanumeric properties to model elements, creating a bridge between the design representation and the contractor’s delivery logic.

Once this is done, model content can be grouped according to how work will actually be executed. This is a foundational step for both 4D and 5D workflows.

4. Resource Breakdown Structure: separating resources from elements

One of the most important conceptual shifts for construction BIM is recognizing that elements are not resources.

A wall is not a resource. It is an assembled outcome. The contractor needs to understand the labour, material, plant, equipment, and subcontract inputs required to construct that wall. In other words, resources must be separated from elements.

This is the role of the Resource Breakdown Structure (RBS).

By mapping model elements or classifications to resource components through rule-based workflows, contractors can begin to automate resource allocation and quantity derivation. For example, a wall type may be linked to constituent resources such as brickwork, plaster, reinforcement, formwork, or finishes, depending on the nature of the assembly.

This creates a more realistic relationship between the model and the act of construction. It allows resource requirements to be grouped, quantified, and managed consistently across the project.

5. Cost Breakdown Structure: connecting model information to payment logic
The Cost Breakdown Structure (CBS) answers a straightforward question: What will it cost?

But cost in construction does not emerge directly from geometry. It emerges from the mapping between classified model content, quantified resources, and the commercial structure used on the project — whether that is a bill of quantities, payment items, cost codes, or internal estimating logic.

Where this mapping is done well, quantities derived from model elements can support consistent pricing and forecasting. Where it is not, estimators are forced to reconstruct scope manually outside the BIM environment.

The important point is that 5D is not achieved merely by attaching a rate to a model object. It requires a structured relationship between model breakdown, work packages, resources, and cost items.

In many cases, pricing may still happen in conventional estimating platforms or spreadsheets. That is not a failure of BIM. The goal is not necessarily to force all pricing into a single software environment, but to ensure that the underlying information can be exported, mapped, checked, and reused with minimal loss of meaning.

6. Task Breakdown Structure: connecting the model to time
The Task Breakdown Structure (TBS) addresses another practical contractor question: How will it be built?

4D planning becomes possible when model elements, already classified and work-packaged, are linked to programme activities. Through rule-based or semi-automated workflows, the model can be connected to task durations, sequences, dependencies, and visual simulations of construction progress.

But here too, success depends on structure, not simply software capability.

If the programme is too coarse, the model too generic, or the work packages inconsistent, then the 4D link becomes superficial. For meaningful construction simulation, every scheduled work package should have a model representation, and every modelled work package should have a scheduling counterpart.

This is not a modelling issue alone; it is an information management issue.

Why low-hanging fruit matters

Not every project will achieve full integration across model, resources, time, and cost. Contractors should not wait for a perfect digital future before extracting value from BIM.

The best results often come from targeting low-hanging fruit:

- receiving models at tender stage,
- ensuring models are consistently classified,
- defining LOIN to support resource description,
- aligning model structure with construction work breakdowns,
- and enabling extraction of quantities for scheduling and cost planning.
- These are practical, achievable steps. They do not require digital perfection. They require discipline.

And they create immediate value because they improve the contractor's ability to interpret scope, plan work, price accurately, and communicate delivery intent.

The BEP as the vehicle for construction value

Within ISO 19650-2, the BIM Execution Plan (BEP) is one of the most important instruments for making this work in practice.

For the contractor, the post-appointment BEP should not be treated as a compliance document produced for its own sake. It should be used to define how project information will be structured, classified, exchanged, and validated in a way that supports delivery. This includes agreement on:

- model breakdown principles,
- naming conventions,
- classification systems,
- LOIN requirements,
- exchange points,
- responsibility for information production,
- and the intended uses of information in costing, planning, and site management.

If these matters are not resolved early, the project often defaults into disconnected workflows later. The consequence is predictable: teams spend more time cleaning, reclassifying, and rebuilding information than using it.

A contractor's definition of BIM maturity

From a contractor's point of view, BIM maturity should not be measured by how advanced the software stack appears, or by how detailed a model looks in a coordination meeting. A more meaningful test is this:

- Can the information be trusted?
- Can it be retrieved efficiently?
- Can it be grouped according to how the work will be delivered?
- Can it support planning, costing, sequencing, and reporting without extensive remodelling or manual reinterpretation?

If the answer is no, then the issue is unlikely to be software alone. It is more likely that the project has not adequately defined what information is needed and how it should be structured.

Conclusion: the real priority

Software is important. It enables authoring, coordination, quantification, simulation, and exchange. But software is not the foundation.

Structuring information is more important, because structure is what allows information to move across planning, costing, and delivery workflows.

Most important of all, however, is knowing exactly what information matters for your purpose.

That is the real lesson for contractors, and it is entirely consistent with ISO 19650-2. The standard does not ask us to model everything. It asks us to define the information needed, generate it in a controlled way, structure it consistently, and make it retrievable for use.

When that happens, BIM stops being a digital promise and starts becoming a construction tool.

And perhaps that is the missing link: not more technology, but better information logic.

BIM Is More Than Software. It's Strategy.

Why the firms winning South Africa's digital construction race aren't the ones with the best tools, they're the ones who know what to do with them.

Thabelo Netshivhungululu - Technical Manager, Modena AEC and Infrastructure

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Walk into almost any architecture, engineering or construction practice in Johannesburg today and you'll find Revit on the workstations, a Common Data Environment somewhere in the cloud, and at least one person who can talk fluently about clash detection. By that measure, the South African industry has "done" BIM. The licences are paid. The training has happened. The models exist.

And yet, project after project still runs late, over budget, and riddled with the same coordination failures BIM was supposed to eliminate two decades ago. The drawings don't match the model. The model doesn't match the site. The information that was meant to flow seamlessly from design into construction into operations evaporates somewhere around practical completion.

The uncomfortable truth is this: buying the software was never the hard part. After more than twenty years helping AEC organisations digitise their workflows, the lesson we keep relearning is that BIM does not fail because the technology is inadequate. It fails because it is treated as a technology problem in the first place.

The software trap

It's an easy trap to fall into, because software is tangible. You can procure it, install it, point to it on a balance sheet. A managing director can approve a line item for Autodesk licences far more comfortably than they can approve "an eighteen-month change to how three departments share information."

But BIM is not a product you install. It is a method for managing information across the entire lifecycle of an asset, from the first feasibility sketch to the day the building is decommissioned. The model on the screen is merely the visible tip of something much larger: a set of agreements about who produces what information, in what format, to what standard, and at what moment it becomes useful to the next person in the chain.

When a firm skips that part and goes straight to the modelling, it ends up with a beautifully rendered 3D model that nobody downstream actually trusts or uses. The technology works perfectly. The strategy was never there.

People, process, technology, in that order

The most resilient digital transformations rest on three legs: people, process and technology. The order matters more than most realise.

Technology is the easiest leg to fix and the least decisive. Process, the standards, workflows and handover protocols that determine how information moves, is harder and far more important. And people, the slowest and messiest variable of all, are where transformations actually live or die.

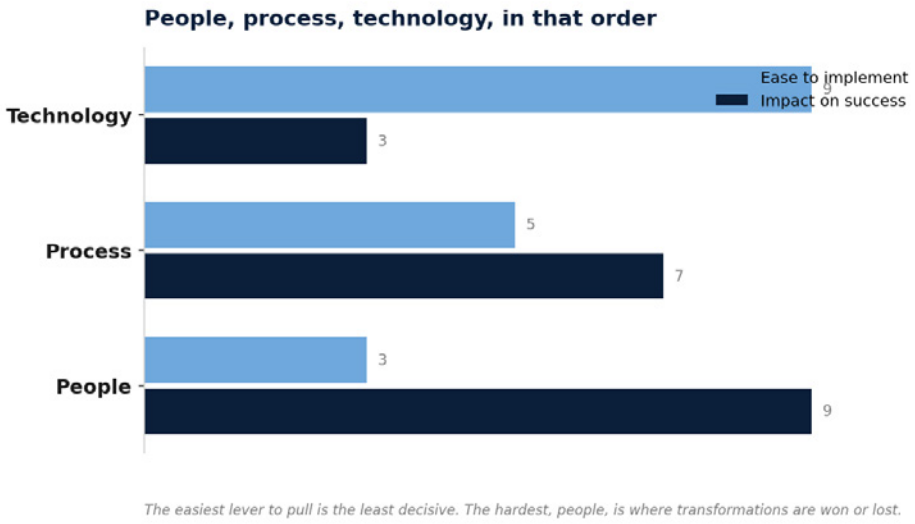

Figure 1: The easiest lever to pull is rarely the one that decides the outcome.

You can deploy the most sophisticated Common Data Environment on the continent, but if your project engineers don't believe in it, they will quietly keep their own version of the truth in a folder on their desktop. The moment that happens, your "single source of truth" becomes one more source among many, and the entire value proposition collapses.

This is why genuine BIM adoption looks far less like an IT rollout and far more like organisational change management. It involves rewriting the way teams are incentivised, retraining people who have done things a certain way for fifteen years, and, perhaps hardest of all, convincing senior leadership that the payoff arrives over years, not weeks.

ISO 19650 and the discipline of information

This is precisely the gap that ISO 19650 was written to close. Far from being the bureaucratic overhead it's sometimes painted as, the standard is a strategic framework. It forces an organisation to ask the questions it would otherwise avoid: What information do we actually need? Who is responsible for delivering it? How will we know if it's good enough?

The cascade from organisational information requirements down through asset, project and exchange requirements into a BIM Execution Plan is not paperwork for its own sake. It is the mechanism that turns a vague ambition, "we want to do BIM properly", into a defined, auditable, contractually enforceable reality.

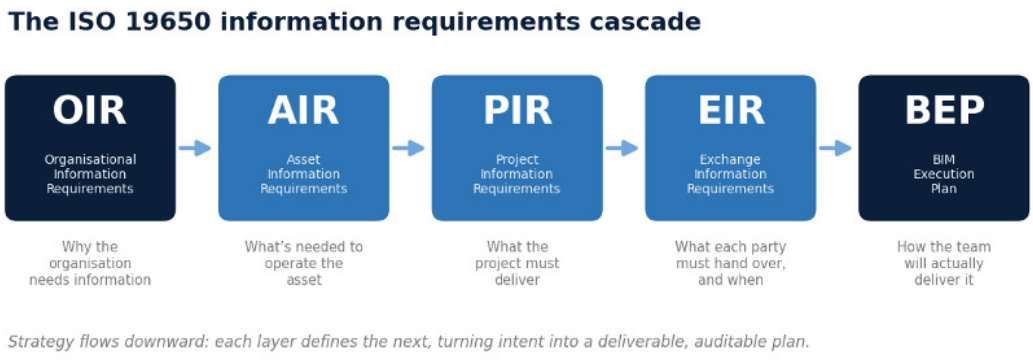

Figure 2: Strategic intent (OIR) cascades down into an executable, auditable delivery plan (BEP).

In the South African context, where projects routinely span multiple disciplines, joint ventures and public-sector procurement frameworks, that clarity is not a luxury. A clearly specified information requirement is the difference between a digital twin that informs facilities management for thirty years and a hard drive full of orphaned files that nobody opens after handover. The same discipline maps neatly onto local realities, SANS compliance, B-BBEE-driven team structures, and the long asset horizons of public infrastructure, where the cost of poor information is measured not in inconvenience but in decades of avoidable maintenance spend.

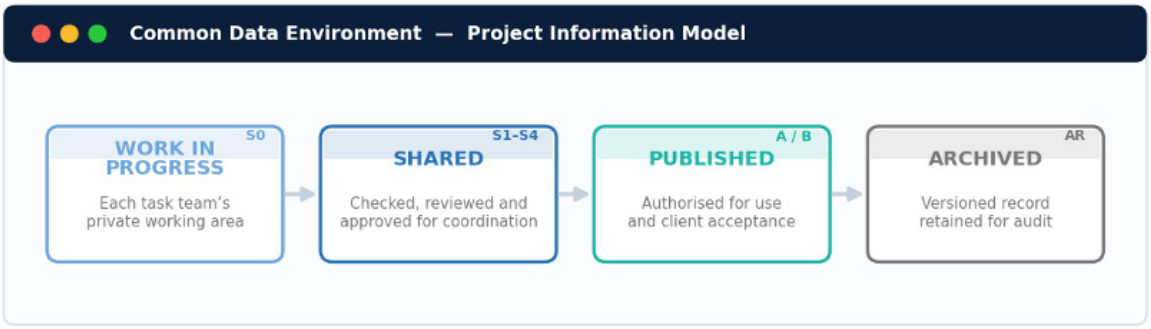

Figure 3: The ISO 19650 Common Data Environment governs how information matures from a private draft to an audited record.

Strategy is a leadership decision

If there is a single message worth carrying out of all this, it is that BIM is a boardroom conversation, not a back-office one.

The firms pulling ahead are not the ones with the biggest software budgets. They are the ones whose leadership has decided, deliberately, what they want their information to do for them, whether that's winning more competitive tenders, de-risking complex delivery, opening up facilities-management revenue, or simply not losing money on rework. Once that strategic intent is clear, the technology choices become almost obvious. Without it, no amount of software will save you.

That reframing changes everything about how a transformation is run. It stops being a project the IT department owns and becomes a capability the business builds. It stops being measured in licences deployed and starts being measured in outcomes: fewer clashes, faster approvals, tenders won, assets that pay back over their lifetime.

Making it work

The gap between implementing BIM and making it work is the gap between buying a gym membership and getting fit. The membership is necessary. It is also, on its own, completely insufficient.

For the South African industry to capture the productivity gains the rest of the construction world keeps promising itself, we have to stop asking "which software should we buy?" and start asking "what do we want our information to achieve, and what must our people and processes look like to deliver it?"

Answer that question honestly, and the software becomes the easy part again, this time for the right reasons.

BIM is more than software. It always was. It's strategy. And strategy, unlike software, can't be installed. It has to be led.

Let's build the future together. Modena AEC & Infrastructure, Autodesk Platinum Partner.


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From 4IR Fluency to 6IR Innovation: The Digital Education Scaffold of the Department of Architecture, UP.

Dr Calayde Davey, Jason McBean, Christo van der Hoven - Department of Architecture, University of Pretoria

Introduction: Navigating Industrial Revolutions in the African Built Environment

The global built environment is navigating period of unprecedented technological shifts. At the Department of Architecture at the University of Pretoria (UP), our response is anchored exploring the transformative potential of integrated digital and industrial innovation for the African context. Transcending the purely technological focus of previous revolutions, we are also scaffolding our curriculum toward the Sixth Industrial Revolution (6IR), a nature-centred paradigm shift that leverages AI and computational design as biomimic translators to drive regenerative, bio-based innovation.

Our digital educational mission goes beyond software proficiency; we cultivate contextual, ecosystemic design thinking. We prepare students to lead this digital transformation by bridging technical skill development with critical engagement on the spatial, social, environmental, and regulatory implications of a data-driven, regenerative practice.

Undergraduate Foundation: Digital Literacy to core BIM Skills

The undergraduate OKU 100–300 modules provide a digital scaffold, transitioning students from foundational 3D digital literacy to data-rich BIM and high-fidelity visualization.

- Year 1: The Digital Toolkit. In OKU 100, students build a baseline of computer literacy and digital post-processing for built environment projects. They transition from hand-drawn sketches to 3D modelling in virtual environments using tools like FormItTM, learning to communicate design intent effectively.
- Year 2: Digital Practice Norms and Geospatial Context. OKU 200 introduces students to digital office standards and the production of technical documentation. Here, they begin preparing geospatial site context models using Autodesk FormaTM and basic GIS applications, ensuring their designs are rooted in real-world data and contexts.
- Year 3: Intermediate BIM and Professional Documentation. OKU 300 acts as a bridge to the workplace. Students engage with high-fidelity Building Information Modelling (BIM) to integrate digital and physical data into comprehensive 3D representations. They produce a complete set of technical drawings for construction while using rendering software like TwinmotionTM to create visually engaging presentations.

Postgraduate Specialisation: Mastering Digital Workflows and Algorithmic Design

In postgraduate Continuing Practice Development (CPD) modules, students learn specialised skills in digital design workflows and parametric (computational) design.

In the digital workflow's elective, the focus shifts to collaborative digital information management and multidisciplinary coordination. Students manage linked models across disciplines (Architectural, Structural, MEP) and develop basic BIM Execution Plans (BEPs) aligned with SANS/ISO 19650 principles. This simulation of professional practice ensures they can maintain model integrity and resolve complex spatial conflicts in federated environments.

The parametric (computational) design elective introduces algorithmic thinking. Using Rhinoceros3DTM and GrasshopperTM, students learn to translate design logic into tectonic details, such as the Parametric Waffle algorithm. We advocate for "Parametric Regionalism," encouraging students to adapt computational theories to situated, local contexts while exploring sustainable material technologies like cross-laminated timber (CLT).

Nature as Technology: Exploring the Sixth Industrial Revolution (6IR)

Our departments most explorative work is the transition to the Sixth Industrial Revolution (6IR), an ecological paradigm where nature itself becomes the technology. By intersecting digital tools with regenerative modes of production, our exploration focuses on bio-based and biotechnical innovation. In this paradigm, students move beyond "harm reduction" to treat projects as co-evolutionary systems rather than isolated artefacts. By prioritising circularity and place-based resilience, they are challenged to explore AI and computational design to create built environment projects that actively restore ecosystems and regenerate social-ecological relationships.

AI as a Biomimetic Translator: Collaborating with AI and computational design

Artificial Intelligence (AI) serves as the critical catalyst for the 6IR transition by acting as a biomimicry translator between biological complexity and architectural application. Traditionally, identifying natural models for design challenges was a laborious, manual process. At our department, we collaborate with the French firm Asteria, leveraging their biomimetic AI agent to efficiently discover biological strategies (such as growth, repair, adaptation, and self-regulation) for application in architectural scales. Through this partnership, students use AI to mine biological knowledge for functional mechanisms, such as the thermoregulatory properties of termite mounds or the ventilation strategies of cacti. This AI-assisted methodology allows students to translate complex organism-level behaviours into computational design rules and digital fabrication logics for regenerative building envelopes. By integrating AI with computational design, students derive new digital-ecological workflows that bridge the gap between biological intelligence and future-oriented architectural expression.

Conclusion: From 4IR Fluency to 6IR Innovation

The University of Pretoria's Department of Architecture goes beyond technical instruction to build a comprehensive digital scaffold that empowers students to lead in the professional demands of the 4IR, while exploring innovation in the transition into the Sixth Industrial Revolution (6IR). By evolving from foundational 3D literacy to advanced AI-assisted biomimetic design, our curriculum ensures graduates are uniquely equipped to navigate an ecological paradigm where nature itself becomes the primary technology.
Through the integration of regenerative design thinking and bio-based innovation, we are preparing our students to move beyond "harm reduction" and treat projects as co-evolutionary systems rather than isolated artefacts. Ultimately, this academic roadmap fosters the resilience and sustainability of the African built environment, ensuring that the next generation of professionals can design a future where technology and nature co-evolve to restore our social-ecological relationships.

Figure 1: Department of Architecture Logo

Figure 2: Examples of postgraduate CPD parametric (computational) design iterations for timber construction using ReRender™ by study leader (Source: C van der Hoven, 2025).

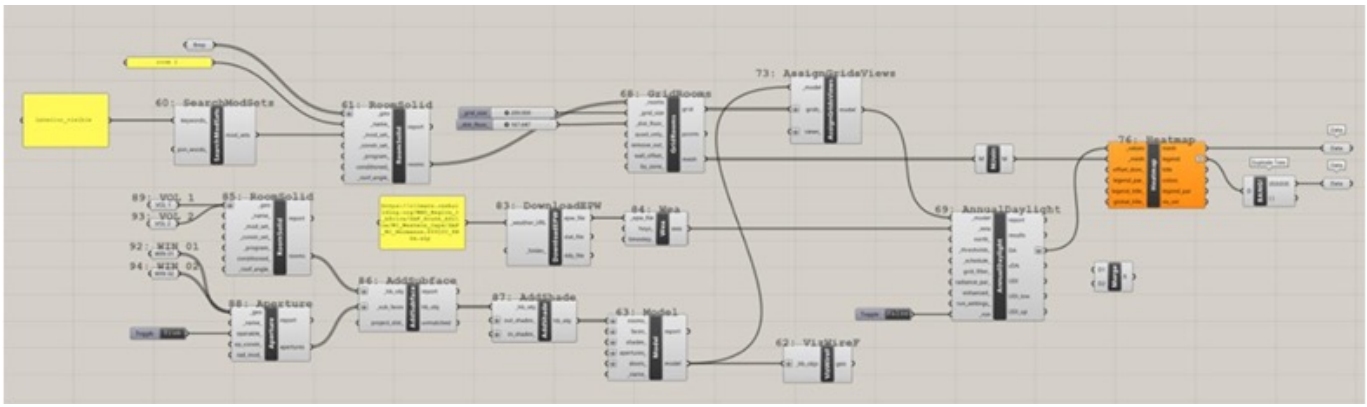

Figure 3: Bio-digital 6IR Prototypes: 3D-printed regenerative envelopes translated via Asteria™ AI and computational design in masters research (W. Wright, 2026).

Smarter BIM.
Better Connected Projects.
Built for Digital Success.

In an industry defined by complexity, fragmentation, and uncertainty, the need for effective digital transformation is greater than ever. Despite ongoing investment in tools and technologies, digital transformation projects still fail to realize the full value of Building Information Management (BIM). The challenge is not capability but adaptation and change with the right connections.

At Pro-Serve Consulting, we believe successful digital projects are enabled through Smart BIM, where relevant skills and a responsive digital platform align. Together, these elements create a connected environment that delivers more predictable, transparent outcomes across the project lifecycle.

From BIM to Project Outcomes

Digital strategists often focus on tools such as software platforms, models, and data environments, without equal emphasis on the people who use them. processes that bring them to life. BIM is not simply a technical function. It is a collaborative, information-led approach to delivery.

Enabling a Responsive Digital Culture

Technology alone will not drive transformation. A responsive digital culture is vital to enable collaboration, adaptability, and accountability. Establish the Common Data Environment, enforce it with Protocol, and embed Digital Workflows consistently.

When digital practices become part of everyday delivery, teams are empowered to respond faster, solve problems together and drive better outcomes.

Intelligent Information as the Key Asset

The real advantage lies in information that is structured, relevant, and usable. At Pro-Serve Consulting, we focus on aligning information with purpose. Whether producing designs, supporting design coordination, cost management or asset operations, the goal is to ensure information remains accurate, meaningful and actionable.

Intelligent information drives decision-making aligns with project objectives and stays accessible throughout the asset lifecycle.

> **The challenge is not capability. It is adaptation, change and creating the right connection.**

Connecting for Digital Success

The true value of BIM is realised when skills, culture, information and modelling are fully integrated.

Smart collaboration depends on structured data management, where BIM models are not isolated outputs but part of a connected information system. By leveraging shared modelling, coordination modelling, strengthens collaboration and supports informed decision-making throughout the project lifecycle.

As the built environment continues to evolve, organisations that invest in Smart BIM, collaborative data environments and information strategy will be best positioned to deliver successful digital projects.

At Pro-Serve Group, we support our clients in integrating people, data and models to unlock value and deliver projects that are efficient, connected and future ready.

SMART BIM DELIVERS

- Better collaboration
- Improved information management
- More predictable project outcomes
- Stronger digital governance
- Lifecycle-focused decision making
- Connected project teams

PRO-SERVE CONSULTING

Connecting people, information and technology deliver **smarter digital projects.**

positive impact today... **for tomorrow**

Beyond BIM: Building a Culture of Digital Delivery Across Africa

Why organisational culture — not technology — is the real constraint on digital transformation in construction

Neels van Zyl - Group Digital Delivery Manager, Stefanutti Stocks

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Harambee is a Swahili word. It means "let us all pull together," and it is the name of the conference at which I was recently asked to speak about organisational culture in digital transformation. The longer I have worked in digital delivery, the more convinced I have become that the word is not just a good conference name — it is a precise diagnosis. Digital transformation in construction is not a technology problem. It is a pulling-together problem.

The uncomfortable truth

The construction industry has never had better tools. We have intelligent 3D models, drones and laser scanners, common data environments, 4D and 5D simulation, and now AI. If tools were the answer, our industry would already be transformed. It is not. McKinsey has put the share of digital transformations that fall short of their objectives at around 70%, and construction consistently ranks among the least digitised major industries in the world.

The pattern behind those numbers is one every executive will recognise. A platform is bought and launched with fanfare. A keen pilot team makes it work. There is a case study, perhaps an award. And then the scale-up quietly dies in old habits. The software worked. The organisation's habits never changed.

> *Culture eats strategy for breakfast — and it eats software for lunch.*

Look at where transformation budgets go: BIM authoring software, CDE platforms, drones, scanners, dashboards. Now look at what actually changes delivery outcomes: how teams share information, how decisions get made, what leaders inspect and reward, and whether people trust the data in front of them. The two lists rarely meet. That gap is the transformation problem.

Beyond BIM: a thread, not a department

Most contractors start their digital journey by creating a BIM island: a clever team in a corner producing models that the rest of the business politely ignores. The models are good. The tenders, programmes, surveys and site instructions carry on as before, retyped at every boundary between disciplines.

The shift that matters is conceptual before it is technical: BIM is not a department. Digital delivery is a thread that runs through the whole lifecycle — tendering, planning, survey, engineering, construction and handover — with one model of the work carried from first estimate to final handover. At tender stage that means quantities, methodology and risk visualised before the price is committed. In the field it means survey data flowing between site and model in both directions. Before construction it means clashes resolved in the model rather than discovered on the scaffold.

Two examples from our own projects show what that thread looks like in practice. On a recent tender, BIM stopped being "the 3D model" and became the common planning language for the project. The estimating team used it to check quantities; the planning team used it to simulate and assess the construction sequence; the construction managers used it to plan logistics, temporary works and constructability. Construction methodologies went from long write-ups to visual, more compelling delivery strategies, risks were surfaced and uncertainty resolved before submission — and the tender went in with far greater confidence in both the price and the method.

On a data centre project, the busduct route was coordinated with the long-lead equipment vendor in the federated model, well before procurement and fabrication. Busduct is not a small coordination item: if clashes are only discovered during construction, the issue is no longer a modelling problem — it is a programme risk, a procurement risk and potentially a cost risk. Coordinating early meant clashes with the structure, building services and access routes were resolved while they could still be fixed properly, and the correct sections, bends and interfaces were finalised before fabrication started. The model is not the outcome; it is the platform that helps a project team make better decisions before those decisions become site problems.

What the culture actually is

"Culture" fails as a strategy when it stays abstract. In our experience it becomes real when it is expressed as a small number of observable behaviours. Five have mattered most.

One source of truth. A common data environment only works when it is the environment — not one more place to look. The operating rule is blunt: if it is not in the CDE, it does not exist.

Share early, share ugly. Draft information shared beats perfect information hoarded. This is where ISO 19650 earns its keep — not as compliance paperwork, but as a shared language for the state of information: work in progress, shared, published. Everyone knows what they may rely on and what they may not.

Decide on data, not seniority. The model, the survey and the measured quantity settle the argument. This is a genuinely uncomfortable shift in a hierarchical industry, and it is also where the productivity is.

Visual by default. A coordinated model in a site meeting changes the conversation with foremen, subcontractors and clients. People argue with a drawing register; they collaborate around a model.

Digital trust. People abandon their private "shadow spreadsheets" only when the shared system proves reliable. Trust is built in weeks and lost in one bad handover.

None of these behaviours can be installed with a licence purchase. They are led. What leadership inspects, rewards and tolerates becomes the culture. If an executive asks to see the model rather than the printout, the organisation notices. If shared information is praised over private heroics, the organisation notices. And every workaround that leadership ignores quietly becomes policy.

What leaders inspect, reward and tolerate becomes the culture.

What changes on site

This is not culture for its own sake. When the behaviours take hold, the delivery effects are concrete: fewer RFIs, because questions get answered in coordination before they ever reach site; clash and constructability issues caught before they cost programme; and sharper risk conversations at tender stage, because method and quantities have been visualised before the price is committed.

Our own projects have started to put numbers to this. On a marine project, reinforcement clashes were identified and resolved in the model before construction started, avoiding a costly precast trial fitment and significantly reducing the risk of rework on site — an estimated cost avoidance of approximately R1.3 million, roughly

equivalent to the project's potential delay penalties. On a wastewater treatment works, mechanical ducting that existed only in 2D was modelled in 3D and coordinated in the federated model before fabrication, saving approximately half a million rand in material — around 30% across five buildings. The cost of coordination is far lower than the cost of correction on site.

Honesty matters here too. We piloted a new digital workflow on a client-driven BIM project and it worked extremely well: the team was engaged, the agreed process was followed, and the CDE was used properly. When we rolled the same workflow out across other projects, the challenge became clear — under pressure, people went back to what they knew: emails, personal spreadsheets, offline trackers. Not because they resisted digital delivery, but because high-pressure projects leave very little room for change unless the new way of working is properly embedded. The lesson was simple: the software was not the problem — changing behaviour was. If digital workflows are to scale beyond a successful pilot, they must be easier to follow than the old habits they replace.

Africa's leapfrog

There is a bigger opportunity in this than fixing individual projects. Africa skipped landlines and went straight to mobile. It skipped branch banking and went straight to mobile money. Construction on this continent can skip the legacy-systems era — decades of entrenched, disconnected enterprise IT that older markets must now unwind — and go straight to collaborative digital ecosystems as the default way of delivering infrastructure.

We have a young, mobile-native workforce and the largest infrastructure build-out of the century still ahead of us. The organisations that treat collaborative digital delivery as the starting point, rather than a retrofit, will set the pace.

The Monday-morning playbook

For any organisation serious about this, the starting point is not a procurement exercise. Map your information flow before buying anything new. Choose the behaviours you want first, then choose tools that reward those behaviours. Put champions inside the disciplines rather than building a digital department beside them. Measure adoption by behaviour — information actually flowing through the CDE — not by licences issued. And leaders go first: ask for the model, and the culture follows. If the exec asks for a printed report, the culture has heard everything it needs to know.

The point

> *The future of African construction will not be determined by who owns the best software — but by who builds the best culture for collaboration, information and delivery.*

Digital transformation is not a technology journey. It is a people and culture journey enabled by technology. Harambee — let us all pull together.

CSIR Integrated Digital Asset Management Approach - A Practical And Progressive Approach For Building Information Management In The Local Context

Samantha Makhwara, Willie Koekemoer, Yolandi Olivier, Melven Naicker, Dr. Kamini Ramiah, Kaveer Harrilall

1. Background and Introduction

The SIM Group delivers Immovable Asset Management support to public sector departments across South Africa by addressing ageing infrastructure, fragmented data environments, and tailored technical capacity through a centralised and authoritative information database that is also geospatially enabled. Within this context, the programme supports key statutory planning instruments such as UAMPs, including work undertaken for various Government departments, while strengthening compliance with GIAMA, PFMA, GRAP, and IDMS. This article is structured to highlight how the SIM Group operates within the BIM environment, with sections of the article making specific reference to projects concluded with the public sector, where Building Condition Assessment was designed, operationalised, and institutionalised to improve governance and support service delivery.

The outcomes were enabled through the CSIR's BIM solution, known as the PREMIS platform, which functions as an enterprise immovable asset information system supporting compliant asset registers, condition assessments, verification processes, lifecycle planning, geospatial integration, cost modelling, management decision support, and audit-ready reporting. Rather than relying on fully developed BIM models from the outset, PREMIS establishes a practical and sustainable approach which targets a trusted minimum information environment grounded in reliable asset identity, custodianship, condition, valuation, location and lifecycle obligations which progressively accommodates richer technical, geospatial, and BIM-linked information as organisational maturity grows. This governance-first approach reflects some of the principles of ISO 19650-3 by prioritising structured, proportionate, and auditable information, including geometric modelling.

While a fully integrated BIM model offers significant benefits, the South African context, especially public sector, requires practical, sustainable, and affordable implementation solutions. Given budget, capacity, and capability constraints, a pragmatic approach to asset and information management is more appropriate than pursuing advanced platforms, such as Revit for example, from the outset.

The key clients for SIM are various Government Departments. The SIM group is usually appointed as the technical partner to provide specialised engineering, data architecture, and quality assurance framework support, while utilising and upskilling internal departmental performance assessors to execute field operations. The solution drivers include:

- **Legislative Mandate & Compliance:** The fundamental prerequisite to align the provincial asset portfolio with the statutory requirements of the Government Immovable Asset Management Act (GIAMA), Act No. 19 of 2007.
- **Service Delivery Optimisation:** Ensuring that critical facilities are maintained in structural integrity and operational readiness to prevent disruptions in essential public services.
- **Fiscal Preservation & Cost Efficiency:** Moving away from historical, arbitrary percentage-based budget allocations toward defensible, data-driven preservation strategies to maximise limited public funds.
- **Asset Lifecycle Extension:** Accurately calculating and extending the Remaining Useful Life (RUL) of physical assets to defer capital replacement costs (CapEx) through timely operational maintenance (OpEx).

GIAMA compliance is not optional and is not achievable without structured, evidence-based condition data. The Building Condition Assessment programme documented here is, at its core, a GIAMA compliance and governance instrument, one that simultaneously aligns with international BIM principles for information management over the asset lifecycle.

2. BIM Implementation in a South African Context

2.1 Level of BIM Maturity Achieved

SIM operates at BIM Level 1 maturity, having transitioned from paper-based drafting to managed digital information, and is progressing toward BIM Level 2 principles for information exchange structures. Due to the immense scale and budgetary constraints, fully interactive 3D parametric models (such as Revit) were not generated for every building. Instead, the project achieved complete standardisation of digital asset data, point-to-point synchronisation, and a collaborative environment for asset documentation. To address local constraints, such as varying technical capacity and procurement challenges, the methodology incorporates flexible data capture methods and cost-effective technologies. This implementation follows a progressive, five-stage maturity framework:

- **Stage 1** – Compliance Foundation: Establishes basic asset registers and ensures financial alignment.
- **Stage 2** – Managed Operational Information: Tracks maintenance, utilisation, and lifecycle data.
- **Stage 3** – Integrated Enterprise Information: Drives system integration and governed information exchange workflows.
- **Stage 4** – BIM-Enabled AIM: Develops structured object- and model-based asset information models.
- **Stage 5** – Digital Twin Management: Achieves integrated, dynamic, multi-domain asset intelligence.

2.2. ISO19650: The International Standard for Asset Information Management

The ISO 19650 series currently comprises six published parts. The most directly relevant to this programme are Part 1 (concepts and principles) and Part 3 (the operational phase of assets, which covers information management during the use and maintenance of built assets). The standard defines a hierarchical set of information requirements flowing from organisational strategy down to individual asset data fields. Table 1 presents the correspondence between ISO 19650 information management concepts and the CSIR SIM Building Condition Assessment methodology, highlighting how global principles are applied in practice.

ISO 19650 Concept	Definition	SIM Equivalent
Organisational Information Requirements (OIR)	Information an organisation needs to achieve its strategic objectives is the foundation for all other information requirements.	GIAMA compliance obligations; CAMP and UAMP data needs; User department service delivery outcomes.
Asset Information Requirements (AIR)	Precise description of what information is required to operate and maintain an asset, and how it must be delivered (format, detail, and method)	PREMIS data field specifications: condition ratings, GPS coordinates, defect photographs, dimensions, maintenance cost estimates, and RUL projections.
Asset Information Model (AIM)	The structured, continuously updated dataset representing the current and historical state of an asset, including technical attributes, inspection records, and maintenance histories	PREMIS central database, provincial asset register, component-level condition histories, cost models, and Maintenance Programme records
Common Data Environment (CDE)	A shared, governed information environment with defined access roles and information states	PREMIS server: assessors (WIP) → CSIR QC review (Shared) → Assessment sign-off (Published) → superseded records retained (Archived) superseded records retained (Archived)
Information States: WIP → Shared → Published	Defined workflow states control validity and access at each stage	Tablet Field capture (WIP) ? CSIR QC review (Shared) ? Formal sign-off to AIM (Published)
Appointing/Appointed Party	The client or asset owner who defines information requirements and holds formal approval authority	Defines GIAMA-driven information requirements and approves all published data
Level of Information Need (LOIN)	Framework defining the quality, quantity, format, and granularity of information required for a specific purpose.	Minimum two GPS-tagged photos per element; distometer measurements to ±50mm; GPS to 5m accuracy; mandatory Cause/ Reason and Consequence fields for ratings below 4

Table 1: ISO 19650 information management concepts mapped to the CSIR SIM Building Condition Assessment methodology

The CSIR SIM methodology was not explicitly designed for ISO19650. However, retrospective analysis reveals structural alignment with the standard's core principles, particularly the pre-definition of information requirements before data collection, the governance of information states through a CDE, and the direct linkage of asset data to organisational decision-making. This reflects sound information management practice developed over two decades of public sector engagement.

2.3. Alignment to South African Regulatory Requirements

SIM methodologies and supporting systems and frameworks are aligned with key South African public-sector frameworks:

- **GIAMA:** Supports custodianship, planning, and compliant asset registers
- **IDMS:** Enables lifecycle information continuity across infrastructure management functions
- **GRAP:** Provides data structures and traceability for compliant asset accounting
- **SCOA:** Ensures asset and financial data are standardised, codified, and reportable
- **GIS** is aligned with the SANS 1878-1:2011 (Spatial Metadata Standard) and the SANS 19157:2014 (Data Quality).

2.4. SIM Infrastructure System & UAMP Automation

To replace inefficient compilation methods, SIM utilises an automated infrastructure system designed for the generation of UAMPs. Government departments are legally required to submit these UAMPs annually under GIAMA requirements. By integrating the Geospatial Immovable Asset Management Solution (GIAMS) with the Building Condition Assessment Database, this platform automatically populates the templates required by the Department of Public Works and Treasury. Beyond compliance automation, the system facilitates data analysis to uncover performance patterns and mobilise strategic interventions, while also reporting on compliance with the Department's Infrastructure norms and standards.

2.5. Tools, Platforms, and Workflows Used

The approach applies BIM principles through an integrated information environment using GIS, CAD, and asset management databases. It aligns with ISO/SANS 19650 Stage 2, which incorporates SIM's technology platforms (PREMIS, ArcGIS Enterprise/Pro, QGIS, AutoCAD, and mobile apps), ensuring collaborative lifecycle management. It also aligns with ISO 19650-3, which focuses on the operational phase, which considers SIM's capability approach, local capacity needs, and corporate procurement strategies, through flexible, cost-effective, and scalable solutions, to meet specific client needs.

2.6. Core PREMIS Modules and Compliance to BIM Progression

PREMIS operates across nine core modules, systematically progressing from compliance registers toward an enriched Asset Information Model (AIM):

i. **Immovable Asset Register:** Establishes the authoritative identity of assets (classification, hierarchy, location, condition, valuation) as the foundational AIM layer.
ii. **Property and Land Management:** Consolidates cadastral, ownership, and rights data with geospatial context to bridge land management with spatial intelligence.
iii. **Operations Management:** Manages asset utilization, inspections, incidents, and work orders to drive continuous AIM updates.
iv. **Lease and Tenant Management:** Unifies financial flows, occupancy, and obligations within a single spatial and property framework.
v. **Cost Modelling:** Evolves from high-level estimates to data-driven lifecycle cost models for budgeting and renewal forecasting.
vi. **Maintenance Requirements:** Governs preventive, corrective, and statutory maintenance linked to backlog management and preservation.
vii. **Service Life Management:** Tracks component lifecycles to support long-term capital investment and replacement planning.
viii. **Asset Accounting:** Achieves full GRAP compliance through integrated processes for capitalization, depreciation, impairment, and disposals.
ix. **Environmental Management:** Tracks basic environmental and occupational health risks, compliance, and sustainability indicators.

Field data is captured using a tablet device aligned to PREMIS's data architecture. GPS-enabled photography, distometer measurements, and hand-drawn site plans were all integrated into the workflow. The figure below illustrates SIM's Asset Management Data Flow lifecycle:

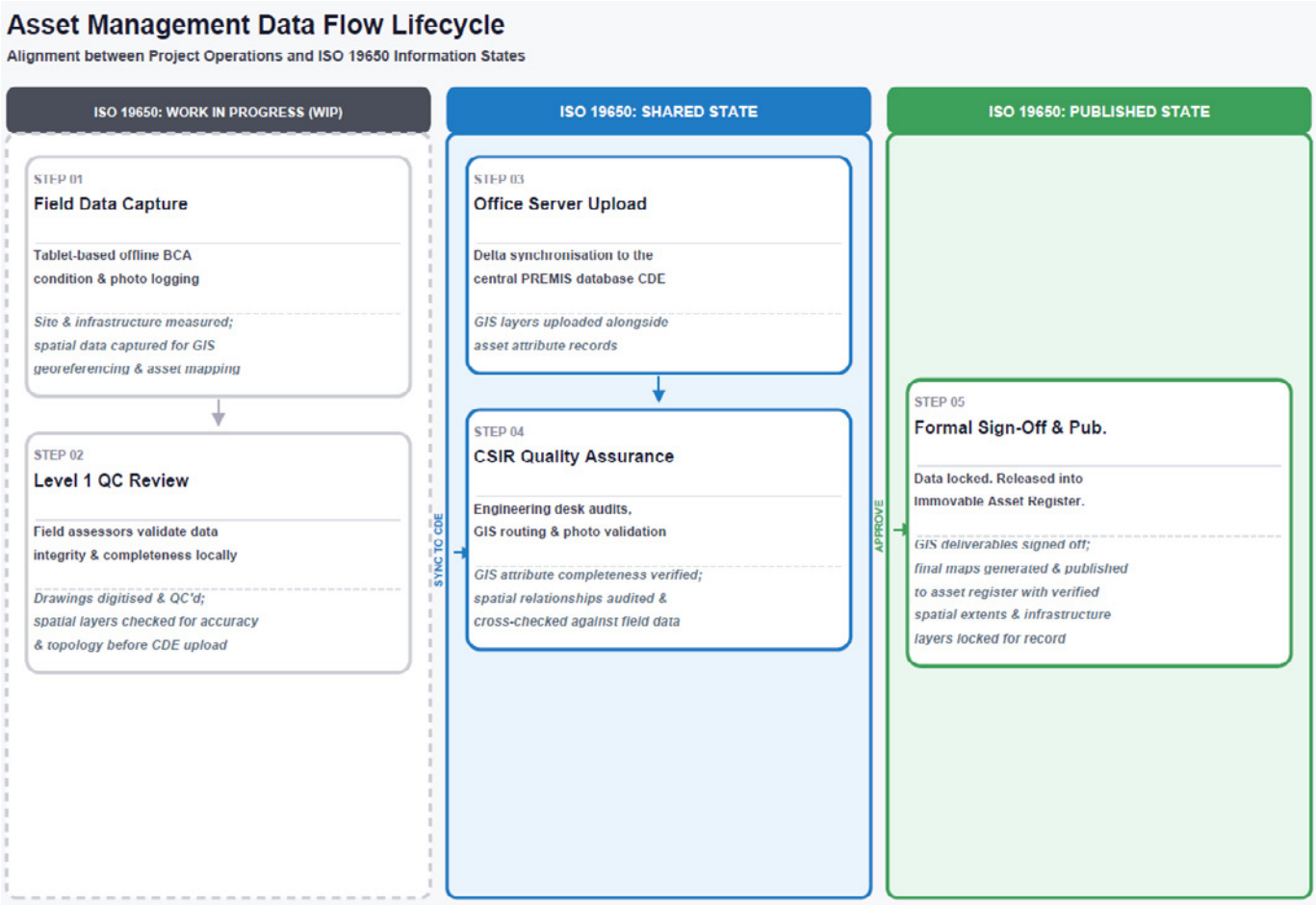

Figure 1: Asset Management Data Flow Diagram

2.7. Data Capture and Asset Information Modelling (AIM)

Within this ecosystem, the PREMIS platform operates simultaneously as a compliant immovable asset management system. It satisfies legal, financial, planning, maintenance, and operational requirements while progressively enriching the provincial Asset Information Model (AIM) from structured register data into object-based, model-supported information. To feed this centralised model, field inspectors utilise tablet-based digital applications to capture component-level conditions in facilities, photographic evidence of defects, building floor layout diagrams and maintenance needs, evaluating each building element on a standardised 1 (Very Bad) to 5 (Very Good) condition scale weighted by cost impact.

CONDITION RATING	Condition	Action Required	Description
5	Very Good	Planned Preventative Maintenance	The component or building is either new or has recently been maintained, does not exhibit any signs of deterioration
4	Good	Condition-based Maintenance	The component or building exhibits superficial wear and tear, minor defects, minor signs of deterioration to surface finishes and requires maintenance/servicing. It can be reinstated with routine scheduled or unscheduled maintenance/servicing.
3	Fair	Repairs Required	Significant sections or component require repair, usually by a specialist. The component or building has been subjected to abnormal use or abuse, and its poor state of repair is beginning to affect surrounding elements. Backlog maintenance work exists.
2	Bad	Rehabilitation Required	Substantial sections or component have deteriorated badly,suffered structual damage or require renovations. There is a serious risk of imminent failure. The state of repair has a substantial impact on surrounding elements or creates a potential health or safety risk.
1	Very Bad	Replacement Required	The component or building has failed, is not operational or deteriorated to the extent that does not justify repairs, but should rather be replaced. The condition of the element actively contributes to the degradation of surrounding elements or creates a safety, health or life risk.

Figure 2: Building Condition Rating Scale used in PREMIS

2.8. Adaptations Made Due to Local Constraints

In relation to the project with a previous Public Department, significant adaptations were required to make the methodology workable within the broader South African public-sector context, particularly in response to connectivity limitations, fragmented procurement arrangements, legacy assets with limited source documentation, constrained technical capacity, and uneven resource availability.

- Connectivity and bandwidth constraints: Because parts of the province experience unreliable internet access, the field application was configured to operate fully offline, storing inspection data locally and synchronising only changed or new records once stable connectivity became available, thereby reducing data costs and maintaining continuity of fieldwork.
- Resource scarcity and variable assessor capacity: Given the limited number of registered professionals and the fluctuating availability of assessors, the methodology relied on highly objectified visual matrices, structured training, and rigorous quality control to produce consistent engineering-grade data without assuming a stable or extensively specialised workforce.
- Physical documentation gaps: In the absence of reliable digital drawings for many facilities, hand-drawn site and floor plans remained a necessary part of the workflow and were digitised where feasible to support later integration into the broader asset information environment.

3. Information Management Practices

3.1. Role-Based Setup and Access Control

The PREMIS operating model is implemented using role-based access control (RBAC) aligned with organisational accountability structures. Defined user roles include:

- System administrators (platform and security administration)
- Data stewards/information managers (master data, standards, quality assurance)
- Custodian asset managers (portfolio ownership and custodianship functions)
- User department representatives (service delivery demand and utilisation inputs)
- Property and land officers (title, parcels, rights, valuation, restrictions)
- Technical and engineering teams (condition, defects, maintenance, service life, interventions)
- Finance and accounting users (capitalisation, depreciation, disposals, reconciliation, audit support)
- Lease and tenant administrators
- Decision-makers and executives (dashboards, analytics, approvals)

This structure reflects the GIAMA distinction between custodians and users while supporting explicit accountability, authorisation, and operational workflows.

3.2. Data Integrity, Auditability, and Version Control

PREMIS maintains authoritative master records supported by unique asset identifiers, mandatory metadata, defined approval states, change histories, and full audit trails. Information is managed through controlled review, authorisation, and acceptance processes before being incorporated into the maintained asset information environment. This ensures both alignment with ISO 19650-3 information lifecycle principles and compliance with public-sector audit and reporting requirements.

3.3. Hosting, Backups, Resilience, and Recovery

PREMIS operates as an enterprise-hosted platform within a controlled environment that includes managed data hosting, scheduled backups, disaster recovery provisions, data retention controls, and monitored system integrations. These controls establish PREMIS as a reliable and resilient repository for asset information and ensure continuity of operations and information integrity.

3.4. Interoperability and the Common Data Environment Principle

PREMIS functions as the organisation's Common Data Environment (CDE) for operational asset information, serving as the single source of truth for all provincial immovable asset data. As the centralised repository for

the Asset Information Model (AIM), it governs information references, approval standings, asset relationships, and system integrations across technical, financial, and geospatial domains, acting as the control layer that ensures consistency and coherence of asset information across enterprise systems. Access control profiles are strictly managed, segregating read/write privileges between field assessors, CSIR quality control engineers, and departmental executives.

The geospatial methodology adopts a comprehensive integrated lifecycle approach to information management, encompassing initiation, planning, execution, quality assurance, analysis, reporting, and project close-out. A structured set of over fifty defined processes ensures consistency and repeatability across projects. The Geospatial Immovable Asset Management Solution (GIAMS), supported by ArcGIS Enterprise and SQL databases, functions as a centralised data repository enabling controlled access, version management, integration, and collaboration.

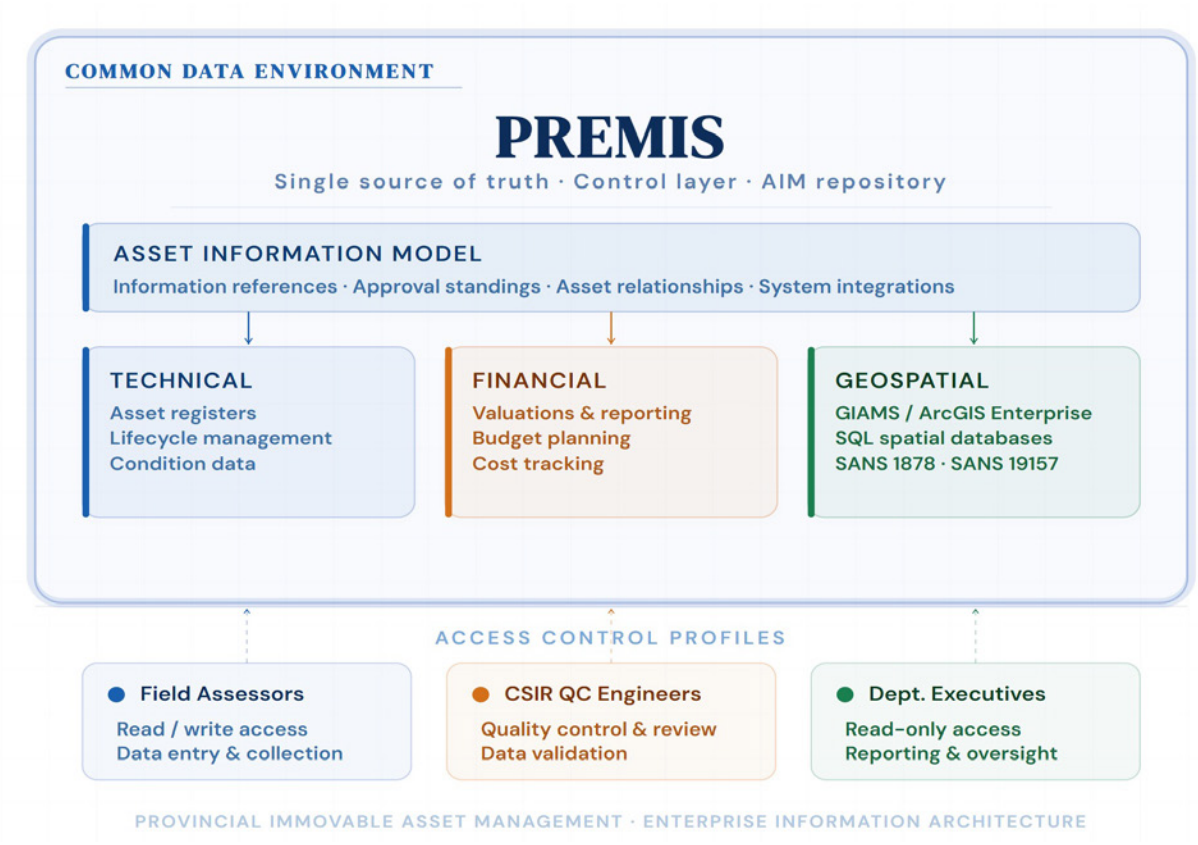

Figure 3: Component Weighting Percentage model: condition scores aggregated from sub-components (CSIR SIM)

3.5. Approach to Managing Project Information

Information management was driven by a strict component-weighted model rather than subjective, generalised visual evaluations. Assets were structurally broken down into hierarchical levels: Site Infrastructure, Building Fabric, Mechanical Systems, and Electrical Systems. Sub-components were mathematically weighted based on their replacement value and structural criticality. For instance, in an external wall element, structural concrete/masonry accounted for 65% of the weight, internal plaster for 20%, and paint coatings for 15%. This ensured that structural damage/deterioration did not incorrectly distort the primary asset's structural integrity score.

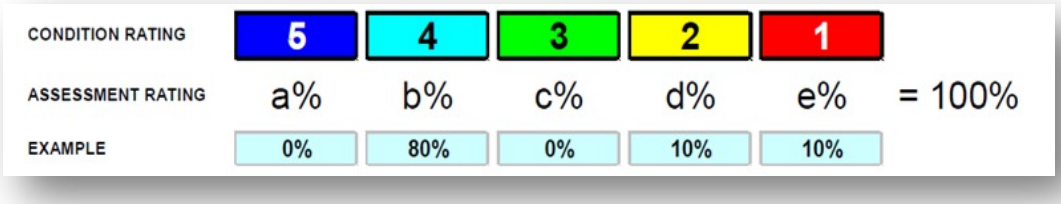

Figure 4: Component Weighting Percentage model: condition scores aggregated from sub-components (CSIR SIM)

One of the most powerful and underutilised outputs of structured condition data is its ability to project Remaining Useful Life (RUL). In infrastructure management, RUL is not simply a function of chronological age. It is continuously recalibrated by physical condition, maintenance history, and operating environment.

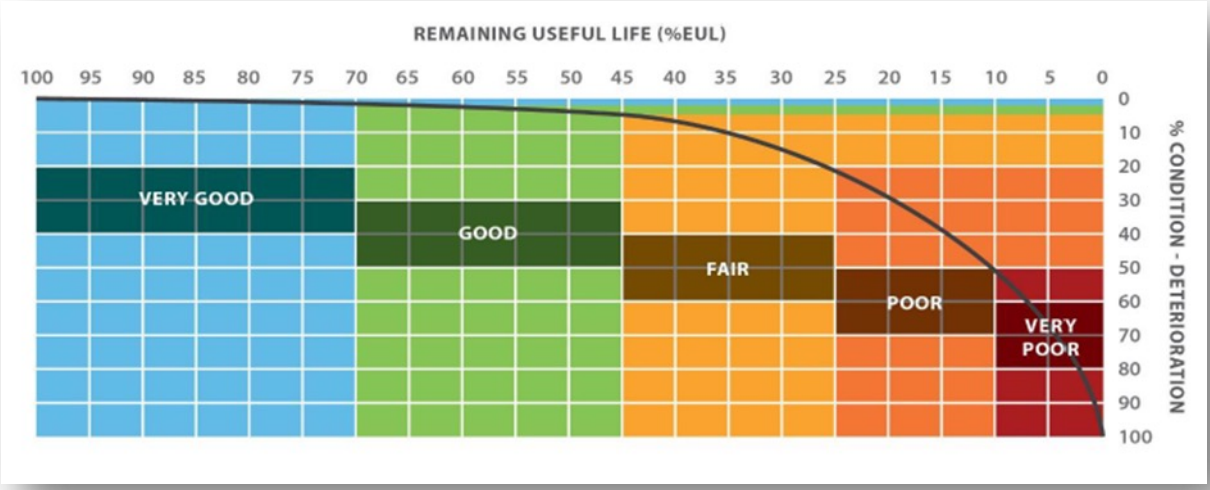

Figure 5: Relationship between condition deterioration and Remaining Useful Life (%EUL), the non-linear deterioration curve (CSIR SIM)

3.6. Naming Conventions, Standards, and Documentation Practices

The SIM methodology incorporates standardised naming conventions, metadata frameworks, and documentation practices aligned with SANS 1878 and SANS 19157 standards. While variability in data quality from different service providers remains a challenge, strong integration between GIAMS and PREMIS ensures that geospatial information directly supports asset registers, reporting, and lifecycle management processes. Facilities were tagged with unique national ID codes corresponding to the National Treasury and National Department of Public Works databases. Elements within a facility were named using a strict relational hierarchy:
{[Facility ID]} - {[Building Number]} - {[Element Category]} - {[Component Code]}
Condition defects were classified using an objectified 5-tier rating system, where 1 is very bad and 5 is very good.

4. Organisational Culture & Industry Context

With previous Public sector department projects, for example, the institutional culture within public sector departments historically leaned toward a reactive, crisis-driven maintenance philosophy ("fix when broken"). Introducing a structured, proactively managed data framework required a paradigm shift. Initial adoption was slow because the transparency of a centralised CDE directly challenged established, ad-hoc regional maintenance spending patterns.

Sustained adoption succeeded only where departmental leadership actively tied PREMIS data visibility to budget approvals. Change management required consistent, iterative client-CSIR technical meetings. Rather than imposing top-down technological dictates, the CSIR acted as a collaborative partner, demonstrating to regional managers how structured data could be leveraged to defend their budget requests to the provincial treasury.

Barriers: Resistance, Contractual Limitations, and Silos

- Siloed Working: A major systemic barrier was the rigid operational divide between the Custodian department (which holds structural responsibility) and the User departments (who operate the facilities daily). These opposing opinions often resulted in user departments executing unauthorised cosmetic modifications that went unrecorded in the custodian's centralised CDE.
- Contractual Limitations: Standard public sector procurement protocols often favor short-term, transactional consultant appointments. A seven-year continuous technical support model is highly unusual, and navigating regular legislative procurement cycle renewals created structural contrast that threatened project continuity.

Operating within the South African built environment requires deep alignment with localised regulatory frameworks, notably SANS 10400 (National Building Regulations), the Occupational Health and Safety (OHS) Act, and National Treasury mandates. The project revealed that while the country has sophisticated regulations on paper, a massive execution gap exists due to a lack of centralised, verified data. Data-driven frameworks like PREMIS bridge this gap by translating regulatory compliance parameters directly into daily field-inspection checklists.

5. Skills Development & Transformation

To ensure the sustainability of project outcomes, skills development is a core element of the SIM Programme. This approach is aimed at addressing the shortage of expertise in South Africa's infrastructure sector. These initiatives build local technical capacity through hands-on project involvement and facilitating effective knowledge transfer. Overall, the approach strengthens technical capability, promotes sustainable data management, and equips public sector stakeholders to manage their data environments independently. Key areas for skills transfer include GIS applications, data collection for Building Condition Assessments, digital tool usage, data quality assurance, high-level maintenance, and asset management principles.

For the previous Public Department project, the CSIR conducted workshops and field-based training sessions that included on-site experiential learning, the distribution of localised visual technical support guidelines, and the provision of field manuals and refresher training courses. The project placed a strong emphasis on professional development and formal institutionalisation by consistently advocating for the formal institutionalisation of the performance assessment roles within the permanent departmental organogram to ensure long-term capability post-project close-out.

Access to technical engineering tools through digital interfaces, the project broke down historical barriers that limited advanced asset management capabilities to a small group of elite consultants. Internal public sector technicians, representing historically disadvantaged backgrounds, were given technical skills to directly influence infrastructure spend within their own local municipalities.

6 Outcomes, Impact & Lessons Learned

6.1. Outcomes and Impact

- Elimination of arbitrary data collection: Through the integration of the offline field-capture applications and the PREMIS platform, the time elapsed between field capture and formal database publication was reduced significantly, while data precision increased.
- Project efficiency and cost savings: Effortless extraction of UAMP data from the CDE and reporting. The implemented solution creates for a highly sustainable platform for effective asset management.
- Risk Mitigation: Critical structural and OHS failure risks (such as failing hospital fire pumps or degraded electrical distribution boards) were flagged instantly and reported to Departments thus minimising impact to operations, prioritising health and safety.
- Quality & Data Integrity: The multi-tiered quality control architecture successfully eliminated data corruption and human bias, producing a legally defensible, accurate provincial Immovable Asset Register (IAR).
- Financial Alignment: The project enabled the transition to zero-based preservation budgeting, giving public departments the exact engineering figures needed to substantiate funding requests for planned preventative maintenance versus backlog rehabilitation.
- Integration of geospatial methodology: Implementation of the geospatial methodology has significantly improved asset data quality, spatial accuracy, and decision-making. Key outcomes include enhanced asset verification, more accurate cost modelling, improved audit readiness, and greater transparency in infrastructure planning and management. Integrating GIS with asset management systems has strengthened analysis, reporting, and stakeholder engagement, while enabling a more effective decision-support capability.The figure below demonstrates the Decision Support GIS Dashboard, which provides a supports strategic decision-making through the visualisation and analysis of geospatial information.

Figure 6: Decision Support GIS Dashboard

6.2. Key Lessons Learned

What Worked in the Public Department projects: The component-weighted scoring model, combined with continuous quality control feedback loops, successfully maintained high data accuracy and improved project efficiency and reporting. Strong data security was also carried out.

Lessons learned emphasise the need for standardised processes, robust governance, and ongoing data quality assurance. Areas for improvement included establishing a fully formalised CDE aligned with ISO 19650, enhancing system interoperability, and strengthening change management and stakeholder alignment.

6.3. Recommendations for Advancing BIM/Data Management in South Africa

One of the key concerns identified in the CSIR for not adopting a comprehensive BIM solution was the high costs of adoption and its sustainability. Based on this, making the adoption of BIM affordable for all would expedite the process of advancing BIM in South Africa.

1. **Formalise IFC/COBie Standards for Asset Management:** The South African public sector must explicitly mandate the integration of condition assessment data into open BIM standards (like IFC and COBie), ensuring field-captured lifecycle data can easily flow back into 3D design environments.
2. **Design for Connectivity Realities:** Software architectures deployed in the South African public sector must prioritise mobile-first, robust offline functionality as a core engineering prerequisite rather than an afterthought.
3. **Bridge the Custodian-User Silo via a Shared CDE:** To eliminate immense inefficiencies, public sector frameworks must enforce a shared CDE that unites both the Custodian department and User departments within a single data repository.
4. **Commit to Long-Term Institutional Capacity Building:** Public sector bodies must recognise that digitising asset management is a long-term operational objective requiring sustained human capital investment. Short-term, isolated, project-based consultant appointments will not build the durable institutional capabilities required to transform the country's infrastructure landscape.

THE CONSTRUCTION REGULATOR

Construction plays a vital role in South Africa's economic and social development and serves as a large-scale employer. It provides the physical infrastructure that makes up the backbone of our country's economic activity.

Our vision

Our mission is a transformed construction industry that is inclusive, ethical and contributes to a prosperous South Africa and the world.

Our value

Together we can build a South African construction industry that serves continued social and economic growth, while delivering projects at globally competitive standards.

BRICS Future Skills Challenge

CIDB's Centres of Excellence coordinate participation in the BRICS Future Skills Challenge which aims to create a pipeline of skills for emerging jobs. Benchmarked through collaborative partnerships, the Future Skills focus on, among others, Digital Twin, Building Information Modelling, Internet of Things, and Drone Technology.

TVET College Partnerships

CIDB has partnered with TVET Colleges to support their participation in WorldSkills International Competitions. WorldSkills brings together stakeholders from industry, government and educational institutions to set the standard and improve the quality of education through competitions. Plans are underway to extend this partnership to Future Skills.

Extraordinary Woman in BIM 2026: Championing People, Progress and Digital Transformation

Anneke Pretorius Named Extraordinary Woman in BIM 2026

Baker Baynes

Anneke Pretorius

Baker Baynes is proud to recognise Anneke Pretorius as the recipient of the Extraordinary Woman in BIM Award 2026, celebrating her commitment to advancing digital transformation, collaboration and innovation within the built environment.

The Extraordinary Woman in BIM initiative was established to recognise women who are not only technically proficient, but who actively influence industry adoption, champion best practices and create meaningful opportunities for others through mentorship, leadership and knowledge sharing.

Anneke distinguished herself through her passion for Building Information Modelling as an enabler of better project outcomes, stronger collaboration and sustainable growth within the industry. Her submission demonstrated a clear commitment to fostering a culture of continuous learning, supporting teams through digital transformation and advocating for the practical application of BIM processes across projects and organisations.

The judging panel was particularly impressed by her ability to bridge people, process and technology, recognising that successful BIM implementation extends beyond software adoption and requires investment in skills development, collaboration and organisational change.

As the 2026 recipient, Anneke will represent South Africa at Autodesk University in Las Vegas from 15–17 September 2026. Autodesk University provides a global platform for professionals, innovators and thought leaders to explore emerging technologies, exchange ideas and shape the future of the built environment.

Reflecting on the award, Anneke shared:

“Honestly, when I got the call, I was speechless. I hadn’t expected to win. Once it sank in, what struck me is that this recognition validates something I believe deeply as a BIM Consultant: digital transformation was never about implementing another standard or introducing new technology. It’s about understanding the people behind the process and building practical ways of working that make sense. Lasting change doesn’t happen by dictating how people should work. It happens when you bring people with you and create an environment where learning and collaboration become part of the culture. I’m looking forward to carrying that philosophy with me to Autodesk University in September.”

The Extraordinary Woman in BIM programme continues to highlight the growing impact of women shaping the future of digital delivery in South Africa and beyond. Through initiatives such as this, Baker Baynes aims to encourage greater visibility, participation and leadership opportunities for women working across architecture, engineering, construction and infrastructure.

Anneke's Perspective: Culture, Skills and Leadership in BIM

At Zutari, I've watched BIM culture shift from being seen as a set of software tools to something better described as a shared way of working, one that touches governance and mindset just as much as it touches models and data. When I joined the Digital Corporate team as a BIM Consultant in 2024, technical proficiency was already strong across teams, but the understanding of why we work in structured, standardised ways wasn't yet consistent everywhere. I honestly had no idea, going in, how much the people side of the role would shape my thinking. I expected to be implementing strategy and standards, not spending as much time as I have on how to make BIM feel like a stronger, more attractive topic for the teams living it day to day. That's been a tough shift, and if I'm honest, it still is. Over the past two years, we've worked to change that, not by mandating compliance, but by building understanding, through initiatives like our company-wide BIM Awareness Campaign and workshops that translate standards into everyday practice for BIM managers, BIM coordinators, modellers and project teams. I'd describe the culture today as genuinely evolving rather than fully arrived: some teams have embraced structured digital workflows more readily than others, and adoption still varies depending on project size and market unit. Building shared ownership is an ongoing conversation, not a milestone you tick off.

That's also how I think about the skills our industry will need next. Technical skills will always matter: model coordination, clash detection, platform fluency. But the professionals who thrive will be the ones who can translate between people, process and technology. Understanding a framework like ISO 19650 is valuable, but the real skill is knowing how to embed it into an organisation's daily habits without overwhelming the teams who have to live with it. I'd point to three areas in particular: data governance, since projects are only becoming more data-rich; change management and communication, because most BIM failures are cultural rather than technical; and adaptability, the willingness to stay agile as the industry keeps changing around us. I try to live that last point out rather than just talk about it. I've been using AI-driven tools to build small applications that take repetitive, administrative tasks off people's plates, freeing up time for strategy and for the human side of change. More recently I've taken this further, building tools that let teams actively work with the underlying data itself rather than only viewing a static report. Using AI to free people up, not replace the human parts of the process, is exactly the kind of adaptability I think future BIM professionals will need.

Putting this into practice at Zutari started with evidence, not assumptions. I began by assessing our BIM maturity in my own way, working out where the real gaps were rather than relying on assumptions, and used that to build a roadmap covering governance, technology, content standardisation, capability development and cultural engagement, translating our internal information management standard and ISO 19650 into formal templates, and influencing and checking the templates used across our other CDEs for consistency. I also took our design deliverable standard and updated it with a clearer understanding of BIM and how the industry and our teams work, so that it reflects current practice as well as where we can shift to next. Just as important was giving people visibility of their own contribution: dashboards that show how someone's engineering or data expertise feeds into a bigger, standardised picture, rather than sitting in isolation. Transformation sticks when people can see it working and feel supported through it, not when they're simply told it's important, and I'd say the same is true of mentorship. Digital maturity can't be handed down top-down; it has to be shared and reinforced through people. I have regular one-on-one sessions with BIM coordinators, sharing knowledge, listening to the issues they're facing, and helping them translate standards into everyday workflows rather than treat compliance as a checkbox. Beyond Zutari, I've stayed connected to a network of former BIM colleagues, several of them international, which keeps me exposed to how the field is evolving elsewhere and shapes how I support adoption locally. I've also valued judging the GirlCode Hackathon, supporting young people, particularly women, entering programming and digital delivery careers, and I stay involved with BIM Community Africa and ISO 19650 practitioner forums. Knowledge sharing runs both ways for me; every workshop teaches me something about how people actually experience the standards we design.

Looking back, what's worked for me is not waiting until I felt like I had all the technical answers before stepping into leadership. Some of my most valuable contributions haven't come from knowing the software best, but from asking why a process wasn't working and being willing to redesign it. I've also found real value in communities of support, and I've learned not to assume that support has to come from within BIM specifically. Some of my most valuable mentorship has come from people entirely outside the industry, and it's shaped how I lead just as much

as any technical mentor has. Wherever it comes from, having that kind of support has played a bigger role for me than I expected. I've also deliberately pushed myself into situations that felt uncomfortable, because I've found confidence isn't something you wait for. For me, it's built by doing the thing that scares you, and by turning your own doubts into fuel rather than letting them hold you back. I'd also gently push back on the idea that being an empathetic leader is a weakness. As women, we're often told we're too emotionally invested, as if that's a flaw, but I've found that same sensitivity is often what keeps me genuinely in tune with my team. I see it as a strength. For me, leadership starts with doing the work alongside people and bringing them with you, not standing apart from the process and issuing instructions.

Looking ahead, I think South Africa's BIM community is at an inflection point. There's growing appetite for structured digital delivery, but adoption is still uneven across the industry, which means real opportunity for firms that get governance and standardisation right early, both locally and on international projects. I'd like to see more investment in local upskilling and mentorship, so BIM maturity isn't concentrated in a handful of large firms but spreads across the industry, including SMEs and emerging professionals. Platforms like BIM Community Africa have an important role to play here, creating shared spaces where practitioners learn from each other rather than every organisation solving the same problems alone. Representing South Africa at Autodesk University this year feels like a good symbol of that: we have a lot to contribute to the global conversation, not just absorb from it.

This article was contributed by Baker Baynes in celebration of Anneke Pretorius, Extraordinary Woman in BIM 2026, and her contribution to advancing BIM practices in South Africa.

Occupant-Centric Digital Twins (OCDT) in South African Higher Education: Real-Time Acoustic Comfort in Architectural Studios

Lucy W. Gachogu, Masters in Architecture (Research), University of Pretoria

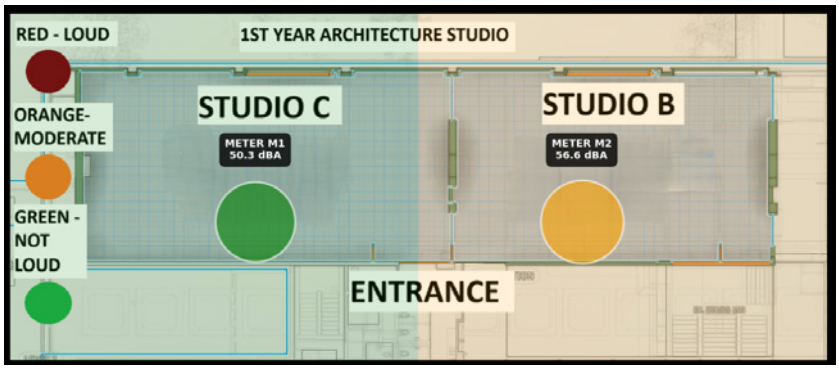

Figure 1: Image showing the OCDT display. Filename: Image of the digital twin interface.

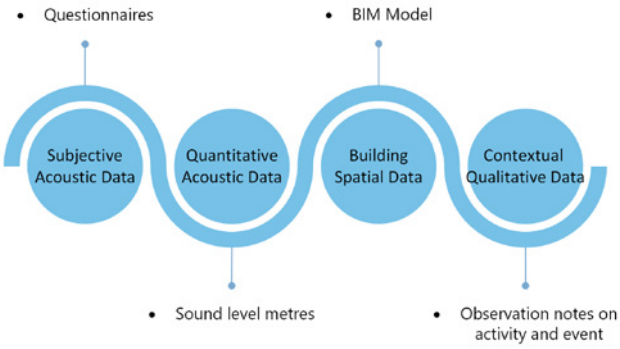

Figure 2: Image showing the project setup process. Filename: Materials and methods flowchart.

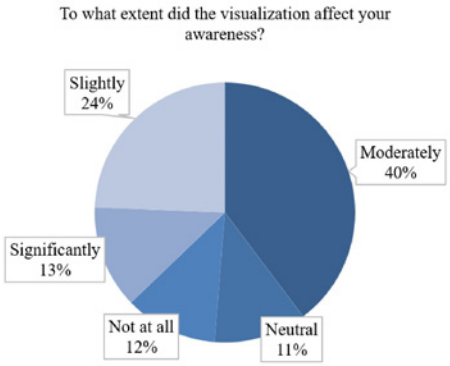

Figure 3: Feedback from questionnaires on the impact of the OCDT on their behaviour
Filename: To what extent did the visualisation affect your awareness?

1. Project Overview

As the Architecture, Engineering, and Construction (AEC) industry adopts digital twins, the primary focus has traditionally been operational, targeting energy savings and facility management goals. However, there is a growing need to bridge the gap between building operations and human experience through Occupant-Centric Digital Twins (OCDT).

This project explores the application of an OCDT to monitor and manage acoustic comfort within a learning space. The implementation site is the first-year architecture studio at the Boukunde Building, University of Pretoria. Architectural studios are hybrid learning environments that function as both quiet zones and collaborative workshops. Poor acoustics in these spaces can lead to cognitive fatigue and impaired communication. By creating a feedback loop that visualizes real-time sound levels, this project aims to empower students and staff to actively manage their acoustic environment, shifting the digital twin from a static facility management tool into an active mechanism for human-building interaction.

2. BIM Implementation in a South African Context

Implementing an OCDT in a South African university setting required a pragmatic, cost-effective technology stack. While industry-leading proprietary solutions exist for integrating IoT with 3D models, they often involve high licensing costs and vendor lock-in. To overcome these local budget constraints, a custom hybrid approach was developed.

The spatial boundaries and geometric data of the studio were modelled using ArchiCAD 26. To transform this static BIM model into a live digital twin, a custom IoT sensor network was deployed. UNI-T UT353BT sound level meters were placed centrally in the studios to capture live acoustic data. These devices were connected via Bluetooth to ESP32 microcontrollers, which then transmitted the data over Wi-Fi to a Raspberry Pi 4 microcomputer using the MQTT protocol.

The live acoustic data was translated into a visual digital twin interface displayed on two 50-inch Panasonic monitors mounted on movable stands within the studios. To make the data instantly legible, the interface featured the room's BIM layout overlaid with visual pulses categorized by colour: green for low noise (less than 55 dBA), orange for moderate, and red for loud (greater than 75 dBA).

3. Information Management Practices

Managing real-time environmental data requires robust information pipelines. The sound level meters captured A-weighted decibel (dBA) readings every second. A Python script was utilized to transmit this data to the visualization interface while simultaneously logging it into a CSV file for historical analysis.

In a higher education setting, ethical data management and privacy are paramount concerns when deploying sensors. To ensure student and staff trust, the sound level meters only captured sound intensity (decibels) rather than recording audio or conversations. This assured occupants that the system was strictly for environmental monitoring and not surveillance.

A notable challenge with data exchange in this custom pipeline was hardware latency. The transmission from the sound level meter via Bluetooth to the ESP32, and then via Wi-Fi to the Raspberry Pi and PC, introduced a 1.0 to 1.5-second lag between the physical noise event and the digital visual pulse. Managing this latency is a critical practice for future OCDT deployments, as real-time accuracy directly impacts the user's perceived sense of control.

4. Organisational Culture & Industry Context

The traditional culture of facility management operates on the premise that building operators control environmental factors, leaving occupants as passive receivers. This OCDT project actively disrupted that culture by establishing that digital twins are highly useful for end-users, not just facility managers.

Survey data collected during the study revealed that 83.3% of the internal noise in the studio was generated by classmates. Because the noise was human-generated, it could not be resolved by facility operations, such as adjusting an HVAC system. Instead, it required behavioural adaptation.

Providing the students with a centralized, visible digital twin interface gave them a sense of spatial agency. When the screen pulsed red during loud transitions or announcements, it served as a visual "nudge" to restore alertness to an environmental factor they had otherwise subconsciously tuned out. The culture in the studio shifted as students utilized the data to self-regulate their collaborative noise levels.

5. Skills Development & Transformation

The deployment of this OCDT highlights a critical skills gap in the South African AEC industry: the need for professionals who possess both spatial design capabilities and cloud/IoT infrastructure skills. Building a custom digital twin requires cross-disciplinary programming knowledge, such as writing Arduino sketches, configuring MQTT brokers, and developing Python visualization scripts.

Through my Master of Architecture research at the University of Pretoria, this project serves as a bridge between academic theory and practical industry application. By developing these specialized skills locally, and utilizing open-source hardware like Raspberry Pi and ESP32, we demonstrate that the South African built environment can actively build and maintain its own resilient digital twin ecosystems rather than relying solely on imported, proprietary platforms.

6. Outcomes, Impact & Lessons Learned

The transition to a real-time, occupant-centric acoustic model yielded measurable impacts on student behaviour and environmental awareness:

- **Increased Awareness:** 77% of surveyed occupants reported that interacting with the OCDT display directly increased their noise awareness (ranging from moderate to significant effects).
- **Behavioural Adaptation:** 67% of respondents reported making active behavioural adjustments to their own noise output after viewing the real-time visualization.
- **Perceived Control:** 59% of users reported an increased sense of control over their environment, proving that environmental data access empowers end-users.

Key Lessons Learned:

- **Accuracy and Latency Matter:** The 1.0 to 1.5-second lag in the display impacted some users' perception of accuracy. Future models must prioritize high-speed IoT control nodes to eliminate latency and maintain user trust.
- **UI/UX Design is Critical:** While the colour-coded visual pulses were effective for quick glances, user feedback indicated a strong desire for the actual decibel (dBA) numbers to be displayed in a larger, more prominent font.
- **Balancing Alerts and Distractions:** Users suggested implementing audible alerts (like a bell or siren) when noise levels spike, but this must be balanced carefully to avoid causing acoustic stress or interrupting learning activities.

Recommendations for Advancing BIM in South Africa: To advance BIM and Digital Twins locally, the industry must expand its focus beyond energy optimization to include human-centric factors like acoustic, thermal, and visual comfort. By leveraging affordable, custom IoT integrations mapped to spatial BIM data, South African institutions can democratize digital twins, placing actionable environmental data directly into the hands of the people who occupy the buildings.

This article summarizes initial findings from an ongoing Master of Architecture (Research) dissertation at the University of Pretoria. Final academic results are pending examination.

Snapshot of BIM: Candid views of 3 BIM professionals

Fabio Companie
Project Manager

What organisation or sector do you work in?
City of Cape Town

How long have you been involved in BIM or digital delivery?
7 years

What first motivated you or your organisation to adopt BIM?
The evolution of industry

How would you describe your current BIM approach of maturity?
We focus on strategy and allow that to dictate the choices we make.

What has been the biggest shift BIM has brought to your work?
Improvement in the delivery of projects.

Which project benefited from your BIM approach?
Greenpoint Dome

What made this project meaningful, innovative or challenging?
It's cultural and educational, so the entire project was an educational and learning process from planning, implementing and handover. Including the asset created continue to create the educational experience.

Which project stages benefited most from BIM?
Planning and delivery

What tools, platforms, or workflows were most useful? And why?
Modelling could understand the structure and coordination requirements.

How did BIM improve collaboration or coordination on the project?
It forced collaboration and focus on the accuracy of design requirements.

Were there any implementation challenges or lessons learned?
The adoption and communication is so important. Obtaining everyone's buy-in is crucial for delivery.

What BIM practices or processes have worked particularly well for your team?
The modelling and coordinating.

What skills are most important for BIM professionals today?
Understanding the technology and its use, including understanding its limitations.

What challenges do professionals or oganisations still face in adopting BIM in South Africa?
The cost of technology and hardware.

How important is leadership and company culture in successful BIM adoption?
Very, very important.

How are younger professionals engaging with BIM differently?
With enthusiasm and excitement.

What role should education and training institutions play in growing BIM capability?
Ensuring it is part of the curriculum so they learn the fundamentals.

Where do you see BIM and digital construction heading in South Africa over the next 5-10 years?
Becoming part of the way the public sector delivers services.

What technologies or trends are you most excited about and why?
The creation of digital twins for better asset management and how it interfaces with facilities management.

What changes would help accelerate BIM adoption across the industry?
Policy adoption by the public sector.

What advice would you give to organisations starting their BIM journey?
Start small with what you have and can afford. But start.

What advice would you give to young professionals entering the field?
Learn and engage BIM certification as it will become the standard of practice in future.

What achievement or milestone are you most proud of in your BIM journey?
The ability to be a part of the conversation and process of change. Including the advancement of knowledge surrounding the practice overall.

Is there anything else you would like to share with the community?
Viva BIM!

Riaan Fourie
BIM Consultant

What organisation or sector do you work in?
Zutari

How long have you been involved in BIM or digital delivery?
20+ years

What first motivated you or your organisation to adopt BIM?
To work more efficiently, faster, more accurately, ensuring quality, reducing risks and be future-enabled.

How would you describe your current BIM approach of maturity?
The approach is to create a CEO approved BIM strategy that starts with people who will drive market tailoired workflows based on international standards and client requirements.

What has been the biggest shift BIM has brought to your work?

In beginning of my career I was technology focused, with time and role changes, it went to processes, but now it is people focused. Of course all three are important in BIM as an information management system

Which project stages benefited most from BIM?

At the moment I'm not on projects, but I think coordination is still the biggest drive to do BIM, but BIM must actually benefit Asset owners. The problem is they don't know the benefits themselves and don't invest time and money and contracts to ensure the process works.

Were there any implementation challenges or lessons learned?

In past projects, in my experience, because clients' contract aren't set up at bidding planning stage to clearly specify BIM, you have to collaborate with parties who are not BIM-enabled. As BIM Lead I must create a hybrid plan, and upskill the other parties. Because it wasn't protocol, I needed to convince them of a better information management way so we could implement BIM at project level to ensure success.

What BIM practices or processes have worked particularly well for your team?

Always ,as a baby step, have a common data environment

What skills are most important for BIM professionals today?

People skills.

What challenges do professionals or oganisations still face in adopting BIM in South Africa?

Client contract protocols and buy in, then a culture that is led by older generation, that is usually not open to change, to empower the new generation to be future-ready.

How important is leadership and company culture in successful BIM adoption?

Utmost importance.

How are younger professionals engaging with BIM differently?

They want change, and automation.

What role should education and training institutions play in growing BIM capability?

Have an information management program to include BIM and ISO19650.

Where do you see BIM and digital construction heading in South Africa over the next 5-10 years?

My hope is that more contracts will mandate BIM protocols, from Asset owners that see the benefits. I think in 10 years the automation of software will require more people for leadership.

What technologies or trends are you most excited about?

AI.

What changes would help accelerate BIM adoption across the industry?
Convincing clients and asset owners to contractually include better information management , but use ISO19650 as best practice until project teams are skilled enough to tender on those projects.

What advice would you give to organisations starting their BIM journey?
Get CEO buy in first, start with people who want to bring change, and love processes like me, lol.

What advice would you give to young professionals entering the field?
Focus on people skills, and project management, learning software is not as challenging as these.

What achievement or milestone are you most proud of in your BIM journey?
To be a Bim Consultant and build up people, gives me joy.

Is there anything else you would like to share with the community?
Great that we have a community that passionately wants to change our industry for the better and prepare our new generations for digital.

Andrew de Freitas
TD ADF Design Draft

What organisation or sector do you work in?
Mining, Petrochemical, Industrial & Comercial

How long have you been involved in BIM or digital delivery?
5 years

What first motivated you or your organisation to adopt BIM?
Various discipline requirements on projects

What has been the biggest shift BIM has brought to your work?
Better coordination and upfront planning.

Which project benefited from your BIM approach?
Various turnkey projects on mines, limited skilled team members.

Which project stages benefited most from BIM?
Design and draft / modelling and being able to share these with clients and other disciplines involved.

How did BIM improve collaboration or coordination on the project?
Early problem solving and forward sustainability.

Were there any implementation challenges or lessons learned?
Yes, always modelers and engineers need to collaborate and communicate regularly.

What BIM practices or processes have worked particularly well for your team?
Model reviews, checking, inter-discipline phasing, planning and logical construction processes.

What challenges do professionals or oganisations still face in adopting BIM in South Africa?

Cost and total buy in. Choose the right software and hardware to support the projects and clients.

How important is leadership and company culture in successful BIM adoption?

Extremely important. It has to be someone who is a mentor to all and a strong people's person

How are younger professionals engaging with BIM differently?

Way too much reliance on online communication. Needs to be more personal.

What role should education and training institutions play in growing BIM capability?

Again, practical and real project exposure, not just online courses and e.g.'s. 3 to 6 month intern at various companies should be re implemented whilst studying as with colleges and Technikons.

Where do you see BIM and digital construction heading in South Africa over the next 5-10 years?

The way to handle major, even smaller projects with cost effectiveness and more skills transfer for employees.

What technologies or trends are you most excited about?

4D and up where once can build for purpose and longevity.

What changes would help accelerate BIM adoption across the industry?

Mining, Petrochemical and commercial company buy-in, support and even learnerships to benefit the industry.

What advice would you give to organisations starting their BIM journey?

Do the sums and plan for growth and expansion. Just start, even if small.

What advice would you give to young professionals entering the field?

Find your passion and become the best in that field. Mentor other but also keep yourself up to date with technology and other disciplines that contribute to your industry.

What achievement or milestone are you most proud of in your BIM journey?

The achievement of mentoring and growing people to remain employable and on top of their profession.

Is there anything else you would like to share with the community?

Just start and then "KEEP ON KEEPING ON!"