CEPT UNIVERSITY

D R P

Understanding Construction FM Handover

Why Information loses meaning and digital Tools Fail?

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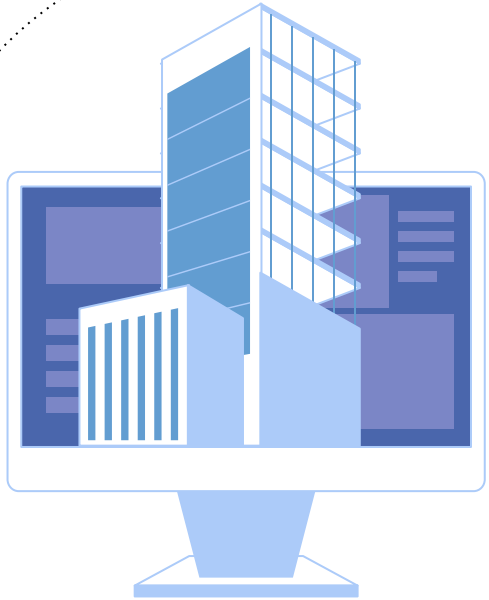
A glimpse into my DRP



SECTION 1

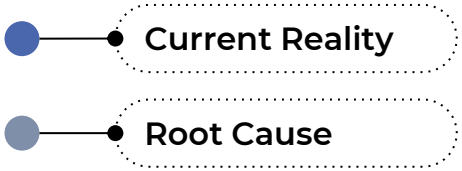
Problem Context

- Introduction
- Background

Introduction

Why Information loses meaning and digital Tools Fail?

Meaning loss occurs because handover data is fragmented and poorly structured, stripping it of the continuity needed for operations. Digital tools fail because they inherit inconsistent data that is unaligned with specific FM requirements.



01. Inefficient Information Handover

FM teams receive massive data volumes (BIM, O&M) that lack usability, leading to heavy reliance on manual rework and parallel systems.

01. Structural Inconsistency

Information is often incomplete or poorly structured at project completion, which prevents digital tools from delivering their expected value.

02. Interoperability Gaps

Fragmented data and a lack of clearly defined information requirements create barriers that limit the effectiveness of BIM in FM.

03. Focus on Data vs. Meaning

Current processes prioritize delivering raw data rather than ensuring information is meaningful and aligned with specific facility management needs.

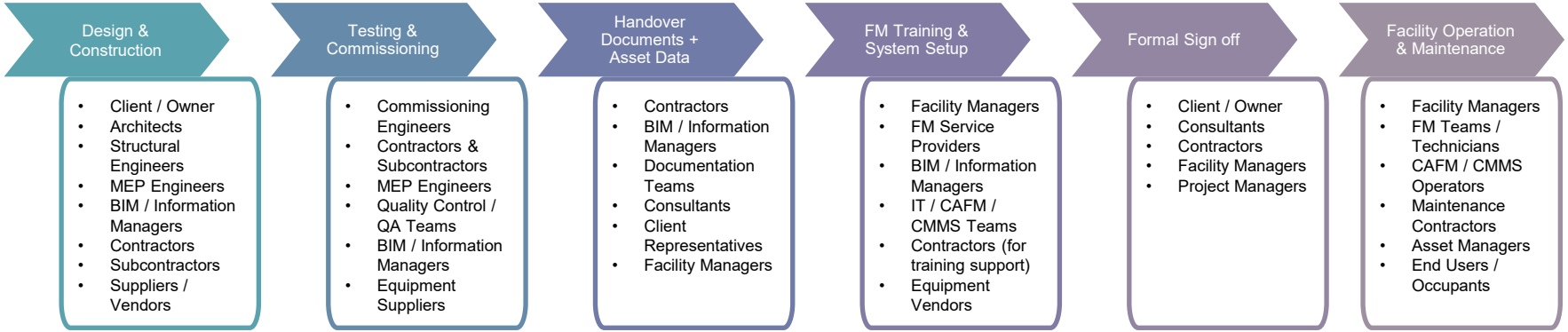
BACKGROUND

What is Facility Management ?

Facility Management is the process of managing building assets, systems, and services to ensure efficient, safe, and continuous operation throughout the lifecycle.
FM handover is the critical transition where responsibility shifts from project teams to FM teams, involving the transfer of information and assets required for long-term operations.

How It Works ?

The transition from construction to facility management is a critical phase in the building lifecycle where responsibility shifts to long-term operations. This stage relies heavily on accurate, structured, and accessible information generated during earlier project phases. However, in practice, this information is often fragmented, unstructured, and difficult to use, creating significant challenges for FM team



SECTION 2

Theoretical Foundation

- Research Methodology
- Literature Review
- Identified Gaps
- Synthesis Of Literature

RESEARCH METHODOLOGY

Research Approach

(Qualitative Exploratory Approach)

Literature-Based Analysis

- **Academic research papers**
- Industry reports
- Standards (e.g., ISO 19650)

Semi-Structured Interviews

- **FM professionals** (5+ years experience)

Focus areas:

- Information usability
- Data completeness
- Documentation challenges
- Manual data reconstruction
- Operational impact

Data Analysis Method

Thematic Analysis

- Coding & categorisation
- Pattern identification
- Gap classification

RESEARCH METHODOLOGY

Research Question

How does informational meaning degrade during construction FM handover, and how does this degradation affect FM usability of delivered information?

Scope And Limitation

Scope

- Focus on BIM–FM information handover
- Analyses information usability & continuity
- Based on traditional handover model
- Covers lifecycle stages:
  Design → Construction → Handover → FM
- Emphasis on information flow, not software tools

Limitation

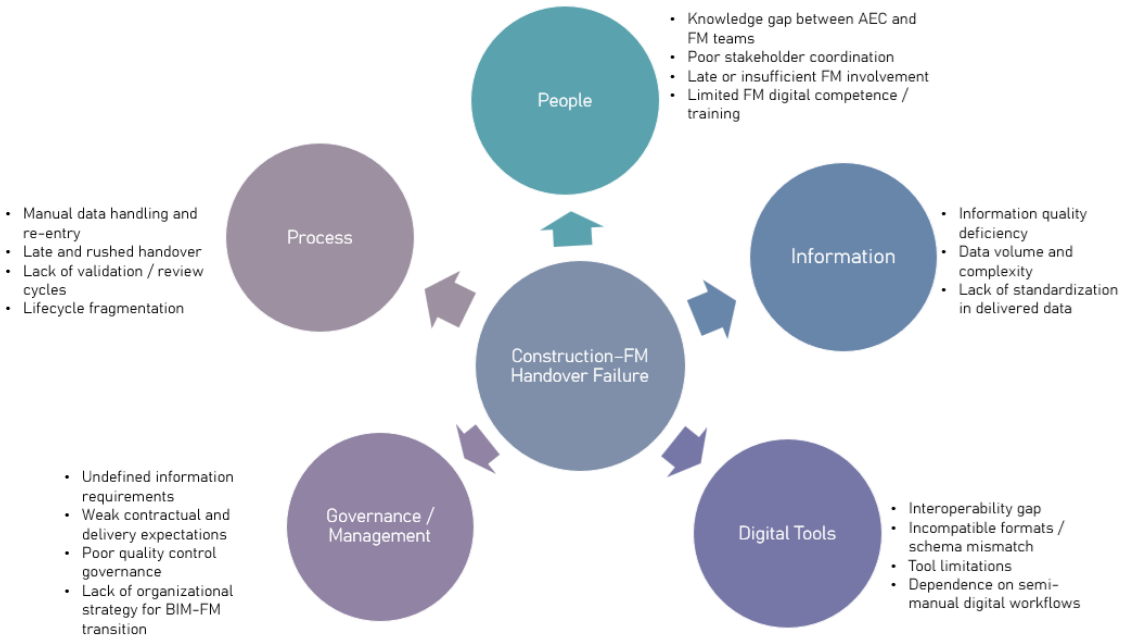
- No access to real project handover datasets
- Reliance on literature-based analysis
- Limited interview sample size

Literature Review

Why Information loss occur?

Information loss during the construction–FM handover occurs because the data delivered is often difficult to use in real facility management operations. Although the process is structured, the information provided is frequently incomplete, poorly organized, and fragmented across multiple systems, making it hard for FM teams to access and apply effectively.
This issue is not caused by a single factor but emerges from multiple interconnected domains:

- **People:** Poor stakeholder coordination and communication gaps
- **Process:** Lack of clearly defined FM requirements (AIR/EIR)
- **Information:** Incomplete, inconsistent, and unstructured data
- **Digital Tools:** Limited interoperability and incompatible systems
- **Governance:** Weak quality control and validation mechanisms



Inference: Information loss is a multi-dimensional problem across the entire project lifecycle

Literature Review – Identified Information Meaning Loss

Informational Meaning Loss in Handover Data

- Data delivered is often incomplete, poorly structured, and not aligned with FM needs
- Late FM involvement reduces data relevance
- “Tsunami of information” creates overload
- Low usability for maintenance operations

Impact of Data Structure and Standardization on Informational Meaning

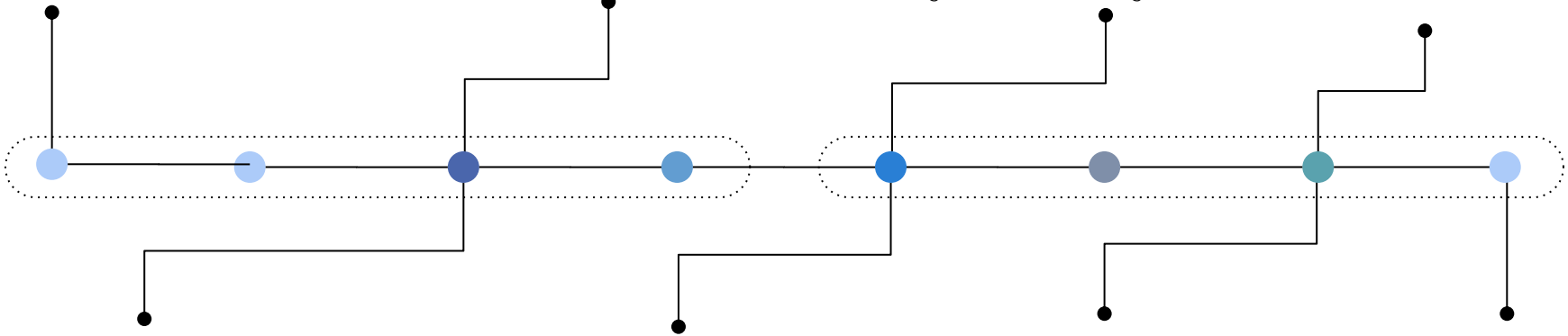
- Inconsistent formats limit usability of data
- Poor implementation of COBie & IFC
- Inconsistent asset naming/classification
- Lack of validation and data completeness

Fragmented Project Processes

- Disconnected lifecycle stages reduce information continuity
- Design-construction-FM not integrated
- Handover treated as final event
- Significant data loss during transition

Stakeholder knowledge and coordination

- Lack of alignment between AEC and FM teams
- Poor communication and knowledge gap
- Misalignment of expectations



Poorly Defined Information Requirements

- Lack of clearly defined FM-specific requirements (AIR/EIR)
- Weak translation of OIR → AIR → EIR
- Generic and unclear specifications
- Absence of “information demand side”

Poor Interoperability and System Integration

- Difficulty in integrating BIM with FM systems
- Data loss during system transitions
- Lack of unified data models

Manual Data Handling

- Reliance on manual workflows introduces inefficiencies
- Data extracted and re-entered manually
- Errors, duplication, inconsistencies
- High time and effort for FM teams

Role of Governance in Information Meaning Loss

- Weak oversight affects information reliability
- No clear roles/responsibilities
- Lack of validation mechanisms
- Poor contractual enforcement of FM data

Literature Review – Synthesis

Information loss in BIM-FM handover is not a one-time issue it builds up across the entire lifecycle. As data moves from BIM models to final handover documents, it gradually loses structure, completeness, and usability, making it less useful for facility management. This leads to real operational problems, where FM teams and engineers have to manually rebuild and verify information, increasing time, cost, and chances of error.

Information meaning loss in BIM–FM handover datasets.

BIM MODEL Design / As-built	· Inconsistent naming · Non-standard parameters · A Hard to link to FM systems
ASSET REGISTERS & COBie DATASETS	· Missing attributes (manufacturer, warranty, maintenance) · Incomplete data for CMMS
O&M MANUALS (PDF Documents)	· Unstructured, lengthy PDFs · Scattered information · Hard to find critical data (maintenance, specs, parts)
Handover Documentation Packages	· Dispersed files & formats · Lack of integration · Manual re-entry into FM systems

Who is affected by this?

Facility Managers

- Receive incomplete and inconsistent asset information
- Spend time rebuilding operational records

Asset & Maintenance Engineer

- Struggle to locate accurate equipment data
- Rely on manual checks and duplicate documentation

Bim / Handover Coordinator

- Deliver files without feedback on FM usability
- Face unclear responsibly for data quality

Operations Team

- Lack clear systems relationship and maintain ace history
- Depend on workaround processes for daily task

Inference: The literature identifies that **information meaning loss in BIM–FM handover is progressive and cumulative**, occurring across key information deliverables and directly impacting stakeholders involved in facility operations.

SECTION 3

System Diagnosis

- Findings and Analysis
- Lifecycle Gap Analysis
- Key Insights

Findings And Analysis

The findings show that BIM–FM handover challenges are not caused by lack of data, but by poorly structured and unusable information. Both literature and interviews consistently highlight that data is available, but it does not align with FM needs.

Literature Based Findings

- Lack of FM requirements (AIR/EIR) - Misaligned data
- Poor standardisation - Difficult to interpret & integrate
- Fragmented documentation - Increased effort to access data
- Incomplete asset data - Weak decision-making
- Interoperability issues - Data loss during transfer
- Lack of context - Reduced usability

Interview Based Findings

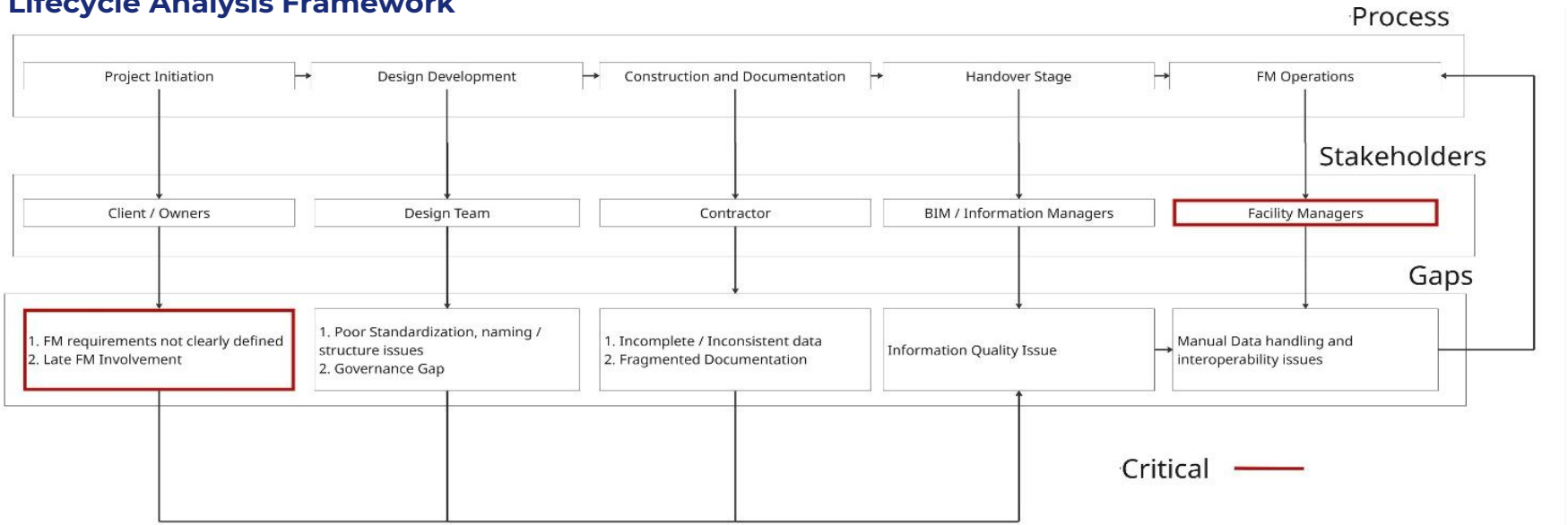
- **Late FM involvement** – "We are usually involved only at the handover stage, so most of the information doesn't match our operational needs."
- **Data not usable** – "The data is there, but it's not usable - we spend a lot of time figuring out what it actually means."
- **Manual reconstruction of information** - "We often have to recreate asset information manually because documents are incomplete or scattered."
- **Fragmented information** – "Information comes in multiple files and formats, making it difficult to access and integrate."
- **Lack of validation** – "There is no proper validation before handover, so we cannot fully trust the data we receive."
- **System integration issues** – "Our FM systems are not connected to BIM, so everything has to be entered manually."

As a result, FM teams are forced to manually reconstruct, interpret, and validate information, leading to inefficiencies, increased effort, and reduced reliability in operations.

Findings And Analysis

The framework was developed by integrating insights from literature analysis and industry interviews to map how information gaps emerge and evolve across the BIM-FM lifecycle. Literature helped identify recurring information issues, while interview findings validated how these gaps occur in practice, enabling the mapping of gap origins, progression, and impact across different project stages and stakeholders.

Lifecycle Analysis Framework



Inference: The analysis reveals that BIM-FM handover issues are lifecycle-driven, not limited to the handover stage. Information gaps originate early and and progressively worsen across design, construction, and handover stages. By the time of FM operations, this results in poor data quality, manual work, and system inefficiencies showing that the problem is lifecycle-driven, not stage-specific.

Discussion - Information breakdown and intervention strategies

The table presents a lifecycle-based analysis of how informational meaning is progressively lost across project phases, linking stakeholders, document types, and specific breakdowns in information quality. It highlights that incomplete, inconsistent, and unstructured data identified widely in BIM-FM literature directly reduce FM usability, resulting in operational inefficiencies and increased maintenance challenges.

Phase	Stakeholder	Document Type	Information Loss Type	Issue Identified	Why FM Cannot Use It	Operational Impact
Project Initiation	Client / Owner	Building Requirements	Missing / Undefined FM Requirements	FM requirements not clearly defined; late FM involvement	No clear guidance for what information should be delivered	Misaligned data across lifecycle; information loss at handover
Design Development	Design Team	BIM Models / Design Documents	Inconsistent / Unstructured Data	Poor naming conventions; lack of standardisation; fragmented models	Data not interoperable or understandable for FM systems	Rework required to structure and validate data
Construction & Documentation	Contractor	Asset Registers / O&M Manuals	Missing / Unstructured Data	Incomplete asset data; documents in PDF/manual formats	Difficult to extract and integrate into FM systems	Delays in maintenance setup and asset tracking
Construction & Documentation	Contractor	As-built Drawings	Inaccurate Data	Deviations from actual site conditions not updated	Drawings unreliable for operations and maintenance	Errors during repair and maintenance activities
Handover Stage	BIM / Information Managers	COBie Sheets / Handover Data	Incomplete / Manual Errors	Missing fields; reliance on manual data entry	Data unreliable for CAFM/CMMS integration	Inefficient system setup; data validation required
Handover Stage	BIM / Information Managers	Commissioning Reports	Context Loss	Performance data not linked to assets/systems	FM cannot interpret system-level performance	Ineffective monitoring and optimisation
FM Operations	Facility Managers	FM Systems (CAFM/CMMS)	Interoperability / Usability Issues	Manual data entry; system integration challenges	Data not directly usable in FM platforms	Increased operational cost and inefficiency

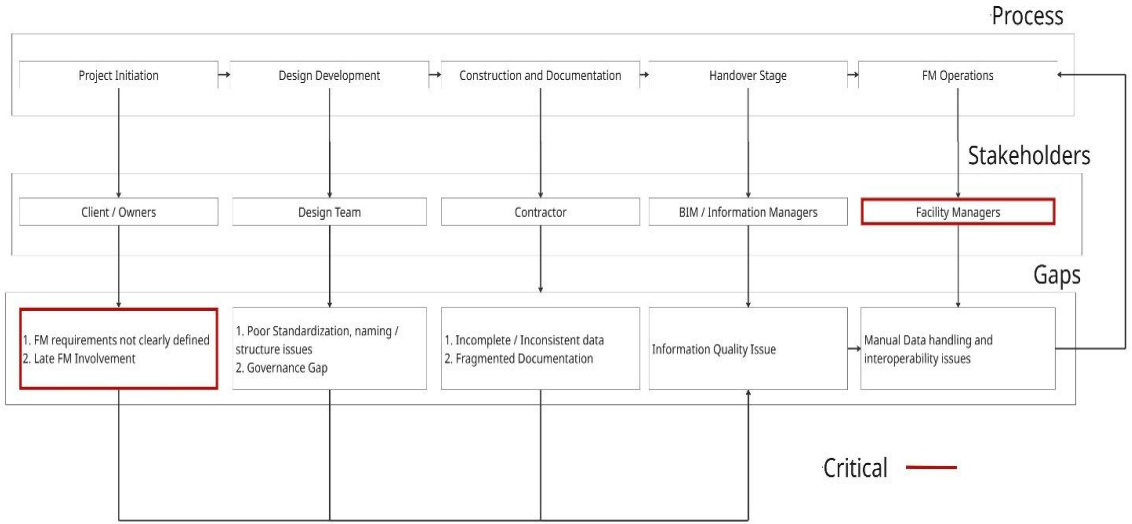
SECTION 4

Intervention & Solutions

- Discussion
- Framework Development
- Proposed BIM-FM Framework

Discussion

The discussion reveals that BIM-FM handover failures are not isolated issues but a **systemic breakdown in information continuity across the lifecycle**



- Information loss is **progressive and cumulative**, not limited to handover
- Core issue is **not lack of data, but lack of usability, structure, and alignment with FM needs**
- Early-stage gaps (FM requirements, stakeholder involvement) **propagate downstream**
- Problems become visible only at FM stage as:
  1. Manual data reconstruction
  2. Poor data reliability
  3. Inefficient workflows

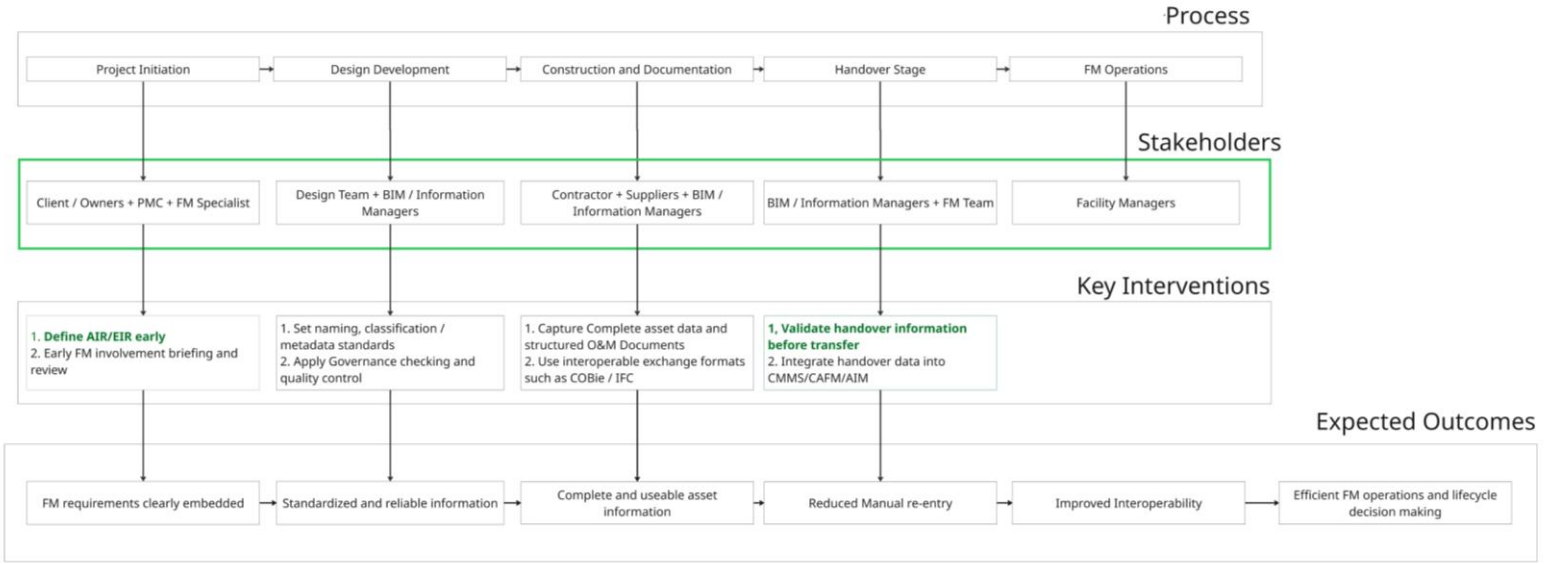
Critical Limitation Of Existing Framework

- Late FM involvement
- No structured requirements (AIR/EIR)
- Weak governance and validation
- Document-centric approach instead of information-centric

Discussion

The framework was developed by synthesizing findings from literature and interview-based evidence to identify key information gaps across the BIM–FM lifecycle. These gaps were then translated into targeted, stage-wise interventions to ensure structured, usable, and continuous information flow.

Proposed BIM–FM Information Continuity Framework



Inference: The framework demonstrates that embedding FM requirements and structured information practices early in the lifecycle ensures continuity and usability of data at handover. It shifts BIM–FM integration from fragmented, manual processes to a coordinated, standardised, and lifecycle-driven information management approach.

Discussion - Information breakdown and intervention strategies

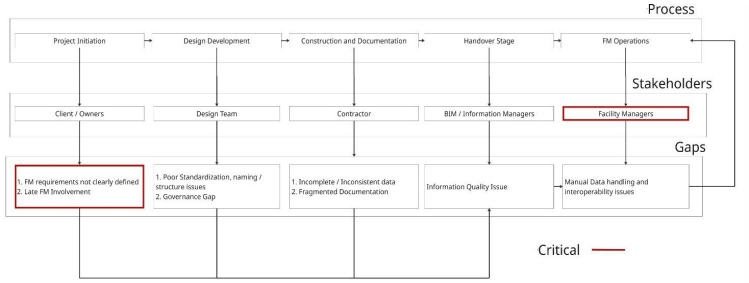
The framework directly addresses the critical information loss identified in the findings by aligning each intervention with a specific lifecycle breakdown. This mapping demonstrates that information loss is not inevitable but can be mitigated through structured and coordinated information management practices.

Phase	Stakeholders	Nature of Information Breakdown (Interpretation)	Root Cause	Framework Intervention	How It Preserves Informational Meaning	Expected FM Outcome
Project Initiation	Client / Owner + PMC + FM Specialist	Misalignment between produced data and FM needs	Undefined or weak AIR/EIR; late FM involvement	Define OIR/AIR/EIR with early FM participation	Establishes clear data requirements and purpose from the outset	Information aligned with operational needs
Design Development	Design Team + BIM Managers	Fragmented and inconsistent data across disciplines	Lack of standardisation and governance	Apply naming conventions, classification, metadata standards	Ensures consistency and structured data relationships	Interoperable and reliable BIM data
Construction & Documentation	Contractors + Suppliers + BIM Managers	Disconnected and incomplete asset information	Manual processes; lack of structured data capture	Capture complete asset data using COBie/IFC formats	Maintains structured, machine-readable data continuity	Complete and usable asset database
Handover Stage	BIM / Information Managers + FM Team	Poor information quality and lack of usability	Absence of validation mechanisms	Validate data before transfer; align with FM requirements	Ensures accuracy, completeness, and contextual linkage	Reliable and ready-to-use FM datasets
FM Operations	Facility Managers	Dependence on manual data reconstruction	Interoperability issues; poor input data quality	Integrate validated data into CAFM/CMMS systems	Enables seamless data flow and system usability	Reduced manual work and improved efficiency

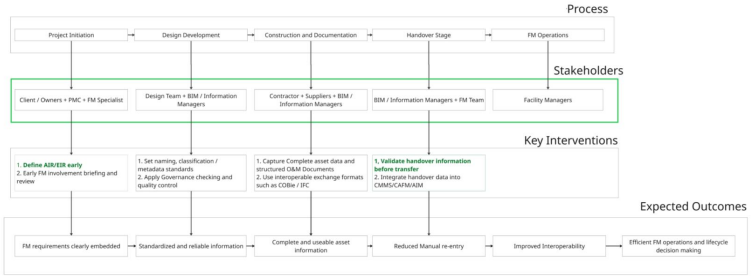
Discussion

BIM–FM Information Continuity Framework

EXISTING



PROPOSED



IDENTIFIED INFORMATION LOSS	FRAMEWORK RESPONSE
Undefined FM requirements	Early OIR/AIR/EIR definition
Poor standardisation	Naming, classification, metadata standards
Fragmented documentation	Structured asset and O&M data
Lack of interoperability	Use of COBie/IFC
No validation at handover	Pre-handover information validation
Manual data handling	Direct FM system integration

Inference: The framework addresses gaps by embedding FM requirements early and aligning information production with lifecycle needs. It replaces fragmented, manual processes with standardised, validated, and interoperable data flows for effective BIM–FM integration.

SECTION 5

Implication & Conclusion

- Key Contributions
- Final Conclusion

Key Contribution

Existing Literature

Existing literature highlights that BIM can support FM through structured information delivery across the lifecycle. It recognises that FM depends on asset data, O&M documents, and digital models generated during design and construction.

- BIM enables information rich lifecycle management
- Handover involves transfer of asset and documentation data
- Standards (e.g., ISO 19650) promote structured information practices
- Emphasis on information availability at handover

Gaps

However, literature shows that despite availability of data, FM teams struggle to use it effectively. The issue is not lack of data, but lack of structure, clarity, and alignment with FM needs.

- Unclear FM requirements (AIR/EIR) at early stages
- Poor standardisation and fragmented documentation
- Incomplete and unstructured asset information
- Lack of validation and quality checks
- Information delivered but not usable for operations

My Contribution

This study identifies that BIM-FM handover failure is a systemic lifecycle problem, where information loss accumulates from design to construction, rather than occurring only at handover.

- Shows that information gaps originate early and accumulate
- Establishes that the core issue is information usability, not quantity
- Connects lifecycle stages with information breakdown
- Demonstrates impact on FM: manual reconstruction and inefficiency
- Provides evidence-based understanding using literature + interviews

Proposed Solutions

To address these issues, the study proposes a BIM-FM Information Continuity Framework focused on maintaining structured and usable information across the lifecycle.

- Early definition of FM-aligned AIR/EIR requirements
- Improved standardization and structuring of information
- Ensuring validation and quality control mechanisms
- Promoting interoperability and system integration
- Shift from handover-based delivery → lifecycle information continuity

Conclusion

What This Study Proves

- BIM–FM handover failure is **not a technical** issue
- It is a **systemic failure of information continuity across the lifecycle**

Core Insight

- The problem is not lack of data
- It is lack of usable, structured, and FM-aligned information

What Changes

Introduces a BIM–FM Information Continuity Framework

- Shifts focus from:

1. Data delivery
2. Information usability

- Embeds:

1. Early FM requirements (OIR/AIR/EIR)
2. Standardization & governance
3. Structured + interoperable data
4. Validation before handover
5. Direct FM integration

Impact

- Eliminates manual data reconstruction
- Improves interoperability & reliability
- Enables efficient, data-driven FM operations

“BIM-FM handover does not fail because of technology - it fails because information is not managed as a lifecycle asset.”

Thank You