



Data Integration Strategy between Property Management System and ERP System for Building Equipment Management: A Qualitative Case Study

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Abstract

Background: Data fragmentation between operational and financial information systems remains a critical issue in building equipment and asset management.

Objective: This study examines the data recording gap between a Property Management System and an ERP System in the management of building equipment within a large corporate building management context in Indonesia.

Methods: Using a qualitative case study approach, data were collected through focus group discussions, observation, and document analysis involving building management, information technology, accounting, and audit functions.

Results: The findings show that data inconsistency is mainly caused by conceptual differences between equipment as an operational object and asset as a financial recording object. These differences create gaps in data requirements, information structures, procurement recording, and disposal processes. This study proposes a data integration strategy using Asset Number as a reference attribute to connect equipment data in ProMS with asset data in the ERP System.

Conclusion: The proposed strategy is expected to improve data consistency, information traceability, and cross-functional alignment between operational and financial asset management processes.

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INTRODUCTION

Building equipment management requires accurate, consistent, and traceable data throughout its lifecycle. In building management practice, information regarding equipment identity, location, condition, maintenance activities, work orders, and maintenance history is generally managed through operational systems. Meanwhile, information on procurement, capitalization, depreciation, book value, and asset write-offs is managed through Enterprise Resource Planning (ERP) systems. Although both systems can refer to the same physical object, differences in their purposes lead to differences in terminology, data structures, and business processes. When operational and financial information is not adequately connected, organizations may face data fragmentation, duplication of records, inconsistencies in asset status, and limitations in information traceability.

These issues are becoming increasingly relevant as investment in buildings, machinery, and equipment continues to increase. Indonesia's infrastructure budget increased from

approximately IDR 256 trillion in 2015 to more than IDR 423 trillion in 2024. The output value of the construction sector also increased from approximately IDR 1,041.85 trillion in 2014 to IDR 2,072.38 trillion in 2023 (Statista, 2025a, 2025b, 2025c). Data from the Central Statistics Agency show that Gross Fixed Capital Formation in 2022 reached IDR 5,714.97 trillion, with the machinery and equipment category contributing 16.22 percent, or approximately IDR 927 trillion (BPS, 2024). The substantial value of these investments demonstrates that equipment and asset recording is not merely an administrative issue but is directly related to cost control, space utilization, maintenance effectiveness, and the accuracy of asset disposal processes.

Information quality is therefore an important factor in equipment management. Incomplete information during the handover from the procurement or project stage to the operational stage can hinder data-driven maintenance strategies because management units may not obtain adequate information regarding equipment specifications, locations, conditions, and maintenance history (DiNunzio, 2021). Chang et al. (2022) similarly affirm that effective asset management requires complete, accurate, consistent, and relevant information. In the context of building management, equipment should therefore not be treated merely as static inventory but as a data entity containing technical attributes, location information, maintenance history, operational status, and financial linkages.

The relationship between asset management and facility management has become increasingly important with the development of smart facility management. Olimat et al. (2023) show that asset management and facility management are closely interconnected. This development reflects a shift from conventional physical maintenance toward lifecycle-based management supported by digital information. Moreno et al. (2022) emphasize the importance of dynamically available building information in supporting facility management activities, while Nojedehe et al. (2022) demonstrate that integrating maintenance management systems with Building Information Modelling (BIM) can improve building management processes. Ahmad et al. (2025) further identify terminology, organizational readiness, and information structure as important factors in integrating BIM with Facility Management Systems.

However, previous studies have predominantly focused on integrating BIM, Geographic Information Systems (GIS), Internet of Things technologies, or digital facility management systems. Congiu et al. (2024), for example, discuss BIM-GIS integration to support facility management, while Ismaeil (2024) examines GIS-BIM integration in asset information management. Al-Kasasbeh et al. (2021) developed a BIM-based decision support system for building asset management, but their framework does not specifically address reconciliation between operational maintenance records and financial asset data within ERP systems. Similarly, Alkhard (2024) emphasizes metadata integration in digital asset management but primarily focuses on technical attributes rather than the alignment of operational equipment identities with financial asset classifications. Thus, although previous research has advanced the technical, spatial, and digital dimensions of asset information management, the integration between equipment-level operational data and asset-level financial records across separate enterprise systems remains insufficiently explored.

This gap is particularly important because equipment and assets do not always represent identical data entities. ISO 55000 defines an asset as something that has actual or potential value for an organization (International Organization for Standardization, 2024). In facility management, equipment can include furniture, fixtures, and equipment used to support building operations. However, for financial reporting purposes, an item is recognized as a fixed asset only when it satisfies requirements related to useful life, materiality, capitalization policy, and economic benefits (International Accounting Standards Board, 2023). Consequently, not all operational equipment is recognized as a financial asset, while a single financial asset may consist of several equipment components. Therefore, the relationship between operational equipment and financial assets cannot always be represented through a simple one-to-one correspondence.

From an operations management perspective, data integration also concerns process design and information flows between organizational functions. ISO 9001:2015 views organizations as networks of interconnected processes that require reliable information to support decision-making (Hoyle, 2018). Total Quality Management similarly positions information quality as an important component of organizational performance because inaccurate data can increase the cost of poor quality and generate rework (Goetsch & Davis, 2016).

Haizer, J., Render, B., Munson (2020) explain that process design requires coordination among activities, resources, technology, and information to ensure that organizational processes operate efficiently and consistently. Therefore, data integration should not be understood solely as a technical connection between systems but also as an organizational mechanism for coordinating processes and information across functions.

The phenomenon examined in this study occurs within a building management unit of a large corporate organization in Indonesia that simultaneously uses a Property Management System (ProMS) and an ERP System. In this study, ProMS refers specifically to an operational system used to manage building equipment, maintenance activities, work orders, equipment locations, and maintenance history rather than a hotel reservation or property rental administration system. ProMS stores operational attributes such as equipment identity, location, hierarchy, maintenance team, technical specifications, installation date, and maintenance history. In contrast, the ERP System stores financial information such as Asset Number, acquisition date, asset category, cost center, acquisition value, depreciation, residual value, and disposal status.

Although some attributes in both systems refer to the same physical objects, the data are not adequately connected. Procurement data created in the ERP System do not automatically generate equipment records in ProMS, while equipment data created by operational functions are not always linked to financial assets in the ERP System. Some equipment is directly recognized as an expense because it does not meet capitalization criteria but still requires operational recording, control, and maintenance. In addition, changes in the physical condition of equipment, particularly during disposal, are not always followed by corresponding updates to financial asset status. Consequently, equipment that is no longer physically available may remain recorded as active in the ERP System, while equipment proposed for disposal may be difficult to trace because it lacks a clear reference to financial records.

These conditions indicate that the integration problem cannot simply be resolved by consolidating all data into a single system. The different functions, definitions, attributes, and business rules of ProMS and the ERP System must be maintained according to the needs of their respective users. What is required is a consistent relationship between operational and financial data that enables changes occurring in one process to be traced across the other. In this context, the Asset Number can serve as a reference attribute connecting financial asset data in the ERP System with operational equipment data in ProMS without eliminating the distinct functions of either system.

Accordingly, the novelty of this study lies in proposing a dual-identity integration model in which the Unit Number remains the operational identity of equipment in ProMS, while the Asset Number serves as the financial identity and reference attribute connecting relevant equipment with ERP asset records. Unlike previous approaches that predominantly emphasize BIM-to-FM integration, GIS-based spatial information, or technical metadata integration, the proposed model combines data identity with process integration at critical equipment lifecycle transition points, particularly receiving, capitalization, and disposal. The model also accommodates equipment that is not financially capitalized and relationships in which one financial asset may correspond to multiple equipment components. This approach provides a specific operational-financial integration perspective that has received limited attention in previous facility and asset management research.

Based on the identified research gap, this study aims to identify the data recording gaps between the Property Management System (ProMS) and the ERP System in building equipment management, map the integration requirements across master data, procurement, capitalization, and disposal processes, and formulate a data integration strategy using the Asset Number as a reference attribute to connect operational equipment data with financial asset records throughout the equipment lifecycle. Through this approach, the study is expected to provide a conceptual and practical basis for improving data consistency, information traceability, and cross-functional coordination while maintaining the distinct operational and financial functions of the two systems.

METHOD

This study employed a qualitative case study design with an exploratory-descriptive approach. The qualitative approach was selected because the data integration problem between operational and financial systems involves not only technical system structures but also differences in terminology, work procedures, information requirements, cross-functional coordination, and asset recording policies. The exploratory approach was used to identify patterns and factors contributing to data mismatches, while the descriptive approach was used to describe the equipment and asset recording processes performed in both systems.

The research focused on the recording and management of building equipment in a building management unit of a large corporate organization in Indonesia. The unit uses the Property Management System (ProMS) to manage operational equipment data and the ERP System to support procurement, accounting records, and financial asset management. The research examined the relationship between equipment recorded in ProMS and assets recorded in the ERP System, considering that the two systems have different data structures, purposes, and recording processes. This context enabled the integration problem to be examined from operational, information system, accounting, and organizational control perspectives.

Data were collected through Focus Group Discussions (FGDs), direct observation, and document analysis. FGD participants were purposively selected based on their experience, authority, and direct involvement in equipment management, asset management, information systems, and internal control. Five informants participated in the FGD, representing building management, information technology, accounting, financial system development, and audit functions. The number of informants was considered based on the principle of information power Malterud et al. (2016), taking into account the specificity of the research objective, the focused organizational context, and the functional expertise of the participants. The FGD focused on equipment and asset recording processes, differences in data requirements, procurement flows, master data formation, maintenance, control, and disposal.

A semi-structured FGD guideline was used as the data collection instrument. The guideline was organized around seven thematic dimensions related to the research questions, covering equipment data structure and master data formation in ProMS, asset data structure and financial recording in the ERP System, procurement and goods receiving processes, capitalization and asset recognition procedures, maintenance and status update workflows, disposal and write-off processes, and reconciliation and cross-functional coordination mechanisms. Open-ended questions were used to obtain descriptions of existing practices, perceived data gaps, and integration requirements from the perspectives of the participating functions.

Direct observation was conducted on the use of ProMS and the ERP System to examine how data were created, used, updated, and transferred across relevant processes. The observations covered equipment master data structures in ProMS, asset master data structures in the ERP System, procurement and receiving processes, equipment data formation, asset capitalization, maintenance, and disposal. Document analysis covered organizational documents related to procurement procedures, equipment recording, asset acquisition, capitalization, disposal, system user manuals, and other supporting documents relevant to equipment and asset management. The use of FGD, observation, and document analysis enabled information provided by participants to be compared with actual system processes and organizational documentation.

Data analysis followed the interactive model of Miles Matthew et al. (2014), consisting of data condensation, data display, and conclusion drawing and verification. FGD transcripts, observation notes, and documents were reviewed to identify information related to differences in concepts, data structures, information quality, system integration, control, and business processes. The data were subsequently coded using QualCoder to organize, assign, and retrieve coding segments from FGD transcripts, observation notes, and document excerpts. QualCoder served as a data management tool and did not replace researcher judgment in determining code assignments. Initial open coding was performed by the primary researcher, and the resulting codes were subsequently reviewed and discussed with a second researcher to examine the appropriateness of code labels, consistency of code boundaries, and coherence of thematic groupings. Coding differences were resolved through discussion until consensus was reached.

Codes with similar meanings were grouped into categories and themes. A comparison matrix between ProMS and the ERP System was then developed to map related data attributes

and identify points at which data were formed, changed, or terminated throughout the procurement-to-disposal process. Findings derived from the FGD were compared with observations and organizational documents to examine the consistency of the evidence. Data validity was maintained through source and method triangulation. Source triangulation compared information across participants from operational, information technology, financial, and audit functions, while method triangulation compared evidence obtained through the FGD, system observations, and organizational documents. Based on the identified patterns of data gaps, integration requirements, attribute relationships, and business process transition points, the integration model was formulated by positioning the Asset Number as a reference attribute connecting asset data in the ERP System with equipment data in ProMS.

Ethical considerations were applied during data collection. Participants received information regarding the purpose, process, and use of the research data and provided consent to participate. Participant and organizational identities were kept confidential, and the information presented in the study was limited to data relevant to the research analysis and academic purposes.

RESULTS AND DISCUSSION

Research data was obtained through Focus Group Discussion (FGD), direct observation on the Property Management System (ProMS) and ERP System, as well as document analysis related to procurement, equipment recording, asset acquisition, and disposal. Data is analyzed through thematic coding processes, triangulation of sources and methods, mapping of data structures, and tracing of business process flows on both systems. The findings are presented based on the main patterns that emerge from the data, namely differences in equipment and asset concepts, data flow gaps, information quality and consistency, data structure and hierarchy, control and tracking, and integration of procurement and disposal processes. The empirical results are then interpreted using the perspectives of operations management, information quality, asset management, and system integration.

Results

The research involved five resource persons representing operational, IT, financial, system development, and audit functions, thereby helping researchers gain a comprehensive understanding of the business processes of equipment management, asset recording, information system management, and organizational control processes. The results of the research are presented based on FGD data, observations, and documentation studies, compiled in several main parts: identification of recording gaps, analysis of integration needs, mapping of data structures, analysis of business processes, and formulation of data integration strategies.

Characteristics of Informants and Data Management Context

The FGD involved five informants representing the functions of building management, information technology, accounting, financial system development, and auditing. The selection of informants is based on direct involvement in equipment management, asset recording, system development, procedure drafting, and internal control. The diversity of functions provides an overview of the management of physical objects from the perspective of operational, technological, financial, and control.

In the context analyzed, ProMS is an operational system to manage equipment identity, location, hierarchy, maintenance team, technical specifications, and maintenance history. The term ProMS in this article does not refer to a hotel reservation system or property rental administration, but rather to a system used for the management of equipment and building maintenance activities. ERP Systems are used to support procurement, receipt of goods, capitalization, depreciation, asset value recording, and disposal. Both systems can manage the same physical objects, but have different objectives, data structures, and users.

Theme of Equipment and Asset Recording Gap

The process of encoding the FGD transcript resulted in 36 codes which were then grouped into eight themes. The themes include equipment management, asset management, differences in data concepts and needs, integration gaps, data quality and consistency, data structure and

hierarchy, asset control and tracking, and business process incompatibility.

Table 1

Results of Grouping Codes into Research Themes

Theme	Code Grouping	Number of Codes
Equipment management	Building equipment management; building equipment inventory; responsibility for equipment; recording and maintenance of equipment; equipment history; Master Data Equipment ProMS	7
Asset management	Menu assets in the ERP system; asset recording standards; SOP for asset purchase; Asset SOPs are the standard for system development; asset purchase process; procedure for receiving goods/assets; And I think that's a Master Data Asset	8
Differences in concepts and data needs	Equipment and asset terminology; differences in equipment and asset data; Differences in Recording Equipment and Assets	3
Data integration gap	Not yet integrated; need to be integrated; integrated; the concept of data integration; integration obstacles with finance; No coordination of recording equipment and assets	6
Data quality and consistency	Old equipment data is not recorded in ProMS; old data vs new asset data; recorded twice; Implementation stopped	4
Data structure and hierarchy	Furniture data hierarchy; Furniture hierarchy problems	2
Asset handling and tracking	Tracking; asset control; asset checking; equipment checking; Pose a risk/fraud	5
Business process inconsistencies	Purchase SOP workaround outside of normal procedures	1

Source: Researcher-generated data (2026)

The theme formed illustrates that the gap that occurs is not only caused by technological factors, but also influenced by differences in concepts, information needs, data quality, data structure, and control mechanisms in the two systems. Of the eight themes identified, two themes, equipment management and asset management, represent the foundational context describing each system's domain and function. The remaining six themes represent the analytical findings that directly address the data recording gaps between the two systems. The results of the gap identification of the six analytical themes along with supporting quotes from the FGD are presented in Table 2.

Table 2

Results of Identification of Gaps in Recording and Equipment Management

Theme	Quotes in FGD	Findings
Differences in concepts and data needs	"... these are two different domains..."; "... You can't equate assets with equipment..."	Equipment and assets have different purposes, attributes, and management so they cannot be treated as the same data.
Data integration gap	"... Data does not flow between procurement and equipment..."	Procurement data is recorded in the ERP but has not been automatically connected to the recording of equipment in ProMS.
Data quality and consistency	"... the implementation stopped..."; "... The cleaned data	There are obstacles to the use of historical data because the previous

Theme	Quotes in FGD	Findings
Data structure and hierarchy	cannot be connected..." "... The hierarchy must be defined first..."	implementation was not continued. There is no hierarchical structure yet, especially for furniture or non-engineering equipment.
Asset handling and tracking	"... When we are not straight to it, the possibility of deviation becomes open..."	Mismatches between equipment and asset data make it difficult to track and increase the risk of irregularities.
Business process inconsistencies	"... The money is no longer there, but in finance it is still recorded because there is no information..."	Data updates on different systems cause inaccurate and non-real time asset status.

These themes show that the gap does not only come from the technological aspect. Differences in concepts, information structures, responsibilities between functions, as well as procedures for forming and changing data also affect the consistency of recording

Differences in Equipment and Asset Concepts

The key findings show that equipment and assets are two interrelated domains, but they cannot be treated as the same data. One of the informants explained that the two are in "two different domains" and that the organization "cannot equate assets with equipment." The statement illustrates that the difference lies not only in the term, but also in the purpose of its management.

The equipment in ProMS is used to support operational activities, including equipment identification, location, specification recording, hierarchy setting, and maintenance history storage. On the other hand, assets in the ERP System are used for financial recognition, asset category grouping, recording acquisition value, depreciation, cost allocation, and disposal.

The relationship between the two is also not always one-to-one. An asset can consist of several pieces of equipment, especially when one capitalization value represents several physical components. On the other hand, not all equipment becomes an asset because some goods are directly charged as costs based on value, useful life, materiality, and capitalization policies. This condition causes some equipment to still require operational control even though it does not have an Asset Number in the ERP System.

Data Flow Gap Between Systems

The results of the FGD show that the procurement data in the ERP System has not automatically formed the master data equipment in ProMS. An informant stated that "data does not flow between procurement and equipment." Thus, after the goods are received through the procurement process, the operational function still has to make separate equipment data.

The separate process creates the possibility of duplication of inputs, differences in the writing of goods identities, location mismatches, and delays in the formation of operational data. Under certain conditions, the goods have been received and used, but have not been recorded on the ProMS. On the other hand, equipment that has been recorded in ProMS does not necessarily have a reference that can connect it to procurement transactions or master assets in the ERP System.

Gaps are also found in the process of changing status. Information regarding physical conditions, relocation, and termination of use is known first by the operational function. However, these changes are not always passed on to the financial function. As a result, the status of the equipment in ProMS and the status of the asset in the ERP System can indicate different conditions.

Data Quality and Consistency

Data quality is affected by incompleteness of historical data and system implementation that is not continuous thoroughly. The informant explained that the previous implementation process had stopped and the data that had gone through the cleansing had not been fully moved or connected to the new system.

The observation results showed that the ProMS master data contained more mechanical and engineering equipment, while furniture and non-engineering equipment groups had not been recorded in full. The number of equipment in ProMS is also not the same as the number of assets in the ERP System. These differences do not necessarily indicate faults because not all equipment meets the asset criteria, but the lack of references between systems makes it difficult to distinguish reasonable differences and problematic differences.

Double recording also increases the risk of inconsistency. Vendor, brand, model, serial number, location, and acquisition value information can be re-recorded by different functions. When there are no rules regarding the main data source, changes in one system are not automatically reflected in another.

Data Structure and Hierarchy

Data structure mapping shows that there are a number of attributes that can be linked, but there are also attributes that are only relevant to one system. ProMS stores Unit Number, Parent Equipment, Asset Number, Equipment Group, Equipment Hierarchy, Maintenance Team, Installation Date, Used in Location, Vendor, Brand, Model, Identification Number, and maintenance history. ERP System stores Asset Name, Asset Number, Asset Category, Asset Group, Asset Class, Purchase Date, Acquisition Date, Cost Center, Gross Value, Salvage Value, Residual Value, depreciation information, and disposal status.

Some attributes are directly related, such as Asset Number, location, vendor, serial number, date of purchase, and acquisition value. However, operational attributes such as Parent Equipment, Maintenance Team, and maintenance history are not required in financial records. In contrast, depreciation, residual value, and financial account attributes are not required in maintenance management.

A particular problem is found in the structure of the furniture hierarchy. Unlike equipment engineering which can be grouped based on system, function, or installation location, furniture does not yet have an agreed hierarchy. One of the informants emphasized that "the hierarchy must be defined first" before the data can be formed consistently.

Handling and Tracking

Data disconnectedness affects an organization's ability to track physical objects. The informant from the control function said that indiscipline in recording can open up the possibility of irregularities. In ProMS, location information can be recorded in detail according to the building or area of use. In the ERP System, location information is more represented through user units, departments, or cost centers.

The difference in the level of detail causes the verification process to require an examination of two systems and physical conditions in the field. When equipment does not have an Asset Number or an asset does not have a Unit Number reference, identification of the relationship between data must be done manually using the item name, serial number, vendor, or procurement information.

Incompatibility of the Disposal Process

The gap is most visible in the disposal process. The operational function knows the physical condition of the equipment and determines that an equipment is no longer in use. However, financial write-offs must follow the approval procedure and update of asset data on the ERP System.

One of the informants explained that the goods could "no longer exist but in finance they are still recorded because there is no information." The statement shows that changes in physical condition do not always result in timely updates of financial status. In contrast, equipment that does not have asset data can also experience disposal obstacles because its administrative status cannot be traced.

The observation results show that the change in equipment status in ProMS and the change in asset status in the ERP System are carried out separately. There is no automatic mechanism that ensures that disposal equipment triggers the verification and renewal process of the associated assets.

Triangulation of Findings

The findings of the FGD were compared with observations of the organization's systems and documentation. The results of triangulation show a consistent pattern. The disconnection of the procurement data with the master equipment was found at the FGD and confirmed through the observation of separate input processes. The difference in equipment and asset attributes can be seen in the display of both systems and is supported by the user manual. The incompleteness of historical data can be seen from the difference in the number and categories of data. The separate disposal process is also supported by asset removal procedures and observation of status updates on both systems.

Table 3

Triangulation of Findings with Observation and Documentation Studies

Theme	FGD Evidence	Observational Evidence	Proof of Documentation
Data integration gap	Purchase data from ERP does not flow to ProMS (equipment)	The equipment is input by the engineering team at ProMS; purchases recognized as assets are inputted in the ERP by accounting	SOP for Procurement of Goods; SOP for Asset Listing
Differences in concepts and data needs	Assets and equipment are two different domains	The data views and attributes on ProMS and ERP show some differences	User Manual Master Data Equipment and Assets
Data quality and consistency	During the ProMS implementation, the data is not fully moved to the new system	No data other than Mechanical Engineering on ProMS	The amount of equipment data in ProMS is not the same as the amount of asset data in ERP
Data structure and hierarchy	There is no identification of the furniture group hierarchy yet	No furniture data on master equipment in ProMS	KG-ERP Asset Management Document
Asset handling and tracking	Asset tracker and 2812data ssetl required	Detailed location information is in ProMS, but is limited to user departments in ERP	Not found
Business process inconsistencies	Disposal 2812of the set is not done in real time because it has not been synchronized	Changes in equipment status in ProMS and asset status changes in ERP are done separately	SOP for Asset Registration; Asset Concept Document

Integration Needs

Based on the mapping results, the need for integration includes six aspects. First, it is necessary to map between equipment and asset data without equalizing all attributes. Second, the receiving process needs to be used as the starting point for the formation of equipment data. Third, asset recognition needs to generate an Asset Number that can be stored in ProMS. Fourth, the classification and hierarchy structure needs to be standardized. Fifth, status updates must be carried out consistently when there is a move, change of condition, or disposal. Sixth, a reconciliation mechanism is needed to check the completeness and suitability of data on a regular basis.

Data and Business Process Integration Model

The resulting model does not combine ProMS and ERP System into a single system. The ERP System remains the data source for financial recordkeeping, while ProMS remains the equipment operational system. The two are linked using the Asset Number as a reference attribute.

The Asset Number of the ERP System is stored on the master equipment in ProMS. At the same time, the Unit Number in ProMS is still used as an operational identity. The Parent Equipment structure is used to describe the relationship between equipment, especially when an asset consists of several components.

Process integration begins at the receiving stage. When the goods are received, the user determines whether the goods need to be managed as equipment. If so, the basic information from the procurement process is used to form a draft master equipment in ProMS. The operational function then completes the Equipment Hierarchy, location, technical specifications, and maintenance attributes.

At the capitalization stage, the master asset formed in the ERP System generates an Asset Number. The number is forwarded to ProMS to connect financial assets with related equipment. For non-capitalized goods, equipment can still be recorded and managed without an Asset Number, but given the status that the goods are non-capitalized equipment.

In the disposal process, the submission starts from ProMS because the operational function knows the physical condition of the equipment. After obtaining approval and deletion documents, the status of the equipment is updated. If the equipment has an Asset Number, the disposal information is forwarded to the ERP System as the basis for updating the asset status. With this mechanism, changes in physical conditions and financial records can be traced in a series of processes.

Discussion

Integration as Alignment of Two Information Domains

The findings show that the main problem is not the absence of information systems, but the absence of adequate relationships between the two information domains. This finding aligns with the perspective of Sousa and Meireles (2023), who argue that quality management and asset management share a common need for cross-functional information consistency. While their study examines this alignment conceptually, the present findings provide empirical evidence from an organizational case where the absence of such consistency manifests in concrete operational problems—duplicate data entry, untraceable disposal records, and mismatched equipment-asset status. In contrast to Congiu et al. (2024) and Ismaeil (2024), who propose BIM-GIS integration as the primary solution for facility information management, this study demonstrates that the integration challenge extends beyond spatial and technical data to encompass the financial dimension of asset recording, which these prior studies do not address. ProMS and ERP System perform different functions and both are still necessary. ProMS supports operations and maintenance, while ERP supports financial control. Because the purpose of use is different, unifying all attributes into a single database is not the only solution and can create an information load that is irrelevant to each function.

The findings expand our understanding of data integration. Integration does not have to mean complete uniformity or the elimination of boundaries between systems. Sousa & Meireles (2023) explain that integration is necessary to establish consistent information relationships without eliminating the characteristics of each domain. In this context, relationships through Asset Numbers allow both systems to maintain their respective structures and functions, but still have a common reference point.

The use of Asset Number also answers the problem of traceability. Alkhard (2024) emphasizes the importance of metadata that is able to connect operational information and asset information. The findings in this study suggest that this interconnectedness requires two layers of identity. Unit Number represents equipment as an operational object, while Asset Number represents an asset as a financial object. The two-identity model is more appropriate than imposing one number as the only identity for all organizational needs.

Boundary of the Relationship between Equipment and Assets

The conceptual difference between equipment and assets is an important basis in the design of integration. The same physical object can have different meanings for operational and financial functions. For building management, low-value items still need to be recorded if they need maintenance, have a specific location, or are at risk of loss. For accounting functions, the same goods may be charged immediately because they do not meet the capitalization limit.

The findings suggest that the relationship between data is not always one-to-one. One asset can be related to several equipment, while some equipment is not related to financial assets. Therefore, the integration model needs to support one-to-many relationships and the existence of non-capitalized equipment.

This understanding is important because integrations that are only based on matching one asset with one piece of equipment will result in incomplete data. The model also has the potential to remove uncanceled equipment from the control system, even though the goods still have operational value and administrative risks.

Data Integration Requires Process Integration

Gaps not only appear in master data, but also in business process change points. The process of procurement, receiving, capitalization, maintenance, transfer, and disposal produces or changes information. If the relationship is only created after the master data is formed, the discrepancy can reappear each time a transaction occurs.

Haizer et al. (2020) place process design as the arrangement of activities, resources, technology, and information flows to produce consistent processes. From this perspective, the integration of ProMS and ERP System is not enough through the addition of technical interfaces. The points of data formation and updates should be placed in a clear process.

Receiving is a strategic point because at that stage the goods are physically available, but not yet fully operational equipment or financial assets. Determining equipment categories at the receiving stage allows organizations to form operational data early. The capitalization further completes the relationship with the Asset Number if the goods meet the asset criteria.

The same principle applies to disposal. The process must start from information about the physical condition of the operational function, then proceed to the control and financial functions. Thus, disposal is not just an accounting deletion transaction, but a cross-functional process that harmonizes physical conditions, proof of consent, and recording status.

Data Quality and Information Governance

Data quality is not only affected by the completeness of the field, but also by the clarity of the ownership and source of the data. When vendor information, serial number, location, or item value is recorded by multiple functions, the organization requires rules regarding the source system for each attribute.

Chang et al. (2022) explain that the quality of asset information includes accuracy, completeness, consistency, and relevance. The findings of this study show that the four dimensions depend on cross-functional governance. Accuracy requires validation of physical objects. Completeness requires a combination of procurement, technical, location, and financial data. Consistency requires a common reference and an update mechanism. Relevance requires restricting attributes as per the user's needs.

The integration model therefore needs to be accompanied by data ownership. The procurement function is the source of information on purchase transactions, the operational function is responsible for the location and condition of the equipment, while the accounting function is the source of capitalization and depreciation data. Information technology supports relationships between systems, but does not replace the responsibility of process owners.

Model novelty

The main novelty of the model lies in the connection of the building's operational system and ERP through a combination of data identity and process integration points. Previous research has mostly discussed BIM, GIS, and Facility Management System as a source of technical and spatial information. The model generated here places ERP as the source of financial information and ProMS as the source of operational information, then connects them throughout the life cycle of the equipment.

The model does not assume that all equipment is an asset and does not require all functions to use a single system. Asset Number is used as a reference key, not as a substitute for Unit Number. This approach allows organizations to control non-capitalized equipment while maintaining relationships with financial assets when those relationships are available.

Another novelty lies in the integration of disposal. Many asset integration approaches

focus on data formation and maintenance. The study's findings suggest that end-of-life should also be part of integration design because differences in physical and financial status can increase control risks.

Practical and Managerial Implications

Model implementation requires standardization of master data, definition of Equipment Hierarchy, rules for the use of Asset Numbers, and the determination of key data sources. Organizations also need to determine equipment criteria that must be noted even if they are not capitalized.

The receiving process needs to provide equipment identification and basic data transmission to ProMS. The capitalization process needs to return the Asset Number to the master equipment. The disposal process needs to connect approvals, proof of disposal, equipment status, and asset status. Periodic reconciliation is needed to identify equipment without references, assets without equipment, and differences in status.

In terms of control, this relationship can strengthen trail audits. Auditors can trace assets from procurement transactions to physical objects and their operational history. On the other hand, operational functions can trace equipment to the source of procurement and financial records.

International Relevance

Fragmentation of operational and financial data does not only occur in organizations in Indonesia. Globally built asset management increasingly relies on interoperability between procurement systems, asset accounting, maintenance management, BIM, GIS, and the Internet of Things. Research on digital asset management shows that organizations in various countries still face problems with terminology, metadata structure, and differences in information needs between functions.

The reference key-based model and process integration can be applied to organizations that use Computerized Maintenance Management System, Integrated Workplace Management System, Enterprise Asset Management, or other facility management platforms with ERP. The name and architecture of the system can be different, but the basic issues are similar: operational data focuses on physical condition and maintenance, while financial data focuses on value and reporting.

Cross-border implementation still requires adjustments to accounting standards, capitalization policies, organizational structure, and digital maturity levels. However, the principles of domain separation, the use of shared references, integration at process point change points, and control of noncapitalized equipment have broader relevance than the context of a single organization.

Limitations

The findings come from a case study in the context of building management so that process patterns and data structures can be different in other organizations. The formulated model is still at the conceptual and business process level and has not been evaluated through the implementation of APIs, middleware, or automated data exchange.

The analysis also did not quantitatively measure performance changes, such as reduced input time, reduced amount of inappropriate data, cost savings, or increased disposal speed. Assessments of information security risks, access rights, and the quality of technical integration have not been the main focus.

Advanced testing is required on different organizations, building types, and system platforms. Post-implementation evaluation is also needed to assess the influence of the model on data quality, process efficiency, equipment tracking, asset control, and cross-functional performance.

CONCLUSION

The data mismatch between the Property Management System (ProMS) and the ERP System is primarily caused by differences in functions, terminology, data structures, and business processes. ProMS manages equipment for operational and maintenance purposes, whereas the

ERP System manages assets for financial recording. These differences result in procurement data not always being linked to equipment records, operational equipment not always having corresponding asset references, and changes in physical conditions or disposal status not being consistently reflected in the financial system. To address these gaps, this study proposes an integration model that uses the Asset Number as a reference attribute to connect asset data in the ERP System with equipment data in ProMS without merging the two systems into a single platform. Integration is incorporated into the receiving, equipment formation, asset recognition, and disposal processes to maintain data relationships throughout the equipment lifecycle.

The proposed model enables ProMS and the ERP System to retain their respective operational and financial functions while supporting better data consistency, traceability, and cross-functional coordination. Its application requires standardized equipment classifications and hierarchies, clearly defined primary data sources and data ownership, and periodic reconciliation between the two systems. However, the model remains at the conceptual and business-process level and has not yet been validated through technical implementation using APIs, middleware, or automated data exchange. Future research should therefore test the model in different organizational and system environments and quantitatively evaluate its contribution to data accuracy, processing efficiency, asset control, equipment traceability, and disposal process performance.

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AUTHOR CONTRIBUTION STATEMENT

Anastasia Puspita Sari and Maya Irjayanti contributed to the conceptualization, methodology, investigation, data analysis, validation, and preparation of the manuscript. Both authors contributed to writing, and editing the manuscript and approved the final version for publication.

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