

# Improve Asset Management through Asset-Centric Information Management

Design, construction, maintenance, and operation of physical assets are complex processes that generate large volumes of information over time periods spanning decades. Tracking and managing asset information over the lifetime of an asset creates unique challenges for your organization.

- How do you persistently and uniquely identify and track critical assets across multiple business units within your organization?
- What is/are the appropriate level(s) to track assets to help you meet legal, regulatory, and business needs while keeping the process manageable?

In this paper, we examine the primary challenges related to managing asset-related information and outline an approach to address how best to address those challenges.

## What is an asset?

First, what do we mean by an *asset*? An asset is something of value that an entity owns, benefits from, or has use of in generating income. \*

An organization's assets differ depending on its core business. Assets can range in size and purpose from a 1,000-mile-long pipeline, to an office building, to a laptop on someone's desk. Knowing what assets you hold and how to track them is essential for making informed decisions on how you manage and maintain these assets.

This paper addresses the management of information relating to physical assets. We present an asset-centric information management<sup>®</sup> approach to resolving typical challenges related to managing asset-related information.

## Asset Lifecycle Information Challenges

Assets follow a lifecycle – from design and construction, through maintenance and operation, to decommissioning or replacement. During each stage of the lifecycle, an organization must track the right information at the right level to meet legal, regulatory, business, and operational needs. Even if you acquire already built assets, you face the same information challenges and responsibilities, basing your information on asset information you may have acquired.

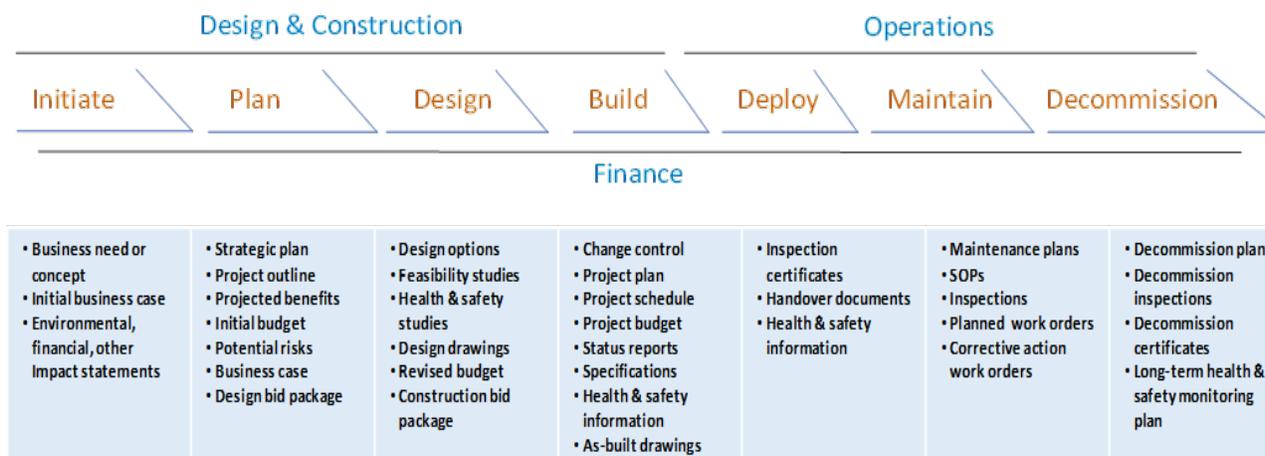


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\*<http://www.businessdictionary.com/definition/asset.html>

An organization must meet specific business needs, often varying from department to department, while maintaining a **shared set of asset information – a single source of truth to eliminate duplicate data and mitigate version control issues.**



As shown in the figure above, responsibility for assets shifts throughout the asset lifecycle. Typically, Finance manages capital spend, assigning a budget or capital project number. The Design and Construction teams often use this same project number to identify the set of information created during the initial capital project. While this number supports Finance's immediate need to understand the distribution of its capital budget, and supports Construction's short-term need to manage the construction project, the budget or project number fails as a long-term asset identifier for two reasons.

- Budget numbers are assigned at the project level. Most projects produce more than one asset. The assets must be inspected, maintained, and repaired at a much lower level of granularity than the project budget number allows.
- Given the extensive life of most physical assets – buildings, for example, have an expected useful life of 50 years or more – it is likely that multiple capital projects will impact the same assets over their full lifecycle. An organization must then match project numbers from different fiscal years to the same asset to track the full physical history, including changes and upgrades, for the asset.

At the other end of the spectrum, Operations may identify assets at a very low level of granularity to enable specific maintenance planning, inspections, and repairs. While this level of granularity is helpful to Operations, it is not practical to manage depreciation, taxes, or other organizational reporting requirements at this level of detail.

These disparate business needs are each valid, offering separate but equal views into the organization's physical assets. However, from an enterprise perspective, these various views present more challenges than solutions when it comes to creating a definitive set of asset information. Asset-centric information management<sup>®</sup> provides a way to reconcile and manage the asset information across the whole organization and meet these disparate needs – without requiring major business process changes from any one group.

### Challenge One - Technology Solutions

The full history of an asset is captured in multiple data sources, including both structured and unstructured data in electronic and hard copy forms. Linking unstructured data such as drawings, specifications, and other documents to detailed specification, maintenance, or other structured data related to the physical assets can be challenging, especially considering the varying asset identifiers, as discussed above.

The volume and variety of asset information can be overwhelming. Organizations typically have paper, microform, and electronic drawings spanning decades. The newest drawings (usually in Computer-Assisted Drawing [CAD] form) should reflect the current state of the assets. However, most regulations require maintenance for the life of the asset of all design and construction information. In addition, organizations must create and maintain records of changes made to assets during the period of operations and maintenance; this type of information is often recorded only through work orders and associated data. At the same time, maintenance and inspection operations rely on business applications such as Enterprise Asset Management (EAM), Facility Management (FM), Computerized Maintenance Management System (CMMS) to capture and manage detailed asset data and actions taken on assets. Some asset data may also reside in standalone spreadsheets maintained on share drives, hard drives, or in other collaboration tools including Enterprise Content Management (ECM).

An organization must be familiar with leading EAM, FM, CMMS, and ECM products, develop detailed functional requirements and associated evaluation criteria to ultimately select the most appropriate product (or suite of products) for its overall asset-centric information management<sup>®</sup> program needs.

EAM / FM / CMMS	ECM
<ul style="list-style-type: none"> <li>• Maximo</li> <li>• Ultimo</li> <li>• API Pro</li> <li>• TMA</li> <li>• Autodesk</li> </ul>	<ul style="list-style-type: none"> <li>• SharePoint</li> <li>• OpenText</li> <li>• FileNet</li> <li>• Documentum</li> </ul>

### Challenge Two – Implementing EAM Standards

There are several international standards that relate to the creation, management, and use of building and asset information. Understanding how these standards interact with each other and how they may impact organizational decisions relating to the management of physical assets is essential. The table below lists some of the key standards to consider when developing and implementing a shared asset hierarchy as part of an asset-centric information management<sup>®</sup> program.

Standard	Description
ISO 55001: Asset Management	Asset Management
BSI PAS 1192: BIM	Building Information Management
COBie	Construction Operations Building Information Exchange
NBIMS-US	National Building Information Management Standard for the United States

### Challenge Three - Asset Data Alignment

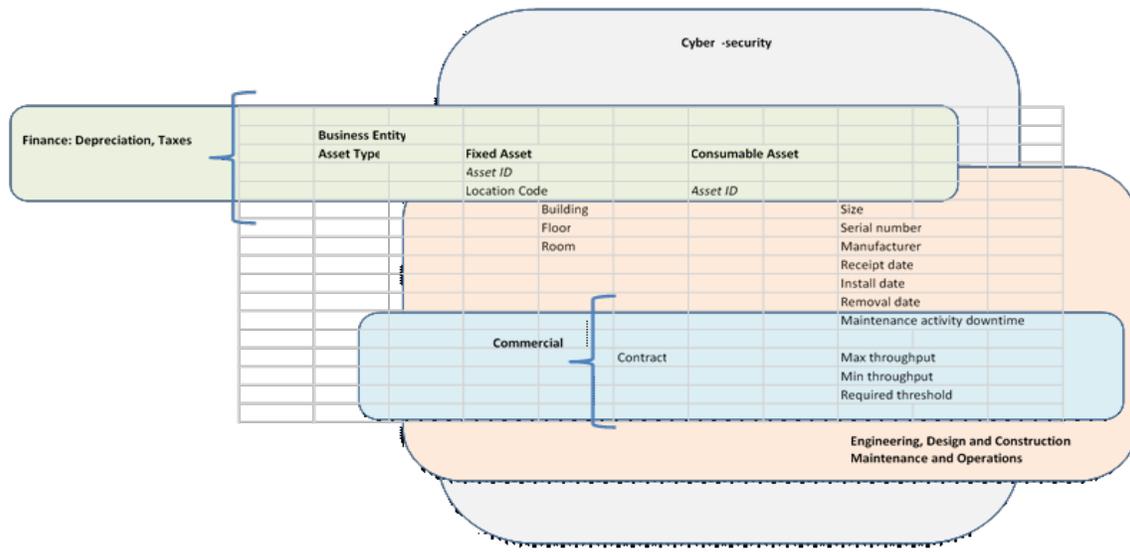
For most organizations, there is a large volume of legacy asset data, usually stored in multiple systems and repositories across the organization. Implementing new software will not result in improved asset information management unless you first address the quality, consistency, accuracy, and integrity of the legacy asset data.

An organization must apply data governance, data quality, data migration, and project management approaches to reviewing legacy data. While many tools (e.g., Extract-Transform-Load [ETL] tools) can provide visibility into the legacy data, there is often some level of manual review and validation needed to ensure data quality. Our experience shows the value to be gained outweighs the cost of this activity. If internal staff, responsible for ongoing maintenance of the assets, take on the asset data alignment project, they come away not only with a clean data set for migration, but also improved understanding and increased confidence in their data. This type of confidence supports an overall increase in trust in the asset management system leading to improved compliance and a reduction in ‘workarounds’ that employees develop when they feel they must protect their own data stores to find the data they need to do their jobs.

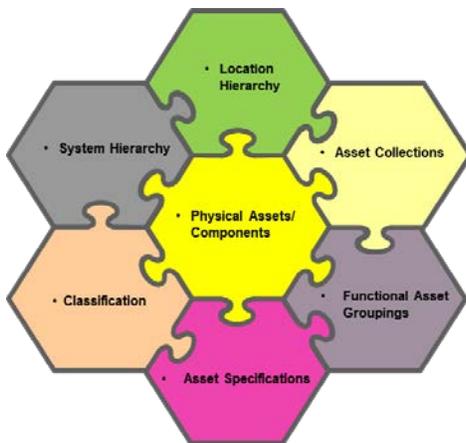
### Challenge Four - Shared Asset Hierarchy

The key to solving asset identification is to group all the departmental or functional asset labels into a **shared asset hierarchy** which is the single source of approved asset identifiers. In developing the hierarchy, you discover that departments and functions identify assets in different ways at each stage of the asset lifecycle, using various labels. By documenting unique and persistent identifiers from existing department/function labels, you create the foundation on which to build a unique, governing identifier (one per asset type). This creates a consistent way for an organization to describe and identify critical resources throughout their lifecycle, correlate information, and apply that information to the myriad of business processes that support your organization’s entire business mission.

The shared asset hierarchy contains the set of governing identifiers available and used by each department to meet their business needs. Each department uses the appropriate shared identifiers, as shown in the following figure.



Ownership and maintenance of the shared asset hierarchy, and generation of the unique identifiers at each level, should be assigned to specific business units. A single business unit should manage requests for changes and maintain the relationships among the identifiers: the crosswalk or translation that links a single capital project number to the set of low level assets resulting from it that require maintenance or inspection. Other business units request unique identifiers, as needed. The owner business unit is also responsible for maintaining a current list of unique identifiers and making the list available for cross-reference purposes, if needed.



TrailBlazer recommends a modular asset hierarchy that incorporates Asset Location, Asset Classification, and Asset Collections. Each module is a logical grouping of asset data. The figure opposite depicts relationships that exist between and among asset data sets.

While the modules relate to each other in multiple ways, we find that a linear description of 'tiers' supports understanding among end users, especially Engineers and Facility Managers. In database or system terms, the modules may reflect separate (one or more) tables containing asset metadata. In other words, the modules, tiers, collections, and other groupings are virtual and can be organized however best supports an organization's business needs.

**Enterprise – tiers one and two address enterprise-wide asset identification needs**

- Tier One – *Site/Entity*: This level identifies the main location where the assets can be found. For organizations with assets in different geographies, this tier becomes important. In addition, this level identifies corporate entities responsible for the assets. This information changes rarely.
- Tier Two - *Collection/Grouping*: This level is changeable, according to set rules; collections – which are essentially tags/pieces of metadata attached to each individual asset/component – are created for convenience for browsing, maintenance planning, depreciation, or other business purposes. **Assets may appear in more than one Collection/Grouping to meet different business purposes.** The view of the collections changes based on the user:
  - Functional: groups of asset types that perform a specific function
  - Operational: groups of assets that support a specific part of the organization
  - Financial: groups of assets that represent a specific financial transaction including fixed asset register items for depreciation, groups of assets for tax purposes, etc.

**Location – tiers three, four, and five address the location of an asset within a site**

- Tier Three – *Facility/Instance*: specific building, road, stand, etc.; relatively long-lived; maintenance/inspections attach to this tier, as appropriate.
- Tier Four – *Level*: structural level within a facility; assets tie to the level on which they are based; relatively long-lived; maintenance/inspections attach to this tier, as appropriate.
- Tier Five – *Division*: room, area, etc.; subject to more frequent change over time; individual assets move from one Division to another to reflect current usage; maintenance/inspections attach to this tier, as appropriate

**Individual Asset/Component – the lowest level of information relates to specific assets**

- Unique identifier
- Serial number
- Model number
- Asset classification: function or service group; asset type; other, if appropriate
- Asset specifications: manufacturer, size, volume, throughput, etc.; varies by asset type
- Maintenance/inspections attach to this tier, as appropriate
- Repairs, work orders attach to this tier
- Replacements/inventory tracking

In implementing a modular asset hierarchy, the organization must define specific principles or policies that govern the interaction of the asset hierarchy tiers and asset data. These principles guide assignment and creation of asset data and contribute to the consistency, integrity, accuracy, and reliability of asset data over time. The table below presents sample asset hierarchy principles.

Asset Hierarchy Principles	
<b>Business Principles</b>	<ol style="list-style-type: none"> <li>1. An asset must be associated with a physical location within the enterprise location hierarchy.</li> <li>2. An asset should be able to be identified by its grid location.</li> <li>3. An asset can hold some specific attributes which are of importance to a specific department.</li> <li>4. An asset will be associated with a system or equipment hierarchy.</li> <li>5. An asset may be part of one or more collections.</li> <li>6. Assets crossing physical levels will be attached to the level where the main component (e.g., motor) sits or to the level where a fault is likely to be observed and reported.</li> </ol>
<b>Technical Principles</b>	<ol style="list-style-type: none"> <li>1. An asset can only be created and stored as a master in a single (source) system and pushed to other systems that need the information.</li> <li>2. Individual systems can create identifiers that map to one or more assets in the master asset register.</li> <li>3. Collections are managed in the master asset register.</li> <li>4. The master asset register manages the relationships between and among linked systems using asset identifier mappings.</li> </ol>
<b>Drawings/Documents Principles</b>	<ol style="list-style-type: none"> <li>1. Documents will be linked to assets, where applicable.</li> <li>2. Documents may also be linked to projects or other activities.</li> <li>3. Documents should be stored once and linked through asset or other identifiers.</li> <li>4. Views to documents should be managed by access roles, including the specific metadata displayed.</li> </ol>
<b>Asset Classification Principles</b>	<ol style="list-style-type: none"> <li>1. Functions or Services (Classification Level 1) must have at least two Asset Types (Classification Level 2).</li> <li>2. All assets must be assigned to one and only combination of Function/Service and Asset Type.</li> <li>3. Asset Types can be assigned to more than one Function or Service.</li> <li>4. All assets assigned to a single Asset Type must have the same attributes.</li> <li>5. All assets assigned to a single Asset Type must share the same basic maintenance requirements; assignment to a specific Function or Service may impose additional maintenance requirements on the asset.</li> </ol>

## Case Study: International Airport

In a recent project, TrailBlazer helped a major international airport develop and implement a shared asset hierarchy and prepare for the implementation of an integrated asset data platform.

The Construction team at the major international airport faced challenges finding business case and other documents to support their capital investment planning activities and the development of specific construction projects. TrailBlazer was engaged to conduct a deep-dive due diligence assessment. TrailBlazer conducted over 65 interviews across six airport departments during the course of two weeks. Combining analysis of the interviews with document review, demonstrations, and observations of staff across the airport, and TrailBlazer's expertise and best practices developed over 15+ years of client engagements, led us to the following list of risks.

Enterprise Asset Management Risks
<ul style="list-style-type: none"> <li>• CMMS and ECM software out-of-date, out-of-support; unstable software environment; near-term upgrade or replacement required</li> <li>• Isolated, ad hoc, point solutions and workarounds to fill gaps in enterprise software</li> <li>• Duplicate data entry</li> <li>• Inaccurate, incomplete asset data</li> <li>• Inconsistent version control</li> <li>• Unauthorized document repositories</li> <li>• Manual signatures</li> <li>• Data manipulation</li> <li>• Manual reporting</li> </ul>

TrailBlazer recommended a comprehensive asset-centric information management<sup>®</sup> approach.

Asset-Centric Information Management <sup>®</sup> Recommendations
<ol style="list-style-type: none"> <li>1. Develop shared asset hierarchy           <ul style="list-style-type: none"> <li>• <i>Cross-functional development effort</i></li> <li>• <i>Systematic asset and asset data review and validation</i></li> <li>• <i>Identification of new locations including room numbering</i></li> <li>• <i>Fixed asset register entries linked to physical assets through Collections</i></li> </ul> </li> </ol>
<ol style="list-style-type: none"> <li>2. Implement end-to-end data flow           <ul style="list-style-type: none"> <li>• <i>Asset lifecycle-based business processes</i></li> <li>• <i>Detailed process documentation through level 3</i></li> </ul> </li> </ol>
<ol style="list-style-type: none"> <li>3. Reorganise departments involved in asset management           <ul style="list-style-type: none"> <li>• <i>Asset Control &amp; Design Centre (AC/DC)</i></li> <li>• <i>Principal, Project, and Field Engineers collaboration across full asset lifecycle to develop and refine asset data</i></li> </ul> </li> </ol>
<ol style="list-style-type: none"> <li>4. Streamline and simplify capital project review and approval process           <ul style="list-style-type: none"> <li>• <i>Consistent requirements</i> <ul style="list-style-type: none"> <li>– <i>Large capital construction projects</i></li> <li>– <i>Low and medium complexity construction and maintenance projects</i></li> <li>– <i>Large capital Information Technology (IT) projects</i></li> </ul> </li> <li>• <i>IT governance requirements aligned with capital project review and approval requirements</i></li> <li>• <i>Checklist-driven asset handover</i></li> </ul> </li> </ol>
<ol style="list-style-type: none"> <li>5. Support asset owners           <ul style="list-style-type: none"> <li>• <i>Data-driven asset repair/replace decision-making</i></li> <li>• <i>Checklist-driven, multi-tiered inspection process</i></li> </ul> </li> </ol>
<ol style="list-style-type: none"> <li>6. Implement an integrated asset data platform           <ul style="list-style-type: none"> <li>• <i>Asset Register (AR)</i></li> <li>• <i>CMMS</i></li> <li>• <i>ECM</i></li> </ul> </li> </ol>
<ol style="list-style-type: none"> <li>7. Implement Mobile Working           <ul style="list-style-type: none"> <li>• <i>Real-time work order assignment and completion</i></li> <li>• <i>Accurate data gathering (equipment readings, metrics)</i></li> <li>• <i>Improved efficiency</i></li> </ul> </li> </ol>

In year one, the project team achieved the following outcomes.

Outcomes	
<b>Asset Hierarchy</b>	<ul style="list-style-type: none"> <li>Identified over 10,000 individual locations across the airport</li> <li><i>Previous baseline ~2,300 locations which reduced accuracy in fault identification</i></li> <li><i>Room numbers assigned to each facility and level</i></li> <li><i>Assets aligned to specific rooms</i></li> <li><i>Increased accuracy and efficiency in faulting and repairs</i></li> </ul>
	<ul style="list-style-type: none"> <li>Streamlined asset classification codes: Systems and Asset Types</li> <li><i>Previous baseline: 500+ asset functional codes, levels 1, 2, and 3</i></li> <li><i>Agreed principles for assignment and relationships among Functions/Services and Asset Types</i></li> <li><i>ACCs feed Asset Information Requirements (AIR<sup>1</sup>)</i></li> </ul>
<b>Asset Data Alignment</b>	<ul style="list-style-type: none"> <li>Systematically reviewed and validated more than 120,000 assets</li> <li><i>Reduced asset count by 40% by removing 'dummy' or scrapped assets</i></li> <li><i>Applied agreed asset definitions to all assets</i></li> <li><i>Remaining 6% of baseline assets to be reviewed as part of ongoing operations</i></li> </ul>
<b>Organization</b>	<ul style="list-style-type: none"> <li>Co-located key staff to increase collaboration and implement asset lifecycle business processes</li> </ul>
<b>Asset Lifecycle Policies/ Processes</b>	<ul style="list-style-type: none"> <li>Developed ten high-level business processes spanning the full asset lifecycle</li> <li><i>Documented detailed processes to Level 3</i></li> <li><i>Validated processes with representatives from all parts of the business</i></li> </ul>
<b>Asset Data Platform Solution Selection and Design<sup>2</sup></b>	<ul style="list-style-type: none"> <li>Developed detailed functional requirements</li> <li>Developed selection evaluation criteria</li> <li>Conducted procurement process and selected leading software vendors (CMMS and ECM)</li> <li>Developed conceptual design incorporating CMMS and ECM solutions and expanded AR functionality</li> <li>Developed conceptual data model based on asset lifecycle</li> <li>Developed detailed design</li> </ul>

## Summary

Today, organizations create, receive, and manage an ever-growing volume of information related to the management of their vital physical resources. Collecting information is not enough. By focusing on information related to individual processes or business unit needs, an organization creates a series of internal information siloes. These siloes are challenging and expensive to navigate and introduce risk in managing your assets because there is no common denominator that links the many different sets of asset-related information across the organization.

Applying the asset-centric information management<sup>®</sup> approach to link information associated to the same asset increases the inherent value of the information and reduces risk. Use of a shared asset hierarchy reduces potential for out-of-date, incomplete, or inaccurate information and removes inconsistent terminology that often leads to disconnects between vital pieces of information. By creating a holistic view of critical resources, the asset-centric information management<sup>®</sup> approach helps an organization make sound decisions and positively affect asset performance for operational, regulatory, or legal purposes.

<sup>1</sup> AIR = critical BIM document for capital construction projects.

<sup>2</sup> System implementation is ongoing; Go Live planned at the end of year two.

## About TrailBlazer Consulting, LLC

TrailBlazer Consulting, LLC, is a small, certified woman-owned business that provides Information Design® services to client organizations in the public and private sectors. Our mission is to help our clients match business needs to information management approaches, resulting in reduced risk and increased value. Ms. Maura Dunn, President of TrailBlazer, founded the company and began business operations in June 2013.

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