

Asset Lifecycle Management

A Guide for Capital Project & Infrastructure Owners



Dark Data Casts Shadows on Decision-Making, Productivity & Trust

From local governments to state and federal agencies, public infrastructure owners are experiencing record increases in project volume stimulated by new funding and the mandate to modernize aging infrastructure for future generations.¹ But asset owners cannot deliver tomorrow's infrastructure with the methods and technologies of decades past.

1 The White House, **Maps of Progress**, updated November 2022 and American Society of Civil Engineers, **America's Infrastructure Report Card 2021**.



elivering reliable, resilient infrastructure requires efficient use of systems and processes to manage the massive amounts of data needed for asset owners to make well-informed decisions. However, today's public agencies are hamstrung by antiquated technology,² legacy proprietary data formats, and manual processes that create silos of "dark data"—data that has been collected and stored, but is not accessible in the right format to the right team members at the right time.

Data Loss Causes Productivity Setbacks Lack of Decision-Making Support



This data loss—and the resulting lack of decision-making support—dampens productivity, driving up capital expenditures by an estimated 5%-8% and operational costs by as much as 15%³.

- 2 Dodge Construction Network, Connected Construction: The Owner's Perspective, 2022.
- 3 Deloitte, Connected Asset Lifecycle Management, 2018, p. 6.



Asset owners must champion and implement digital transformation at their organizations to bring lost data to light. The result: Improved productivity and decision-making.

These avoidable costs are an added burden to organizations struggling with record labor shortages and constant pressure to do more with less. Yet the societal fallout is even more damaging: Lost data leads to lost opportunities to maximize the benefits from infrastructure investments and to repay the public's trust.

The way out of this data darkness is clear: Asset owners must champion and implement digital transformation at their organizations to bring the lost data to light.

Connected Data Improves Productivity

Informed Decision-Making Across the Lifecycle





Lighting the Way: Digital Transformation of the Asset Lifecycle

Digital transformation replaces siloed information with data transparency; it replaces team-to-team handoffs with seamless, automated workflows. For infrastructure and capital project owners, digital transformation means adopting digital technologies that improve productivity and outcomes at every phase of the asset lifecycle.

BUILD

Digital Project Delivery

DESIGN

CDE CONNECTED DATA

ENVIRONMENT

Enterprise Asset Management

MAINTAIN

OPERA7

Trimble.



Plan and Design

Digitized capital planning automates the process of coordinating stakeholders; maintaining historical, current, and potential planning data; and managing cash flow. With digital design, capital project owners manage the design workflow from a single controlled data set: the 3D design model. The model automatically maintains version control for all design inputs and updates, and enables the owner to more easily track and process submissions and approvals.

Build

By sharing a 3D design model with those who build from it—the contractor team—the owner helps optimize the design for real-world building conditions, technologies, and means and methods. Combining building information modeling (BIM) information with digitized project management platforms eliminates data silos by enabling real-time tracking and visibility across the whole project. The owner can then better assess how changes will affect costs, schedules, and project quality.

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Maintain

Using advanced analytics and predictive modeling, asset owners create optimized work plans to improve productivity and performance while maintaining assets more costeffectively across their service life. Connecting maintenance information with other asset lifecycle data helps owners optimize all phases of an asset, from design through construction, operations, and maintenance.



STrimble



Operate

Up-to-date, digitized asset information—from as-built documents to warranty details to BIM reference models helps team members make better-informed decisions to ensure assets perform optimally for their public. This data also helps owners with future planning by enabling them to take information about asset performance into consideration for the next project.



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Asset Lifecycle Management: From Concept to Capabilities

Evolving from a Project-Centric to an Asset-Centric Approach

For many professionals in the built environment, workflows have revolved around the project. Projects themselves had their own lifecycle, typically described as "design-bid-build" or "design-build." Because those lifecycles ended when the construction was complete, organizational boundaries evolved that persist today between the design-and-construction teams and the asset maintenance teams. In many public agencies, Construction and Maintenance are two different organizations that collaborate only during the handoff from one phase to the other. Those silos don't need to exist anymore.

Progressive organizations are evolving to take a more holistic, asset-centric view of the lifecycle. When organizations recognize the value of having access to reliable asset data over the life of the asset (which may span 30 years or more), their approach to structuring and storing design and construction data is tailored to an entirely different use case.

Designing for the Lifecycle

Similar to an enduring leadership concept popularized by Stephen R. Covey in his 1989 bestseller, **The 7 Habits of Highly Effective People**, the asset-centric approach "begins with the end in mind."⁴ For owners who take an asset-centric approach, the end goal of design and construction is to deliver a safe, sustainable, cost-efficient, and maintainable asset for years after design and construction are complete.

When you see the world through an asset-centric lens, you recognize the long-term value of high-fidelity data about your assets. From this perspective, it's not difficult to imagine a permanent and evolving digital record of how an asset was originally designed, how it was built, and the changes to the asset as it is maintained.

⁴ FranklinCovey, the global leadership and organizational coaching company co-founded by Stephen Covey, actually holds the trademark on the term, "Begin With the End in Mind[®]," also identified as "Habit 2" of Covey's famous 7 habits.



^{6 |} Asset Lifecycle Management

All these subsets of data are essentially "layers" that can be visualized in three dimensions: a 3D model. As the asset lifecycle progresses, additional data subsets—such as inspection data, maintenance work orders, and asset performance data—would all connect to the 3D model, making it much simpler and more efficient to operate and maintain that asset over its lifecycle.

Digital Transformation of Organizations

The encouraging news is that asset lifecycle management technology is evolving to reflect this long-range view of assets. Unlike the project-centric technology of the past, asset-centric technology includes capabilities for the entire Plan and Design, Build, Operate, and Maintain phases of the lifecycle. As a result, innovative owners of public and private assets are taking steps to digitally transform their organizations using these technologies to support a more holistic approach across teams and departments.

For example, some organizations are starting to define an enterprise-wide system of record that encompasses all key sources of truth for assets, including planning and design software, digital project delivery software, geographic information systems, and enterprise asset management software. By connecting all phases of the asset lifecycle, such a unified system of record creates exponentially more value for owners and their collaborators by making asset data accessible in a connected data environment that provides a living digital twin of each asset.

Digital transformation of an organization is not an all-or-nothing process, but an incremental advancement in digital maturity over time. Many organizations are making such a transformation part of their long-term strategic plan.

A Lifecycle-Driven Technology Strategy

A first step toward digital transformation at the organizational level is establishing a technology strategy that supports **asset lifecycle management**, a set of capabilities that maximizes the value of organizational resources people, processes, technologies, and data—by connecting them across the entire asset lifecycle.

While the concept of asset lifecycle management may be familiar from frameworks proposed by the U.S. Department of Transportation,⁵ the Institute for Asset Management,⁶ or global consulting leaders,⁷ we take the concept beyond theoretical models. Rather, we examine asset lifecycle management as the combination of three organizational capabilities made possible by a unified technology platform that integrates all phases of the asset lifespan.

In fact, many of our customers—from private companies to government agencies at the federal, state, and local levels—are rapidly adopting these capabilities and pioneering asset lifecycle management practices using Trimble's uniquely comprehensive and streamlined technology ecosystem. These same customers are inspiring Trimble's ongoing innovation of these technologies to make asset lifecycle management capabilities a reality for a growing segment of the owner and public sector market.

- 5 U.S. Department of Transportation, Federal Highway Administration, **Building Information Modeling** (BIM) for Infrastructure Overview. Updated June 7, 2022.
- 6 Institute of Asset Management, Asset Management: An Anatomy, 2015, p. 16.
- 7 Deloitte, Connected Asset Lifecycle Management, 2018. See also McKinsey, The Future of Maintenance for Distributed Fixed Assets, 2020.



Core Capabilities for Asset Lifecycle Management

Three foundational capabilities comprise the engine that drives successful asset lifecycle management. Together, these capabilities—digital project delivery, enterprise asset management, and a connected data environment—form a perpetual loop of intertwined processes that enhance efficiency, productivity, and decision-making across all the connected lifecycle phases.

1 Digital Project Delivery

Digital project delivery is the use of digital data to plan, design, construct, inspect, and record as-built conditions throughout a construction project. With **digital project delivery**, owners build public trust by coordinating stakeholders and using reliable data to deliver projects on time and on budget. In addition, the resulting data—when carried forward to later phases of the asset lifecycle empowers owners to manage their assets for better performance and cost-effectiveness, lowering the overall cost of ownership.

2 Enterprise Asset Management

Enterprise asset management is the ability to costeffectively plan, manage, and optimally maintain a portfolio of assets for maximum performance across the lifecycle. This means avoiding costly, disruptive repair projects by staying proactive with preventive maintenance—and in the process, increasing public confidence by ensuring asset reliability and longevity. For Trimble customers, a **GIS-centric asset management solution** streamlines maintenance activities by integrating **office-to-field-to-office workflows**, enabling teams to improve both operational efficiency and asset performance.

3 Connected Data Environment

A connected data environment is a digital information platform that enables asset owners to accelerate productivity by getting high-fidelity data into the field through an open, object-based collaboration environment. By centralizing data across the asset lifecycle, **Trimble's connected data environment** eliminates the information gaps caused by legacy proprietary data formats and antiquated file-based systems. Multidisciplinary stakeholders have access to consistent, comprehensive, up-to-date information about the asset—from its design and construction history all the way to its projected future performance and maintenance needs.



A connected data environment makes critical information available to owners and their collaborators over the entire asset lifecycle. The result: Better project outcomes and lower total asset costs.



Connected Integration Services Help Drive Digital Maturity

As asset owners know all too well, disconnected applications that use proprietary data formats limit the visibility of information necessary for datadriven decision-making. Connected integration services solve that problem by providing the strategic and operational expertise to securely connect data sources into a single system of record, leveraging open data standards to streamline workflows and create the transparency needed to make informed decisions. Many of our customers call on Trimble Digital Services to enable a unified technology ecosystem that not only eliminates process bottlenecks, but also mitigates security threats through standards such as SOC2 and FedRAMP compliance.

Trimble Analytics Promote Confident Decision-Making

Effective asset lifecycle management depends on having access to accurate, trusted data to consistently make the right decisions—whether for one asset or the entire asset portfolio. Through more than four decades of innovation in the field of industrial technology, Trimble is uniquely positioned to provide asset owners with a curated business intelligence solution that promotes confident decision-making across every lifecycle phase, no matter the size or location of the asset portfolio. Through their successes, our customers confirm the value of having the information they need, when they need it, to achieve their goals for productivity and project outcome.





Organizational Innovation Brings Benefits for Society

Asset lifecycle management empowers owners to proactively connect their design, project delivery, and maintenance teams through digital workflows, making use of open data to improve project outcomes and lower the costs of ownership.

This unified, collaboration-based approach illuminates the data that would otherwise be lost in the handoffs from one lifecycle phase to the next. Data visibility helps drive organization-wide improvements in decision-making, productivity, and efficiency—because team members have the information they need, when and how they need it.

The benefits of asset lifecycle management go well beyond the organization itself. Local communities, states, and nations benefit from capital improvement programs and infrastructure networks that are managed strategically and cost-effectively. Asset lifecycle management leads to more affordable, reliable, sustainable and resilient assets that benefit society as a whole.

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