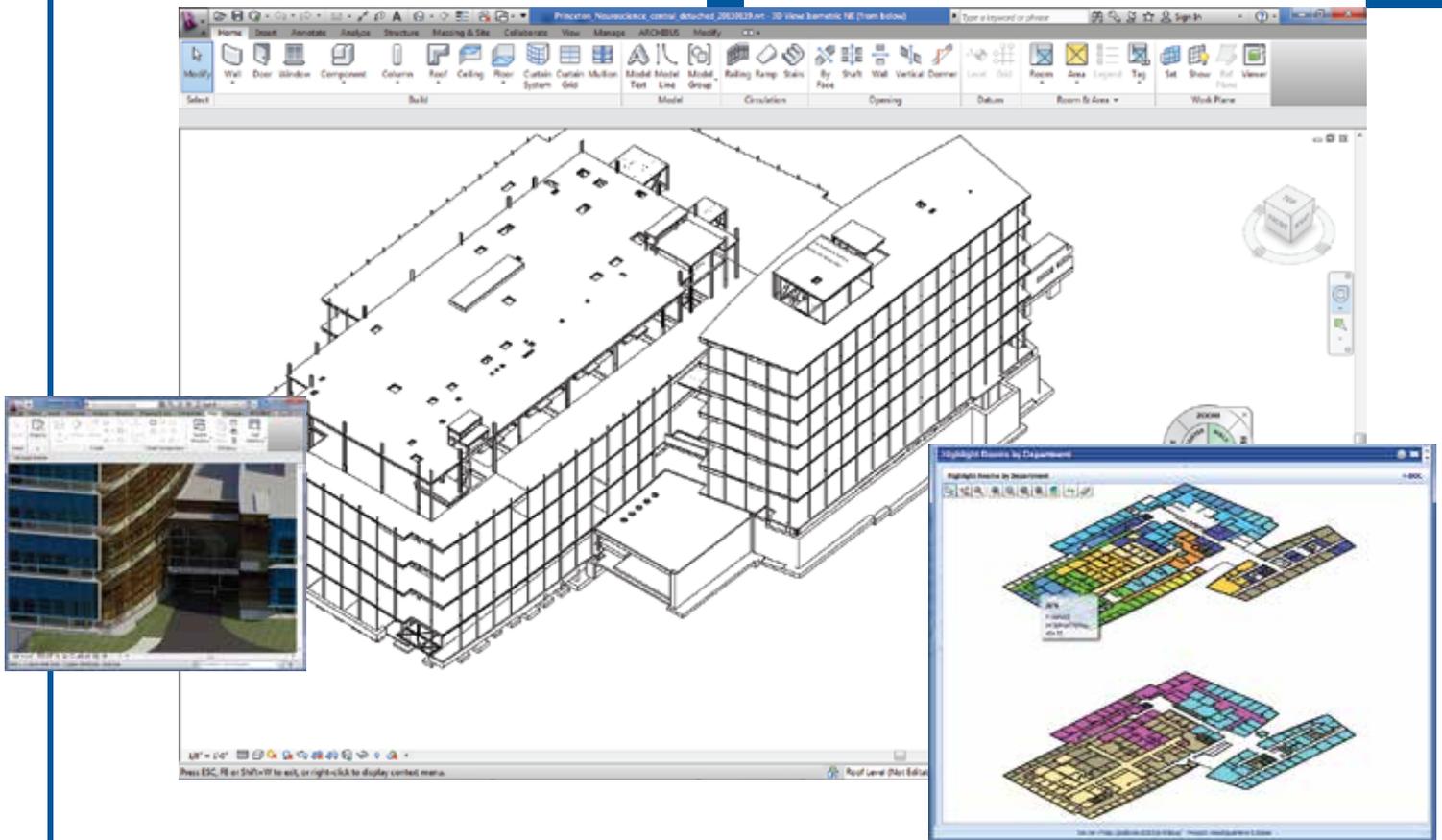


7 Steps to BIM-based Facilities Management

BIM-driven Facilities Management Lowers Cost of Facility Ownership and Delivers Savings to the Bottom Line





Use the bi-directional sync feature to incorporate database-driven business information, such as space allocation by department, within your Revit model

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- 1 John R. Selman, Rich Schneider, (2004) *"The impact of life-cycle cost management on portfolio strategies"*, Journal of Facilities Management, Vol. 3 Iss: 2, pp.173 – 183.
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- 6 United States General Services Administration, *"3D-4D Building Information Modeling"*, 2008.
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7 Steps to BIM-based Facilities Management

BIM-driven Facilities Management Lowers Cost of Facility Ownership and Delivers Savings to the Bottom Line

Abstract

Building Information Modeling (BIM) is a process involving the generation and management of digital information related to the physical and functional characteristics of a facility. This information has found great value within the building architect and construction community, helping to reduce design errors and increase on-time project completions. However, the benefits do not end with the construction of the facility. Executives at every organization that owns or leases facilities can lead their firms to greater operational efficiencies and cost savings by initiating BIM-driven facilities management.

This paper illustrates several examples on how BIM-driven facilities management leads to operational and financial benefits for the organization, and concludes with the seven steps to develop a well-planned approach to BIM-based facilities management. The end results include lower fixed and variable costs, better managed long-term assets, improved physical asset utilization, and significant net savings to the bottom line.

Lifetime Expenses Dominate Total Cost of Ownership

For any new facility, architects, engineers, and contractors aim to make the facility ready for occupancy. Building Information Modeling (BIM) capabilities in software have helped reduce and correct design errors, and increase on-time project completions, thus driving down the overall cost of building the facility. However, the cost incurred in this design and build phase of the facility typically accounts for only a small percentage of the total cost of the facility during its lifetime. A generally

well-accepted statistic states that the cost of preservation of an asset is approximately 80% of its total cost of ownership (TCO) over its lifespan.

Consider for example, the Redwood National and State Parks Information Center in Crescent City, California. Over its 50-year lifecycle, custodial costs alone will add up to more than the total replacement construction cost for the entire facility¹. Another real world example comes from of the Construction Specifications Institute in 2005 for a complex library project where the total cost of building the library was pegged at just over \$203 million, and the total cost of ownership, over 50 years, was estimated to be over \$573 million.

Construction Specifications Institute, 2005

Assessing Facility Lifecycle Costs – Too Difficult to Accomplish?

Executives who seek to successfully execute long-term strategic plans, respond to changing business environments, or improve employee productivity should assess the TCO for their facility portfolio. Unfortunately, the value of TCO for a portfolio of facilities is an often miscalculated, and frequently underutilized, metric.

This situation may happen for a variety of reasons. Executives might focus on expenses related to core operations and leave no resources to assess facilities costs. In addition, the decision to outsource the management of a facility can steer executives away from evaluating the true cost of facility ownership. Executives might be tempted to adopt a “don’t want to be bothered with that” attitude, leading to a possibly costly assumption that the outsource provider’s charges are reasonable.

Executives might also assume that the facility infrastructure in use today will support future growth initiatives. After all, a building will still remain a building after fifty years, correct? This assumption is particularly harmful in fast evolving industries and in volatile business climates. It fails to take into account numerous detrimental factors that could dramatically lower the return on investment or lengthen the payback period of investing in a facility. Such factors include lower future employee occupancy rate, lower resale value, and higher costs related to utilities, energy, replacement parts, and craftsperson labor, all driven by macroeconomic factors such as inflation and supply-demand conditions.

Finally, facilities-related information might simply be unavailable or too hard to access because of either manually maintained data in spreadsheets or outdated technology. The desired information, if available, would have immediately brought about a realization of how important current and historical facilities information is to managing the scope and alignment of the built environment to the organizational mission. This last factor is, perhaps, the most common contributor to the loss of billions of dollars annually at organizations worldwide.

Help Is Available – The Asset Lifecycle Model and its Implementation

The Asset Lifecycle Model for Total Cost of Ownership Management has been proposed by a consortium of organizations leading the evolution of facilities management. The model “defines the cradle to grave responsibility for measuring and managing a physical asset’s useful life. The framework provides structure to help property owners, managers, overseers and others determine and manage the Total Cost of Ownership (TCO) to best support their organization’s overall business or mission.”

While the benefits of using this structured approach are clear, the quantity and diversity of the data that need to be stored, managed, and retrieved are considerable, and most easily accomplished with the use of facilities management software products that allow for modular implementation at a departmental or organization-wide level.

Thus, executives and senior managers can utilize the framework of business areas and skills defined by the Asset Lifecycle Model, to:

- Determine which metrics and cost models are most relevant to the determination of lifetime TCO of their facilities
- Implement integrated facilities management software for selected business areas, such as space management or building operations management, that helps them derive the results for the metrics and cost models pertaining to these business areas
- Use the results returned by the facilities management software to evaluate alternative choices for management of the facility itself, or to better reallocate funds during the capital budgeting process
- Make informed decisions that lower the cost of future facility acquisition and lifecycle management

As an example, all organizations that have building locations are likely to derive immediate benefit from metrics that relate to its space management. In addition,



organizations operating government, healthcare, education, manufacturing or other facilities will likely derive immediate benefit from metrics that relate to their management of on-demand and preventive maintenance activities. Furthermore, larger enterprises might seek to manage a greater number of business functions such as capital budgeting, environmental and risk planning, and workplace services, with the help of enterprise-wide integrated real estate, infrastructure and facilities management software.

Building Information Modeling and Facilities Management: The TCO Connection

The most important benefit an executive can derive from effective TCO estimation for their organization’s facilities is predictability. To be useful, facilities data must be easily documented, relevant, understandable, accessible, and

reportable. With these attributes, the data can provide an excellent starting point for TCO estimation over the period of occupancy for an organization with one or multiple facilities. These attributes can today be readily provided by enterprise-wide integrated real estate, infrastructure, and facilities management software.

But how does BIM fit into this plan for reaching the lowest acceptable facilities TCO? Let’s begin by understanding how the information in a Building Information Model can be beneficially utilized for lifecycle management of the facility.

As illustrated in Exhibit 1, the Building Information Model can potentially include an extensive set of details related to the facility. For example, these details might cover architectural and design specifications of the built facility, as well as information on the assets within the building. Not all of this information contained in the

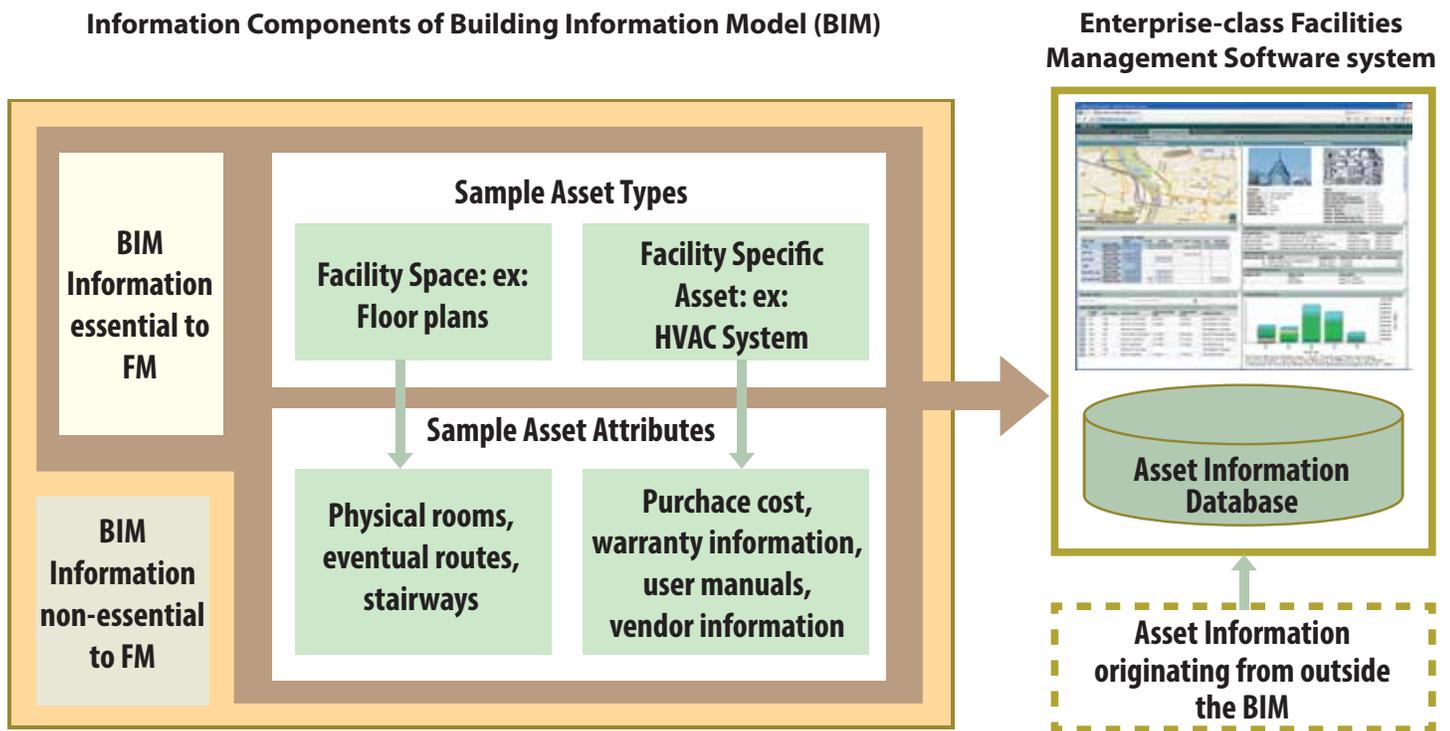


Exhibit 1: Use of Essential Facility Information from Building Information Model for Facility Management

model is essential for lifecycle management of the facility. The information in the model can thus be categorized as essential and non-essential for facility management. The essential information is imported into an asset information database that can be used by the enterprise class facility management software to produce comprehensive analysis, metric calculations, and reports that can be used by senior management to drive strategic decision-making. The delays, errors, and costs associated with collecting and analyzing facility data from disparate and outdated sources are thus eliminated with the use of the single asset information database.



High quality, scalable facilities management software should reuse *and leverage* essential facility information from multiple BIMs for successful management of a large facility portfolio.

Multiplying Benefits with Lifecycle Management of Multiple Facilities

As the number of facilities within an organization increase, there will be a corresponding increase in the number of BIMs, with at least one for each facility. Within large enterprise organizations such as government agencies, multi-campus educational institutions, residential complexes, and global commercial institutions, the number of building models can number in the hundreds or even thousands.

A high quality, scalable facilities management software solution should reuse and leverage essential facility information from multiple BIMs for successful management of a large facility portfolio. Furthermore, it can do so while using a single, integrated asset information database. As the number of facilities managed by BIM-driven facilities management software grows, the benefits multiply, with minimal incremental investment needed for IT infrastructure. This discussion underscores the importance of selecting facilities management

software that is scalable, delivers value quickly, and that has a track record of lowering facility TCO for both large and small facility footprints.

The asset information database can also be populated with other capital or non-capital asset information that did not originate from the Building Information Model. An example of such as addition would be new production equipment added to the manufacturing floor to produce a newly designed product. The ability to manage the lifecycle of these new assets further enhances the quality of the information essential for executive decision-making. Asset information such as historical performance and output, initial and replacement costs, and labor associated with the new asset can all be easily accessed. The management team then has the visibility to take immediate corrective action if the performance of the asset is not up to expectations.

Achieving a Stronger Bottom Line with BIM-based Facility Management

After reviewing how data in BIM is utilized for facilities management, the following examples illustrate their linkage in lowering TCO. Let's consider three categories that represent the highest costs associated with managing a facility – Space, Operations & Maintenance, and Energy as shown in Exhibit 2. By applying BIM-based facilities management, these three categories can each contribute to lowering the overall TCO of the facility, and lower a variety of operational costs which in turn strengthens the bottom line.

Sample Executive Objective	Primary Facility Category	Typical Information Utilized from Asset Database	Operational Benefits	Lowers Facility TCO?	Financial Contribution to Organizational Profitability
Rapidly increase headcount over the next six months	Space	Available and unavailable space across multiple sites, types of spaces, occupancy rate, useable area per occupant	Awareness of real estate needs, location suitability for new hires; easy assignments to maximize productivity, increased employee satisfaction	Yes	Minimize utility, IT, support expenses for vacant space, avoid/defer real estate purchase, lease out unoccupied space for revenue, effectively manage long term fixed assets
Meet higher facility use targets for the next twelve months	Operations & Maintenance	Building and business critical equipment asset count, lifespan, capacity, condition assessment, maintenance schedules and, procedures, current operational costs	Determine if current assets are producing to specifications; estimate building efficiency; reduce waste	Yes	Increase use and life of facilities and equipment assets; lower fixed costs (equipment); increase profitability; effectively manage asset depreciation
Develop a corporate sustainability plan to lower carbon footprint	Energy	Utility energy consumption costs and capital asset energy consumption costs per location; asset energy specifications	Awareness of facilities with poor carbon footprint and determine cause; identify equip. using excess energy	Yes	Lower general utility costs; lower production energy costs—effectively lowering fixed costs

Exhibit 2: Using BIM-driven Facilities Management for Space, O&M, and Energy categories to help improve operational performance and meet strategic objectives

Post-Occupancy Savings Lower TCO over the Lifetime of the Facility

Dubai Mall BIM Implementation

General Contractor: Consolidated Contractors Company (CCC)

Project Cost: US \$1.3 billion

Project Scope: 12 million sq. ft. total area (32 buildings), with leasable retail space in excess of 9 million sq. ft.

Technology: 3D BIM

Business Value Delivered: Automated quantity surveying (QS) saved 700 man-months labor; improved efficiency of 86%, \$10 million savings using integrated/automated BIM/Quantity Surveying process

Exhibit 3: Dubai Mall BIM Implementation Highlights

A building model acts as the originating source of the facility information that comes into existence as a result of collaboration among the key stakeholders during the design-build-commissioning-lifecycle phases of the facility. This collaborative process itself contributes to reduced facility TCO. Numerous real world examples of BIM implementations exist. Exhibits 3 and 4 highlight examples for the Dubai Mall³ project and the University of Colorado – Denver Health Sciences Center⁴ project.

However, the greatest savings begin to accrue during the phase of actual occupancy. During this phase, the integrated facilities management software uses the information in the asset information database to produce the desired output reports to that can help drive down the cost of facility ownership.

Unum Group Facilities Management Implementation Across the Enterprise

Organization Type: Fortune 500 insurance company with global presence.

Project Scope: 3 million square feet of office space in five United States buildings and a facility in the United Kingdom; 90,000 assets tracked; 4,000 work orders received per month.

Technology: Web-based enterprise class integrated Real Estate, Infrastructure, and Facilities Management solution supporting BIM-driven facilities management approach.

Facility Management Functions Implemented: Space Planning & Management, Building Operations, Real Estate Portfolio Management, Asset Management.

Business Value Delivered: \$7 million USD in avoided real estate costs, \$350,000 USD savings from reduction in legacy systems, accurate metric reporting, improved workflows, increase from 72% to 85% in space utilization; churn rate reduced by 50%.

Exhibit 4: Unum Group Facilities Management Implementation Highlight

Unum Group, a Fortune 500 insurance company, represents a classic success story in software based facilities management⁷.

The company was unable to quantify its space portfolio and automate its rent allocation and tracking for its real estate holdings. Further, business continuity was negatively affected by the absence of common standards or audit ability for corrective and preventive maintenance work orders. Moving to a web-based enterprise class facilities management solution for multiple domains helped Unum address the mentioned challenges, resulting in tremendous financial savings and dramatic improvements to business continuity (see Exhibit 4).

Paul Larkins, Director of Corporate Planning and Construction for Unum, gets straight to the point as he explains. “We’re moving to a building that has an area of 175 thousand square feet and earlier we were in a building that’s 385 thousand square feet,” he says. “We’re not growing or shrinking as an organization, but we’re shrinking the portfolio by more than half. That’s a huge savings for our company after implementing space management. We recognized how much vacant space we had, how much inefficiency we had. We were able to educate our management and our customers that we didn’t need the larger facility,” he adds.

University of Colorado – Denver Health Sciences Center BIM Implementation

General Contractor: Mortenson Construction

Project Cost: US \$201 million

Project Scope: 540,000 sq. ft. bio-medical facility (11 floors)

Technology: 3D and 4D BIM

Business Value Delivered: Mechanical sub realized 50% reduction in labor, 50% reduction in schedule

Exhibit 5: University of Colorado - Denver Health Sciences Center BIM Implementation Highlights



7 Steps to BIM-based Facilities Management: An Executive Roadmap

A well-planned approach to BIM-based facilities management will reap rich rewards that are well worth the resources invested. The following execution guidelines can serve as actionable first steps for executives and senior leaders who seek the benefits of strategic facilities management.

1) Begin with the Appropriate Facility Management Functional Area

Identify known pain points within a specific functional area that are either seriously inhibiting business initiatives, or that are causing a “bleeding” at the bottom line. For this area, implement a facilities management solution that makes use of the information delivered by BIM to relieve the pain point. For example, if employee headcount is poised to increase at multiple facilities, then implementing a facility management software solution for the space management function can provide insights that can help avoid or defer the purchase of new facilities, while offering opportunities for space consolidation.

2) Establish a Facilities Management Task Force

Create a task force that comprises the necessary management and technical expertise to implement a BIM-based facilities management solution for the selected functional area. If the current facilities management staff do not have BIM or integrated facilities management expertise, this gap must be met by training or by hiring BIM and facilities management deployment specialists. It is advisable and necessary to utilize the expertise of external implementation personnel, who have successfully gone through the full-cycle process for multiple installations.

3) Use Current Business Practices to Guide Implementation

Each organization has business practices that are unique and best suited to meet its mission and strategic objectives. Mandate the task force to drive the BIM-based facilities software implementation in a direction that will increase the productivity, customer satisfaction, and financial returns from its deployment. It is also highly recommended to use key performance indicators (KPIs) to measure the improvements to the business practices obtained with the use of facilities management software.

4) Communicate the Executive Expectations Desired from the Implementation

Clearly communicate the desired executive expectations to the task force. This may involve an iterative process of communication between the executive and the task force, but will ultimately lower both financial and human resources needed for the move to BIM-based facility management. For example, the executive might wish to have the facility management software generate information on specific asset model metrics and to have the ability to compare functional performance to certain benchmarks. With this guidance, the task force will be able to deliver an implementation that brings value to the executive decision-making process. Typical facilities management implementations for functions such as Space Management and Building Operations can deliver value in ninety days or less, even for large organizations.

5) Mandate the Use of BIM-based Facilities Management Guidelines

Pennsylvania State University and the United States General Services Administration (GSA) publish BIM execution guidelines that provide a strong foundation upon which to build BIM-driven facility management. Both organizations publish BIM execution planning guides that cover the design-build phase and the facility management phase of a facility. These guides have gained broad acceptance within the building design and construction community and

with property owners. The task force will benefit greatly from the structured approach and the best practices offered by these guidelines.

6) Evaluate Facilities Management Software Vendors with a Strategic Mindset

Entering into BIM-based facilities management in a single function such as Space Management or Building Operations is a logical first step. However, it is important for managers to think strategically about objectives they wish to achieve with facilities management further down the road. To this end, evaluate facilities management software vendors on a variety of fronts. Evaluate the usefulness of their software's features, their ability to implement multiple facility management functions within the organization, the level of software personalization they can provide to bring value to the organization's business processes, and their ability to integrate with industry leading BIM software vendors for seamless bi-directional transfer of facilities specific information between a building model and the facilities management software.

Furthermore, from a business value perspective, one should evaluate facilities management software based on deployment successes and short-time to value realization. Factors that contribute and illustrate rapid deployment success are continuity of the core technology platform, a track record of successful deployments, and an extensive user community.

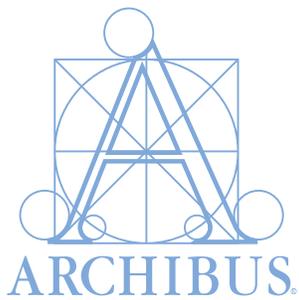
7) Use the Implementation Output as Input to Strategic Decision-Making

Finally, use the output of the BIM-based facilities management implementation to drive strategic decisions. Proven, integrated facility management software typically offers easy-to-follow graphical reports that can deliver personalized metrics and results. These reports provide valuable insight into the operation of each functional area that is being reported on, and serve as valuable drivers for organizational strategy and decision-making.



Summary

In short, the benefits of BIM do not end with the construction of a facility. Executives at every organization that owns or leases facilities can lead their firms to greater operational efficiencies and cost savings by initiating BIM-driven facilities management. This process can enable an organization to effectively manage building and facility assets to lower total life-cycle costs over the life of a facility or across a portfolio of facilities. By integrating business strategy decisions in the designbuild, operations, sustainability, repurpose, and ultimate disposition of facilities, BIM-driven facilities management can significantly contribute financial benefits to the organization's bottom-line.



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