

WHITE PAPER

# Data-Driven Asset Management Can Transform Ports Into Smart Ports

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Ports and harbors are under pressure to modernize infrastructure and assets to facilitate smoother movement of goods and ease supply chain bottlenecks. From ports along the coasts to inland intermodal terminals, data-driven asset management solutions are proving to be an answer.



Port and terminal operators are experiencing growing complexity in the form of rapidly accelerating throughput demands. These challenges are occurring during a time of increasing calls to reduce environmental impacts and achieve greater sustainability, while at the same time maintaining safety and improving resilience. These drivers are in conflict, yet experience has shown that port operation optimization can increase throughput by 10% to 20% using a data-driven asset management approach to provide substantial return in all of these operational areas through a coordinated approach.

The entire port ecosystem — from the harbor to inland intermodal terminals located hundreds of miles away — is under pressure to modernize. Port authorities, terminal operators and logistics providers are seeking to optimize performance and reliability of assets by applying a holistic capital planning framework, from project inception through

ongoing maintenance and replacement decisions as well as considerations for reuse and recycling.

Effectively managing asset life cycles requires clarity and accuracy in maintaining asset inventories, conditions and requirements, as well forecasting future needs. This information must be communicated across the organization and to other stakeholders.

To meet these challenges, each port/terminal operator must utilize a framework for managing assets and consider how to leverage data in the approach. This framework should consider all aspects — from people and culture to employing technologies such as the Internet of Things (IoT), geospatial systems, machine learning/artificial intelligence (ML/AI) and advanced analytics algorithms — to transform work processes and practices.

An asset management strategy must align to the core values of the business, be they safety, throughput or quality. Ideally, this strategy embraces continuous improvement, which means changing the way that things are done to make improvements. But if ports and terminals are continually changing, the need to understand the impacts of those changes, communicate the changes and remove barriers becomes a core competency. This is what management of change involves. It is focused on technical changes and proactive elimination of risk associated with change. Change management, on the other hand, is focused on people and — as noted by the Institute of Asset Management — people do asset management. In a world where the rate of change is increasing, both the management of change and change management will require more attention to achieve port optimization. In short, value comes from what gets used, not from what gets designed or built. Asset management is the coordinated activity of an organization to realize value from assets and data, and information management is a key piece of this.

## Seaport Infrastructure Challenges

Seaports face unique challenges stemming from the breadth of infrastructure that must be maintained. The variety of assets and systems encompasses a wide range of associated engineering and operational disciplines. This complexity is compounded because these assets are often dispersed from the channel entrance to inland facilities many miles away. Additionally, different parts of the system have diverse sets of stakeholders, from funding agencies to adjacent communities.

These factors lead to a complicated set of decisions and tradeoffs for capital investment, operations and maintenance (O&M) budgets, and organization staffing.

## Asset Management

The International Organization for Standardization (ISO) defines asset management as the “coordinated activity of an organization to realize value from assets.” The value gained can be from readily measurable key performance indicators (KPIs) such as reduced costs and improved overall equipment effectiveness (OEE) to less quantifiable but equally important metrics like customer satisfaction.

A well-structured asset management system provides benefits that impact financial performance through improved management of value and risk that are not limited to financial gains. From an organizational perspective, understanding the scope and role of assets, as well as the function of each department in maximizing the value of those assets, provides better alignment around the organization’s mission and business values.

In asset management terms this is known as line of sight. Line of sight means aligning the top-down aspirations of a port with the bottom-up realities and opportunities of operational use of assets. It is to begin making sure that the focus stays on the outcomes — requiring information sharing and optimization among silos that begins before an asset is purchased and continuing until it is retired.

To achieve these benefits, asset management cannot be limited to a particular department or seen as an extension of maintenance or operations. It should be a core component of the organization and treated as critical to overall success from the board and executive level down. Conversely, asset management cannot simply be a corporate talking point but must include on-the-ground realities of day-to-day operations, needs and capabilities.

## The Role of Data

Besides organization and culture, another critical component of an effective asset management system is the use of data to inform and drive decision-making across the organization. At all levels, it is important to have accurate, clean and timely data to support good decisions and behaviors. Good data enables everything from providing visibility of business level KPIs to early detection of process problems and condition-based monitoring (CBM) of critical equipment.

Given the disconnected nature of supply chain — from manufacturer to ship to port to rail or truck — challenges from problems in one point of the chain cascade quickly. This effect has been evident recently as logistics challenges have resulted in vessels stuck offshore, containers stacking up on ports, and long delays for trucks waiting to load. Utilization of data shared among stakeholders is key to developing situational awareness within the overall logistics process.

Many of these initiatives require expensive data cleansing projects that will only provide sustained value if new data is accurate and does not have critical gaps. This in turn depends on the people and devices that are collecting the data. In this respect, a clear data governance strategy and good data infrastructure are key components of an asset management system.

In addition to asset management, many standardized management systems such as ISO 9000 (quality), ISO 55000 (asset management) and ISO 14000 (environmental) support the integration of multiple management systems in order to reduce the effort in implementing new systems and to improve coordination across disciplines and departments. This integration again requires accurate, clean and timely data interchange between systems.

Like physical infrastructure, a data infrastructure provides the systems and structure for data to flow and to be used effectively. With many available sources as well as end uses for widely varying types of data, a well-developed system for collecting, transforming, delivering and storing data is critical. Getting the right information to the right people and systems in the right format at the right time is becoming more critical with each passing day.

## Leveraging Tools and Technology

The availability of some asset data often depends on the age of the systems and the technology that was available at the time of delivery. In some cases, automation upgrades have made more data available, but until recently this could only be accomplished as part of a capital upgrade. Fortunately, the barriers to providing real-time operational data for both process and transactional systems are lowering quickly.

Communication networks have been among the biggest challenges to data collection and distribution. Port locations and the presence of large structures, such as container stacks, certainly make communications an even bigger challenge for traditional networks such as public cellular or Wi-Fi. Lower costs for establishing mesh networks or even private cellular can enable data flows from assets and operations that were not previously possible.

Geographic information systems (GIS), along with building information modeling (BIM) concepts, are now being used to provide a contextualized and nearly real-time view of physical assets and infrastructure. These frameworks allow teams to more clearly understand the assets and how they fit together as part of the overall system. They also provide detailed information that allows managers to make better decisions regarding assets and can even be made available via mobile systems to allow work crews to better identify and address problems or routine maintenance requirements.

IoT devices represent another key set of technologies that have become ubiquitous throughout industry. From remote equipment sensors to drones, the ability to monitor almost every aspect of equipment and cargo flows is now within reach.

Along with these systems, service models enabled by cloud technologies mean that these approaches can be deployed relatively quickly, with low risk, and without placing excessive burden on IT departments.

## Value Now and for the Future

The challenges that port operations and terminal managers face require consideration of all potential tools. From increased throughput while maintaining safety and quality to increased resiliency and adapting to new demands, port authorities and operators must turn to a data-driven asset management approach. This will provide substantial returns in value creation as well as increased resiliency and sustainability.

Asset management improves an organization's line of sight to the value created by its investments throughout the entire life cycle, from initial planning through replacement or disposal. While organizational vision and culture set by the board and executive management are key to a successful asset management program, data is the lifeblood that drives communication and decision-making at every level.

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