

Asset information enablers for business management

BY Mark Knight AND Dirk Mahling

Bill Gates once said that information technology and business are becoming inextricably interwoven; nobody can talk meaningfully about one without talking about the other. In a previous paper we discussed how asset management is essential to business management. Here we examine the importance of managing asset information as an enabler of effective business management.



Information is the lifeblood of the modern business, and asset management is the coordinated activity of an organization to realize value from assets, as defined in ISO 55000, but how does that coordination occur and what are the enablers? As noted in Section 2.5.2 (a), asset management is data intensive, and new tools and processes are often necessary to collect, assemble, manage, analyze and use asset data. The creation and use of these tools can stimulate and improve organizational knowledge and decision-making.

Asset data comes from a variety of sources, including control systems, analytics and observations taken during maintenance, as well as from the assets directly, whether it is sent to an operational control system or an information system. Other data has its origins in nontechnical areas such as regulation, policy and opinion surveys.

Bringing together data from different sources also can create new information that can provide important insights. These insights inform the ability to make decisions, assess risks, influence policies and strategies, and evolve operational processes. As noted in ISO 55002 Section 4.4, a factor of successful asset management is the ability to integrate asset management processes, activities and data with those of other organizational functions, such as quality, accounting, safety, risk and human resources.

From data to information to knowledge

Asset management consists of six groups of subjects. Asset information is one of those groups and contains four subjects within it: strategy, standards, systems and management. Most organizations have suboptimal or inadequate asset information. Whether it be a lack of desired data, the inability to share the data effectively, or poor data quality, a focus on improving asset information will have cascading benefits to all areas of asset management.

As data management becomes more complex and data is distributed among many corporate systems, there is a need to know where information exists about common elements such as customers or specific asset classes, and if it is usually in multiple locations. Users need to be able to identify where specific information on a topic is stored. This requires information to help discover and identify data, also known as metadata. Bringing these multiple attributes together to turn raw data into actionable knowledge is what is needed, but at what level does one share this new information? At what level does one make decisions?

People, process and technology

Improving the way people handle asset management means transforming the way they do things. In the area of business

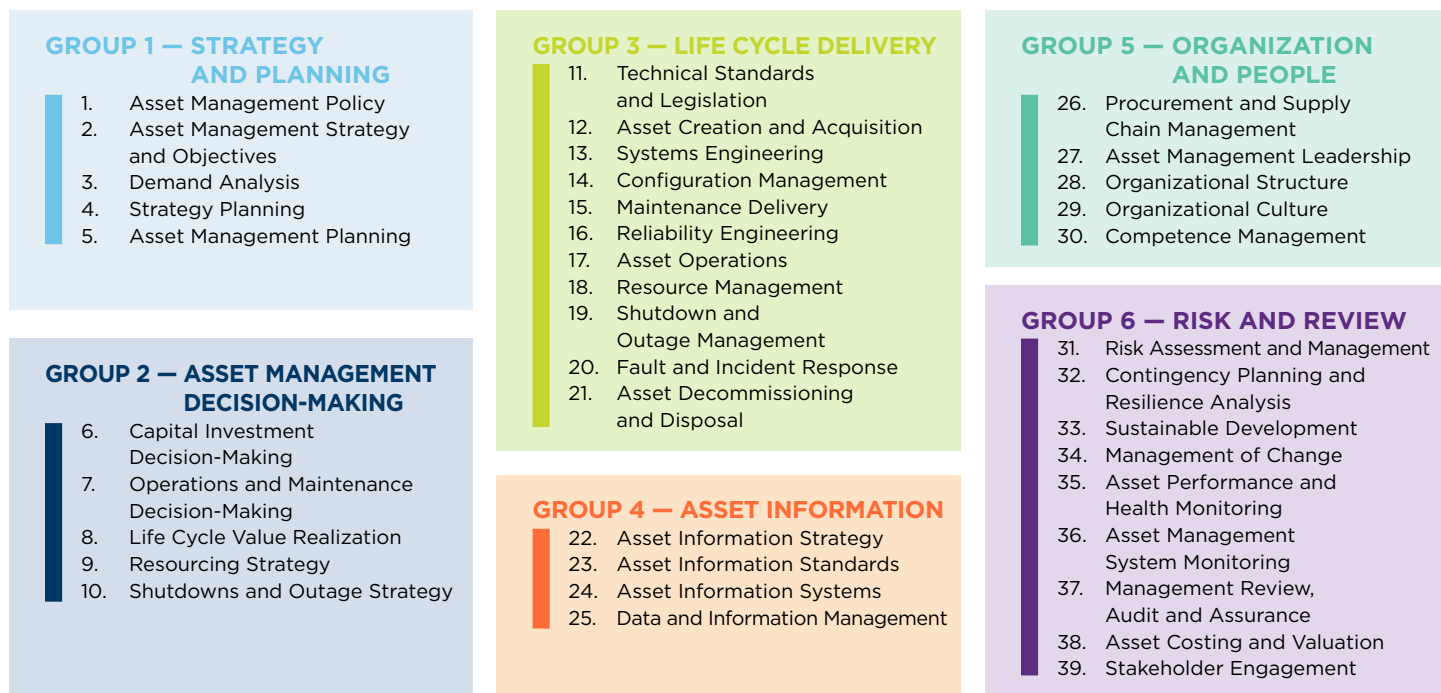


Figure 1: Alignment of the 39 asset management landscape subjects with the six subject groups. Source: The Institute of Asset Management.

transformation, three topics are frequently discussed: people, process and technology. Transformations involve businesswide culture changes that also include change management (discussed in another paper in this series) as well as how people work. That includes using information. People use information to make decisions. Information is created and shared by technology, and technology is integral to processes. As noted by the Institute of Asset Management (IAM) in “Asset management — an anatomy,” Version 3, Section 5, people do asset management.

There is also a saying in change management that value comes from what gets used, not from what is designed or built. Sharing information can create tremendous value, but how does one see that it gets used effectively? Asset management is the coordinated activity of an organization to realize value from its assets, and when it comes to realizing value, it is important for people to embrace the processes and for asset information to be an early focus for improvement.

Closing the loop

In its simplest form, a process is simply a set of related steps to achieve an action or goal. A process requires inputs and produces outputs. Performance metrics are used to measure how effective a process is. Often these metrics measure the performance of many different processes that combine to perform a service. By measuring the effectiveness of the service, one obtains inferred information about the effectiveness of the processes.

Some processes need to be monitored constantly using control systems. Some processes perform a function that has been simulated beforehand, and the process then executes its work under the assumption that things are performing as designed. Actual performance is then measured periodically by examining past effectiveness. Other processes monitor their own output and adjust their operation according to that output. This is known as a closed-loop system. In such a system the process can be controlled by monitoring its output and feeding some of it back to compare the actual output with the designed output. This can reduce the error rate and, if deviations occur, the system allows the operator to restore the process to the desired outcome.

An asset management system (AMS) is a set of interrelated or interacting elements to establish asset management policy, asset management objectives and processes to achieve those objectives (ISO 55000:2014, Section 2.4.3). Like everything else, the AMS must be monitored for its effectiveness to be



measured. The 39 subjects of asset management include one specifically for the processes and measures of an organization to assess the performance and health of its asset management system. To do this one needs timely data that has high quality and metrics that are specific, measurable, achievable, realistic and time-related (SMART).

Increasing rate of technology change

Strategy and standards are not static. The evolution of technology and communication drives changes in how data is collected, processed and used. It impacts how decisions are made, when decisions are made and how they are reacted to. Technology presents a challenge: Spend money today and your investment is out of date in a relatively short time; if you don't spend money, you forfeit the benefits the technology can enable — but only if you can leverage the information gains effectively. If you decide to wait for the next update, your existing capabilities become even more outdated.

As noted in ISO 55001, asset management is data intensive. New tools and processes are often necessary to collect, assemble, manage, analyze and use asset data. The creation and use of these tools can stimulate and improve organizational knowledge and decision-making in the long and short term alike.

Digital transformations are changing many industries and markets at a fundamental level. This poses enormous challenges and creates strong pressure for innovation for many companies. Innovations that extend across industries and value chains are becoming increasingly important and can rationalize and reduce production costs.

Data governance

Data and information management are important foundations for asset management. Data and the information gathered from it are key enablers for strategy and planning, decision-making, asset health and performance monitoring, and risk management. The data may be centralized or distributed, but it is important not to underestimate the value of the data and information held within an organization's asset information systems. Doing so risks underestimating the importance and value of the processes for management and governance of that data and information.

To properly manage asset data, a comprehensive, accurate and timely picture is needed. This means identifying the various systems of record that house these data and information elements, since they cannot be found in a single place or system of record. Due to the specialized nature of work processes, highly specialized systems exist for every job function that touches each type of asset at various stages in its life cycle. Thus, some asset data — such as price, purchase date or vendor — might only exist in procurement systems. Other important aspects, such as sizing calculations or life expectancies, may be found in other specialized systems of record. Because various processes come into play through interaction with an asset on its way through the various corporate systems, information about an asset may be distributed over many systems.

Sampling rates and data intervals are important details of data items when it comes to prudently managing assets. Sampling rates need to be commensurate with business cases they are

serving, and the range is vast. At one end are sampling rates in real time down to the nanosecond for issues connected to life protection or precise process controls. At the opposite extreme, an asset could have just one data point recorded during its lifetime.

Another data property that needs careful monitoring is data quality. Decisions are only as good as the quality of the data they are based on. Other examples are constant or proportional data offsets, where the actual value is “bent” by a problem with the sensor or its calibration. Yet even more harmful than offsets are the “crossed wires,” where the sensor or actuator and the user interface label associated with it are crossed. These instances are often difficult to recognize and track down.

Data ownership is closely associated with data and information governance. It is often falsely assumed that the IT organization is the owner of data. In most cases, the IT organization is the steward and guardian of the data but not the owner. Just like a bank keeps money safe but does not own it, IT collects and stores data but in many cases does not own it. The ownership of data should be associated with the operational organizational unit that produces and uses the data. With this ownership comes responsibility for the accuracy and timeliness of the produced and transmitted data. A proper data or information governance process and the associated governance bodies are best practices to properly address this aspect of data.

Bridging IT and OT

Traditionally, information technology (IT) and operational technology (OT) have had separate roles within an organization. However, this is changing with the Internet of Things in general and the industrial Internet of Things (IIoT) in particular. IIoT is a network of complex physical machinery with embedded sensors and software, blurring the lines between the IT and OT realms. This requires many devices and systems to talk to each other, but it can enable a data scientist to predict whether the bearing on a fan is vibrating beyond its range and when the same effects will be seen in other devices.

This also creates more information at the edge of traditional corporate ecosystems and creates opportunities to decentralize, make distributed decisions and leverage cloud systems. More distributed systems also means more interfaces, which means interoperability is paramount.



Virtual reality, augmented reality and geolocation

It is difficult to address three such significant topics so briefly, but they are bundled together here due to their complementary natures. Virtual reality (VR) headsets give the impression that the user is somewhere else. They are great for gaming but also helpful for virtual walk-throughs of designs before they are built in the real world. Augmented reality is interesting for asset management because the concept extends to everyday devices such as smartphones. The phone's camera can track its surroundings and overlay additional information that represents asset health and condition. For vertically mounted equipment, however, this requires tracking the user's physical position so the software can maintain consistent positions for the images it projects in three-dimensional space.

While many non-mission-critical applications can manage fine using 2D data, the need for 3D is growing. Heavily capitalized organizations such as utilities, refineries and manufacturing will need to use 3D data for decision-making in the next few years, which means the time to be planning how to capture that and assign it to assets is now. If one decides to model some or all of the data in 3D, the most important decision will be the units of the z-values and implementing them consistently.

Asset information strategy

As discussed earlier, good (asset) information enables better decisions to be made, especially those related to asset management activities and feedback for closed-loop systems. It does not, however, prevent bad decisions being made from good data. To make informed decisions effectively requires a strategy. According to the IAM, asset information strategy is the strategic approach to the definition, collection, management, reporting and overall governance of asset information necessary to support the implementation of an organization's asset management strategy and objectives.

There are a lot of things an organization does with its data, so the strategy needs to cover all of these, including how it acquires, stores, uses, assesses, improves, archives and deletes its data. Data quality has to be sufficient to support asset management activities and the decision-making processes that involves. This means that the information strategy needs to be aligned with the organization's strategic asset management plan (SAMP).



Asset information standards

Standards set out specifications, procedures and guidelines that aim to see that products, services and systems are safe, consistent and reliable. Some standards may be prescribed by regulation while others may be voluntary. Digital transformations and innovations are helping satisfy consumer demands for low-cost services while maintaining quality. The use of asset information standards within an organization provides specification of consistent structure and format for collecting and storing asset information and for reporting on the quality and accuracy of asset information.

Standards vary from industry to industry and region to region, and there are many standards development organizations (SDO), but regardless of which standards are being used, an organization's internal standards for asset information should define the quality for different types of information that takes into account the criticality of the assets and the nature of the decisions being made based on the information.

Asset information systems

Information systems are places where information is stored. This includes servers, laptops, mobile devices and even paper records. The complexity of the systems will depend on the size, complexity and maturity of each organization, but these systems serve to store the information about assets, to share it with other systems, and to provide useful information to users. There are some software systems that are sold for the purpose of asset management, or a component of it. They may provide an asset register with information about each asset and where it is located. Other asset information is stored on enterprise systems that are used for other purposes.

Asset information systems are the systems an organization has in place to support the asset management activities and decision-making process in accordance with the asset information strategy. This is true whether the systems are general corporate systems or have been designed specifically to support asset management.

Summary

Everything is important, but in an age when decisions need to be made rapidly and situational awareness is becoming more important for many businesses, some things are more important. Data is one of those. How we manage the data, how we turn it into information and how we use it are all important. We need to see that the data and information we use to enable asset management is accurate, complete and consistent. But in our focus on the data itself and the systems we use to store and share it, we must not lose sight of the human role in data and information management. People conduct asset management, and thus they need to understand where the data comes from, how it gets modified and how it should be used. People, processes, technology and information are all important.

Biographies

Mark Knight is a principal consultant for the energy and utility industries at 1898 & Co., part of Burns & McDonnell. With more than 30 years of experience working for utility companies in the U.K. and the U.S. and as a consultant in the electric supply industry, he is focused on building comprehensive strategies that will improve business and technology solutions for clients. Mark is a member of the IAM, the Society for Maintenance and Reliability Professionals, the Asset Management Council, and the IAM USA Executive Committee.

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