

ASSET MANAGEMENT

Cutting-edge research

In the first study of its kind, Gregory M Baird reviews the major computerised maintenance and asset management systems used by municipalities and water/wastewater utilities in the US and Canada – and draws his conclusions

IN RECENT years, municipalities in the US and Canada, and water and wastewater utility companies, have struggled to manage the complex and diverse assets for which they are accountable.

Great strides have been made to develop programmes and systems to improve cost efficiencies but core work order management software system functionality by itself did not address the growing needs of infrastructure asset management practices.

In the past five years since the worldwide economic decline, which in part continues today, municipalities and utilities at all levels have faced severe revenue shortfalls. Maintaining basic services has involved delaying hundreds of millions of dollars a year in needed maintenance activities and deferring critical capital projects.

Efforts made at state, regional, county and local levels to better manage assets and allocate limited resources to high-profile failing assets were met with a high degree of frustration due to inconsistent and outdated practices, neglected data tracking and storing, and a lack of data integration abilities with silo/stranded data throughout many departments.

Asset management infrastructure programmes, offered by different consulting firms, should still focus on managing assets in a way in which the investment for each asset can be optimised, producing a reduction in capital budgets and operating expenditures, an efficient and cost-effective maintenance programme based on risk, and an overall reduction in the capital cost.

One common problem has been when engineering drives the capital agenda and the needs of operations and maintenance are overlooked. Likewise, when the financial tracking and planning functions are also neglected, true enterprise asset management decision-making cannot occur. A multidisciplinary approach at a corporate level is highly recommended to create a consistent management-wide effort to guide investments and resource allocation.

Comprehensive asset management professionals possess the expertise in, and understanding of, the International Infrastructure Management Manual (IIMM), essentially the bible of asset management. This training is critical in establishing the foundational knowledge of the comprehensive process of modern asset management.

SYSTEMS MANAGEMENT

Asset management as a philosophy is a process of continuous improvement and change. In the US and Canada, the definition of asset management will continue to be defined by the software tools each organisation selects as a means to improve asset performance and manage costs. A cut in cost can be defined as a short- or a long-term gain, or both. The logic entails that if an asset is not maintained correctly, it can fail prematurely.

Likewise, an asset replaced prematurely wastes a useful asset and, as a result, improved performance and investment decision-making does not occur. Informed decision-making can reduce the overall cost of the asset and function to the taxpayers' benefit. This data-intensive process requires policies, leadership and structure to meet sustainable infrastructure aims.

PUBLIC ASSET MANAGEMENT

The concept of public asset management strives to combine all infrastructure assets and land-based assets and functions to effectively manage the social and environmental goals of the community while offering an improved management decision-making process with public review, approval and justification. Computerised Maintenance Management Systems (CMMS) and Infrastructure Asset Management Software implementation trends for municipalities demonstrate initial progress in business enterprise funds like water, wastewater, and storm drains, migrating efficiencies and practices to other municipal departments. This system functionality migration trend will continue and can be better managed with a GIS-centred strategy.

METHODOLOGY

The comparative analysis of core maintenance management and infrastructure asset management functions was completed for these 14 software systems: Accela, Agile Assets, Azteca System's Cityworks, Cartegraph, Cityview, Energov, IBM's Maximo, Infor/Hansen, Lucity/GBA, Maintenance Connection, Novotx's Elements, Oracle, Pubworks and Vviewworks.

The comparative criteria includes software costs, vendor services, support, specialisation, work orders, inventory, licensing and permitting, condition assessment, risk management, asset inventory, GIS mapping, Esri GIS integration,

REVIEWING THE SOFTWARE

A ranking score of 1-5 was assigned to software for each of the three areas. A '5' represents the highest functionality, while a low score represents a marginal level of functionality. If software had no functionality in a given area, a zero was assigned and calculated into the overall scoring.

311 systems, mobile devices and Esri GIS ROI taking into consideration future industry trends. The four major functional categories include: 1) Company/service; 2) Work management; 3) Asset management; and 4) GIS.

REVIEW OF SERVICES

The functionality of the core components of a software application is key. Yet the success and level of benefit gained is a direct result of the work and support around planning, implementation, testing and training. The ability for the software vendor to provide enhanced support and training to ensure the successful implementation is critical. In asset management, data conversion and a specialisation in specific infrastructure types can ensure a higher degree of utilisation of software capabilities. The company/service functional category includes vendor services and implementation, support and training services, and company strength and specialisation. Customer service is a key criterion post-implementation and enables the organisation to continue to leverage its software investment.

REVIEW OF WORK MANAGEMENT

A robust CMMS with work orders providing the ability to separate planned or unplanned maintenance costs builds life-cycle cost history, records direct costs of the activity, documents the procedures followed, notes the failure mode and primary cause of failure, with comments on indirect costs and impacts to customers and possible unproductive time. A basic CMMS alone is not an asset management system. All this data enables more possibilities of failure, causal, consequence and efficiency analysis.

WORK MANAGEMENT

The work management functional category consisted of work orders and workflow, inventory control, and licensing and permitting. A work order management system lies at the

core of any system and, through constant and consistent usage, will develop a rich work history of data used for asset management data analytics and improved decision making.

REVIEW OF ASSET MANAGEMENT

Condition assessment can be defined as a method establishing the current condition of assets as a way of prioritising/forecasting maintenance and rehabilitation efforts. The Asset Inventory or Registry is core to any asset management program/strategy. An asset register is a systematic record of all assets an organisation owns or for which it has responsibility.

Asset management functional category includes condition assessment capabilities, risk management, and asset inventory and hierarchy. Asset management features are continually being added to a CMMS, increasing the importance of GIS and analytical functionality.

REVIEW OF GIS

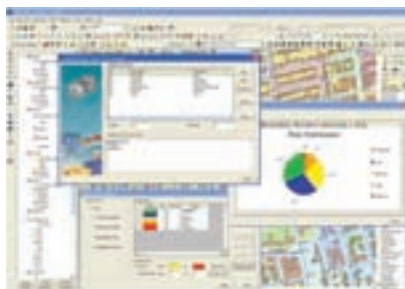
Investing in a complete Geographical Information System (GIS) with full functionality produces an overall reduction in operating and maintenance costs and can become the foundation of a lower-cost system. GIS is a unique system used to create, store, edit, organise, manipulate and analyse information within a geographic area. GIS can visualise models of the physical infrastructure and related activities in a map view.

The GIS functions consist of GIS Mapping features, Esri GIS integration, 311 System Abilities, Mobile Devices Enhancements, and Esri GIS ROI considerations. GIS has been able to meet the increased demand for mobility and information sharing. Many applications for asset maintenance and management purposes have been developed by software companies to improve the transactional cost of public accountability. Some of these features can also be accessed through third-party vendors. In fact, many single-user components should be selected as modules or simply included as approved third-party 'bolt-on' to maintain a high return on the original software investment.

REVIEW OF COST FACTORS

Esri GIS ROI

GIS offers an ROI and these operational savings will continue almost indefinitely. Municipalities and utilities in the US and Canada rely on industry leader Esri (Environmental Systems Research Institute) GIS for their GIS software. Local governments and utilities benefit overall with standardisation and common open



standards for consistency, which helps achieve lower costs through economies of scale.

Under this approach, the Esri GIS ArcGIS geodatabase is the feature database for storing the all-asset attributes. Further, there is no redundancy for data storage (no reliance on views, data mapping, database triggers, or 'transparent' links). All feature (asset) data is fully user-definable and customisable without vendor support.

Overall scores/rankings normally are based on functional categories' scores and averages. Under this review, the four major functional categories were weighted evenly. The element of cost adds additional complexity to the analysis.

Most municipalities and utilities will focus on the software's core functionality to meet all business needs before reviewing bids or prices. The price component can be challenging, considering basic user licences, software and maintenance costs/agreements, along with phased implementations, modular selections, data clean-up, data conversion, systems integrations, testing and training. This study focuses on the common costs; however, it is important to note that if various modules are selected and integrated, implementation costs are normally much higher.

COST FACTORS

Likewise, when system integration and conversion is required for many different systems and several modules, the initial implementation and long-term system synchronisation and maintenance of redundant databases can raise the total cost of ownership hugely. This is true in licensing and permitting. Every municipality and utility has a degree of data clean-up due to neglect or inconsistent policies and practices concerning workorder histories, inspection recording and asset data collection. One specific area of concern has been development of the asset inventory and the connectivity and integration with GIS software.

Esri GIS ArcGIS: Geo-database management
ArcGIS for Desktop includes comprehensive

professional GIS applications that support a number of GIS tasks, including mapping, data compilation, analysis, geodata and image management, and geographic information sharing. ArcGIS for Server includes capabilities for managing multi-user geo-databases in several DBMSs. Geo-databases take full advantage of underlying DBMS architectures to support:

- Extremely large, continuous GIS databases;
- Many simultaneous users;
- Long transactions / versioned workflows; and
- Relational database support for GIS data management.

Esri GIS leveraged software: Innovyze

Innovyze is a leading global provider of wet infrastructure business analytics software solutions designed to meet the technological needs of water and wastewater utilities, government industries and engineering bodies.

Many utilities struggle with developing a rehabilitation and replacement programme that addresses the most critical pipes in the system. CapPlan Water offers utilities the tools in one off-the-shelf software package to build or refine the capital improvement plans to provide maximum benefit for the lowest cost.

CapPlan Water can assess the hydraulic, geographic, spatial and public relations criticality of each pipe in the system – including automatically taking each pipe out of service and determining the hydraulic and water quality consequences. It also has a wide range of budgeting options available.

OVERALL RESEARCH RESULTS

The summary results of the 2012 comprehensive comparative review and study ranks Azteca System's Cityworks maintenance and infrastructure asset management system as the top selection for municipal and utility use.

Cityworks has demonstrated strength and longevity in the municipal and utility market place for the past 15 years with a highly developed work-order management system; it can fully leverage an organisation's ROI in the Esri GIS and the ArcGIS geodatabase as the asset repository, reducing implementation and long-term maintenance cost of ownership issues.

Cityworks maintains some of the most advanced Local Government Templates with over 630 work order templates, 150 service requests, with detailed condition assessment inspections. The licensing and permitting functionality is further enhanced by the Esri GIS Centric approach in developing connectivity of all public assets, infrastructure and activities.

Written on behalf of the US-based Water Finance Research Foundation (www.waterfinancerf.org). This article summarises a review in 2012 by Gregory M Baird of the major computerised maintenance and asset management systems used by municipalities and water/wastewater utilities in the US and Canada. The research was conducted over a nine-month period in 2012. Gregory M Baird focuses on asset management cost-saving strategies as a MWH global financial, commercial and risk services principal consultant and president of the Water Finance Research Foundation. Further details: gregory.m.baird@us.mwhglobal.com