

Making the Right CMMS Selection for Users: Durham Water Management's Experience

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Abstract

Currently, the City of Durham's Department of Water Management (DWM) does not utilize a computerized maintenance management system (CMMS) for facility-related assets, but uses a Microsoft Access database to document limited information about asset-related work and for warehouse inventory transactions. To optimize workflow processes, DWM opted to procure a new computerized maintenance management system (CMMS) for operation and maintenance of its treatment plants, water supply facilities, wastewater pump stations, and other "vertical" assets.

DWM managers adopted a progressive approach in regard to engaging the operations and maintenance staff – the system end-users - throughout the procurement and selection process, that will ultimately make a difference in the successful implementation of the system.

The first phase of the project documented desired workflows for facility asset operations and maintenance, and developed requirements for a new CMMS. Workflow mapping was facilitated in a workshop setting with a representative cross section of operations and maintenance staff, and focused on how a CMMS could be effectively incorporated in optimized business processes.

The second phase of the project included the development of a Request for Proposals (RFP) to procure the necessary hardware and software for the new CMMS. Before the RFP was prepared DWM invited a wide range of CMMS vendors to present their products to operations and maintenance staff, allowing the system end-users and managers to collaborate on desired features and required processes.

Proposal scoring and vendor demonstration scoring were weighted based on functionality that would aid end-users. The vendor demonstration script was scenario-based, following a CMMS process "from cradle to grave". During demonstrations of the final three CMMS options, the City selected operations and maintenance staff, supervisors, warehouse managers, and engineers to fill the same roles in CMMS workflows they would in real-life situations. The vendors were required to walk these staff through the steps; staff, not vendors, interacted with the CMMS during the demonstration.

This provided the end users with first-hand opinions of each shortlisted CMMS. Operations and maintenance end users represented a majority of the selection committee, so their acceptance was essential. Participating in vendor presentations and RFP development created a level of ownership by the Operations and Maintenance staff towards the CMMS system. The result for DWM – engaged CMMS users that will make the most of this powerful data collection tool.

Keywords: Asset Management, Computerized Maintenance Management System, Operations and Maintenance

Introduction

The City of Durham's Strategic Plan guides City services to support making Durham a great place to live, work and play by focusing on five strategic goals: a strong and diverse economy; a safe and secure community; thriving and livable neighborhoods; a well-managed City; and stewardship of the City's physical assets. The Department of Water Management (DWM) has undertaken implementation of a maintenance management system for utilities facility assets in order to implement the goals of the Strategic Plan, as one

component of its overall effort to enhance its level of service and demonstrate effective stewardship of the City's physical assets.

Computerized maintenance management systems (CMMS) or enterprise asset management systems (EAMS) are effective tools used to optimize asset reliability through proactive maintenance management and to leverage asset knowledge, including condition, to support long-range planning. A CMMS can provide a number of significant benefits:

- Work order management, including-tracking for longer-term analyses that can enhance utility effectiveness
- Support for both corrective and planned maintenance tasks
- Equipment performance monitoring
- Measurement of performance against key indicators
- Materials management and inventory control, including the ability to track the use of parts and costs against maintenance work orders
- Condition assessment

Integrating CMMS with Geographical Information Systems (GIS), Financial Information Systems (FIS) and customer relationship management (CRM) systems offer the potential to improve access to information across the entire organization. Such accessibility is critical in making accurate, informed decisions about funding priorities and future cost projections.

DWM has not previously utilized a CMMS for its water supply reservoirs, water treatment facilities, wastewater pump stations, and water reclamation facilities. However, DWM desired to implement a CMMS for these asset groups to improve its maintenance processes and overall level of service.

DWM and its consultant, Brown and Caldwell, prepared for implementation of a CMMS for facility assets in 2013 by, initially focusing on strategic organizational objectives, improved business processes, and changes in the way people work and perform. The new CMMS system requires new processes and new levels of accountability to meet the stated service levels. The new systems support the goal of improving water treatment and water reclamation facility availability.

DWM and Brown and Caldwell prepared a needs assessment report in early 2012, reviewing the current software and hardware environment, proposed workflow processes for DWM functions, and strategic business objectives which are recommended to guide CMMS implementation. The report recommended an implementation plan that met both the strategic business objectives of DWM as well as specific CMMS functional requirements. The report also commented on organizational changes that can help DWM move toward a sustainable organization providing excellent water/wastewater service.

Durham's Operations and Facilities Environment

DWM currently provides water and wastewater service to approximately 250,000 residents of the City of Durham and surrounding unincorporated areas. DWM is organized into divisions as follows:

- Administration Division
- Utility Engineering Division (13 full-time-equivalent employees (FTEs))
- Plant Engineering and Maintenance Division (49 FTEs)
- Water Supply and Treatment Division (39 FTEs)
- Wastewater Treatment and Laboratory Division (40 FTEs)

- Water and Sewer Maintenance Division (108 FTEs in Construction and Maintenance, 30 FTEs in Meter Maintenance)

The Plant Engineering and Maintenance Division also includes workgroups for building maintenance and grounds.

The utility includes two water supply reservoirs (Lake Michie and Little River reservoirs), two water treatment plants (WTPs) - Williams WTP and Brown WTP, 61 wastewater lift stations, and two water reclamation facilities (WRFs) - North Durham WRF and South Durham WRF. The City delivers water to its customers through approximately 1,200 miles of distribution piping, and collects wastewater in approximately 1,100 miles of sewer pipe for treatment at its water reclamation facilities.

The City has previously implemented a CMMS to manage work on other City infrastructure, including water distribution and wastewater collection, streets, and stormwater assets. DWM currently uses the Cityworks CMMS for its distribution and collection system assets. To improve the level of service provided to the citizens of Durham and to increase operational efficiency to minimize costs, DWM proposes to implement an automated work order and inventory management system as parts of a new CMMS for the reservoirs, WTPs, lift stations, WRFs, landfill and administrative facilities. ; work orders for plant, reservoir and pump station assets are managed through a Microsoft Access database developed by DWM staff Water distribution and wastewater collection system pipeline-related assets will not be included in this new CMMS, though DWM desired that the software selected for this system be capable of managing linear/GIS-based assets as well.

Methodology

The CMMS Implementation project (for the reservoirs, WTPs, lift stations, WRFs, landfill and administrative facilities) has proceeded in three Phases:

- Phase I – Involved development of a needs assessment study. Assessment efforts include interviews with DWM maintenance and operations (WTP and WRF) personnel and review of the functional requirements for a CMMS. Functional requirements fall into several categories including corrective work and maintenance management, asset management and inventory management. Requirements for supporting hardware and software were also reviewed. Assessment results included process diagrams illustrating the required DWM operations and maintenance activities. Phase I also involved identifying potential organizational issues created by a CMMS implementation. Phase I was completed in Fall 2011.
- Phase II – Involved development of a Request for Proposals (RFP) to procure the software and hardware necessary to implement the project plan originated in Phase I. This phase also included subsequent vendor selection and product procurement. Phase II began during Spring 2012 and concluded with a notice to proceed for the selected CMMS vendor in Winter 2013.
- Phase III – Involves implementation and integration of the selected solution at DWM. As of September 2013, Phase III is underway with the system expected to be operational in October 2013.

Engaging Operations and Maintenance Staff

Throughout the project, engagement and support from operations and maintenance staff was considered essential to the success of the development of new workflows supporting CMMS implementation, selection of a CMMS software vendor, and configuration of the software during implementation. DWM managers adopted a progressive approach in regard to engaging the operations and maintenance staff – the system end-users - that will ultimately make a difference in the successful implementation of the system. Some of the key activities to carry out this approach, organized by project phase were:

Phase I - Needs Assessment

The first phase of the project documented desired workflows for facility asset operations and maintenance, and developed requirements for a new CMMS. Workflow mapping was facilitated in a workshop setting with a

representative cross section of operations and maintenance staff, and focused on how a CMMS could be effectively incorporated in optimized business processes.

- Durham's operations and maintenance managers and staff, from Water Supply and Treatment, Wastewater Treatment, Plant Maintenance, Administration, Utility Engineering, and the City's Technology Solutions Department participated in the initial Strategy and Goals workshop, to determine the project drivers, goals and performance measures.
- Operations and maintenance staff guided Brown and Caldwell through a discussion of current business processes and workflows, and how these workflows "should be" when a new CMMS system was implemented. Brown and Caldwell then documented these workflows in "swim lane"-style business process maps for the following major processes:
 - Work Identification Planning, and Scheduling
 - Emergency Work
 - Planned Corrective Work
 - Preventive Maintenance
 - Inventory Management

Figure 1 is an example of the products from this business process mapping exercise. The "should be" business process maps developed by operations and maintenance staff have guided subsequent configuration of CMMS software.

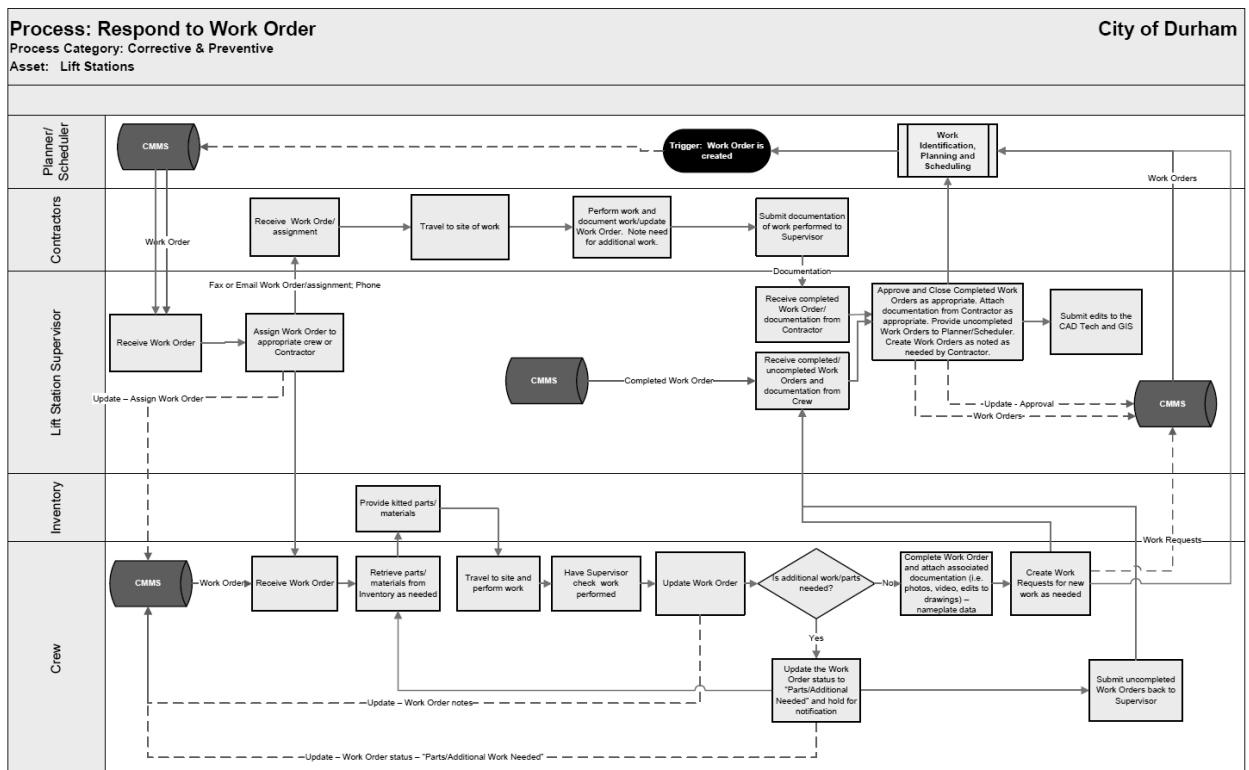


Figure 1. Representative "Should Be" maintenance business process, showing use of CMMS

- Operations and maintenance staff and supervisors, worked with Brown and Caldwell to define the decisions which could be supported from better data collected on assets and work, the appropriate

CMMS functional requirements to ensure the systems were capable of supporting the data/decision needs, and the potential organizational impacts from a successful CMMS implementation.

Using this input from operations and maintenance staff and supervisors, DWM management and Brown and Caldwell evaluated possible software alternatives, the comparative costs and benefits of a new CMMS focused on facility assets versus extension of the CMMS platform used for linear assets, and available technologies for supporting the CMMS on the City's network infrastructure and with wireless field connectivity. DWM managers guided the City's Technology Solutions Department and Brown and Caldwell to consider the end-user in developing business process changes and software functional requirements. The core question during this phase of the project was, "How can this CMMS system be designed to provide operations and maintenance staff the best chance of success?" Ease of use for operations and maintenance staff was a strong consideration for CMMS design. The needs assessment document provided the basis for the next phase – procurement of CMMS software and services.

Phase II – CMMS Procurement

The second phase of the project included the development of a Request for Proposals (RFP) to procure the necessary hardware and software for the new CMMS. Once the RFP was completed, the project was advertised. Selection was made in three phases: (1) Proposals were received from eleven vendors, including several implementer/vendor teams; (2) three vendors were invited to make in-person demonstrations, which resulted in selection of the preferred vendor; (3) The preferred vendor's qualifications and references were evaluated, and a final scope of products and services was negotiated. Proposal scoring and vendor demonstration scoring were weighted to emphasize the importance of functionality that would aid end-users.

- Prior to preparing the RFP, DWM invited a wide range of CMMS vendors to present their products to operations and maintenance staff, allowing the system end-users and DWM managers to collaborate on desired features and required processes.
- DWM operations and maintenance staff and supervisors were incorporated into the proposal scoring team, which selected the three vendors invited to make in-person demonstrations. Selection of the shortlisted vendors was based on a structured scoring sheet which considered the following factors:
 1. Software technical solution, including:
 - Software functional requirements
 - Integration requirements – existing and future
 - Reporting and data extraction
 - Ease of use for operations and maintenance staff
 2. Services solution, including:
 - Project management plan
 - Installation and configuration
 - Data loading
 - Training
 - Testing
 - Startup assistance
 - Post-implementation support
 3. Vendor business information
 4. Project team experience
 5. Budget estimate

The selection of the shortlist addressed highly-technical factors and business stability, as well as end-user acceptance, so that DWM managers and their consultant considered that any of the shortlisted

vendors could feasibly be successfully implemented and achieve the strategic objectives for the CMMS project. The three short-listed vendors were Azteca Cityworks (partnered with implementer Timmons), Lucy and NexGen.

- DWM operations and maintenance staff and supervisors were the foundation of the vendor demonstrations. The short-listed vendors were provided a “script” of required demonstration scenarios, and instructed that the software would be operated at several steps during the performance of these scenarios by Durham staff that actually performs the assigned roles (e.g., operator, mechanic or supervisor) in the scenario. The intent of this demonstration approach was that end users be able to assess the ease of use criteria directly, as a result of hands-on experience, during the demonstrations, rather than only later, during training and implementation of the selected software.

The vendors were provided with actual Durham data collected during DWM’s recent lift station assessment program. The demonstration “scripts” were aligned with the RFP performance requirements, and are organized into three scenarios. Vendors accomplished the scenarios using their CMMS solution, loaded with Durham data, on both a laptop computer and mobile device – either a Smartphone or tablet – with QR code/bar code reading capability.

The script elements were:

1. Vendor Introduction – User Interface, General Requirements
2. Scenario 1 – Work Management, Warehouse Management
3. Scenario 2 – Reporting, Level of Service, Asset Management
4. Scenario 3 – Inventory Management, Cost Control
5. Vendor/Project Team Qualifications
6. Implementation Services
7. Vendor Closing Statement

Approximately twenty DWM operations and maintenance staff, along with the DWM CMMS leadership team, participated in the vendor demonstrations. Three DWM staff were selected to assist directly with the demonstrations. The involvement of the DWM staff in the vendor demonstration accomplished the desired outcome, and operations and maintenance staff remained engaged and gathered behind their co-workers during the demonstrations to observe and offer suggestions. Operator and maintenance staff direct involvement in the demonstrations provided very helpful insights into the ease of use evaluation criteria for the final vendor selection. Introducing the variable of operator direct involvement did affect the delivery and pace of the vendor demonstrations; specifically, it was noted that technical issues occurred with accessing the vendor’s on-line test database, and the pace of the demonstration scenario was impacted as the vendors coached operations staff through work order field data entry and lookup tables.

- The DWM CMMS leadership team and operations and maintenance staff attending the vendor demonstrations were each provided with demonstration scoring sheets and asked to complete the scoring sheets for each of the demonstrations. At the conclusion of the vendor demonstrations, the DWM CMMS leadership team assembled with the operations and maintenance staff to discuss the demonstrations, while Brown and Caldwell compiled the proposal scores. Operations and maintenance staff input on the demonstrations was consistent with input from the leadership team, affirming the selection of NexGen as the consensus preferred vendor. Involvement of the operations and maintenance staff in this step of the CMMS selection was a conscious decision of DWM managers, to demonstrate their commitment to the field staff and their commitment that the changes in process required to implement the CMMS system would be a joint effort.

Phase III – CMMS Implementation

Since April 2013, the City has been engaged in implementation of the selected CMMS solution, NexGen AM. End user training and go-live activities are planned for early October 2013. Operations and maintenance staff support for NexGen implementation has included:

- Operations and maintenance staff have partnered with Brown and Caldwell to develop an asset hierarchy for each DWM facility, inventorying and organizing the utility's assets.
- Operations and maintenance staff have cataloged preventive maintenance work orders required for facility assets.
- DWM and NexGen have tailored the software configuration to align with the “should be” business processes identified in project Phase I.
- DWM Plant Engineering and Maintenance managers have provided regular briefings to operations and maintenance staff to keep them informed on the progress of the NexGen implementation.
- Select DWM operations and maintenance staff will be identified as “key users”, trained to be trainers for future staff on CMMS software and processes.

Conclusions

Throughout the CMMS needs assessment, selection and implementation process, the City of Durham Department of Water Management (DWM) has demonstrated teamwork and a concern for the effectiveness of the project for end-user operations and maintenance staff. Participating in development of business process enhancements and CMMS functional requirements, taking key roles in vendor proposal reviews and vendor demonstrations, and having an active role in the data which is imported into the CMMS has created a significant level of ownership by the Operations and Maintenance staff towards the CMMS system. The result for DWM can be an engaged CMMS users making the most of this powerful data collection tool.

Acronyms

CMMS – Computerized Maintenance Management System

DWM – City of Durham Department of Water Management

EAMS – Enterprise Asset Management System

FTE – Full-time-equivalent employee

RFP – Request for Proposals

WTP – Water Treatment Plant

WRF – Water Reclamation Facility