Cost Tracking Leads to Database Development

Effort is spearheaded by performance measures and real time activities.

By Deodat Budhu and Maricela Torres

In recent years, many government agencies have turned to the private sector to provide some of the services that were normally furnished by government. Tight budgets and increasing responsibilities have forced government agencies to take this approach. The public perception of the cost of governmental services and the pressure for improved government efficiency have also been contributing factors.

It is often assumed that private companies will be more efficient and cost-effective than public entities. However, the effectiveness of outsourcing is highly dependent upon the analysis of the costs and benefits of the services provided. Therefore a proper cost analysis, and a comparative evaluation of public and private options, is essential to determine how much each activity costs and the potential savings.

Every year, the Orange County (FL) Roads and Drainage Division knew its budget and how much work was accomplished. But that budget number in the past could not tell the division the cost of individual activities. In addition, the data from employee worksheets was filed without processing its information, and as a consequence, there was no way to answer questions about the type, location, or cost of the maintenance activities performed without arduous efforts. Even though county staff kept handwritten records of the services performed, and did hand calculations to estimate activity costs, a more effective way to quantify costs was needed due to the amount of components per activity.

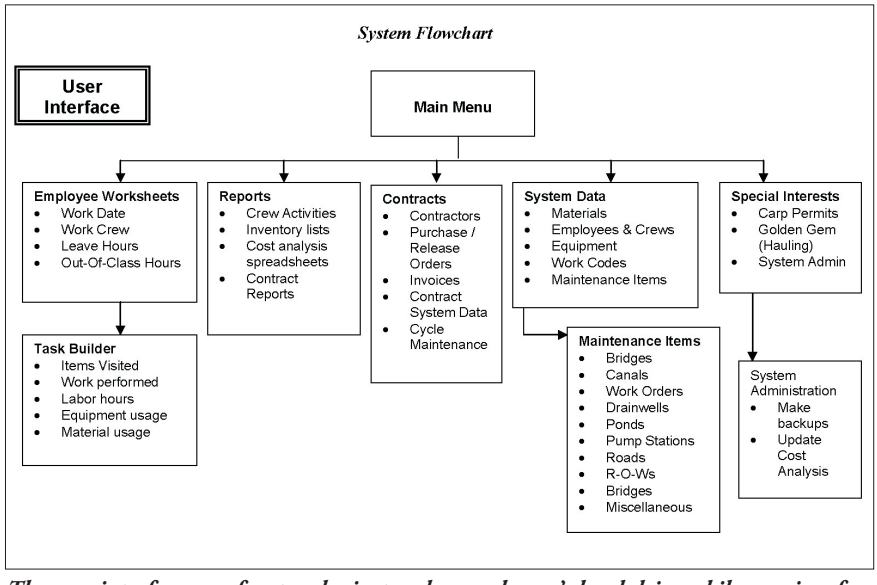
The need for a database management system was evident when the cost of maintaining retention ponds under the Municipal Services Taxing Unit (MSTU) program had to be determined to justify the revenue collection from subdivisions and the need to revise the fees. After an audit was performed, it was found that the processes in place did not enable the efficient retrieval of costing information. Therefore, a computerized database system was envisioned to manage and keep track of the maintenance and operation activities to derive performance measures and costs based on real time information.

Before developing a database management system, the Roads and Drainage Division researched and determined which elements to include in the database. Components such as personnel, material, and equipment costs were easily identified. The overhead costs were more difficult to determine, as they include indirect expenses that cannot be easily charged to a specific activity.

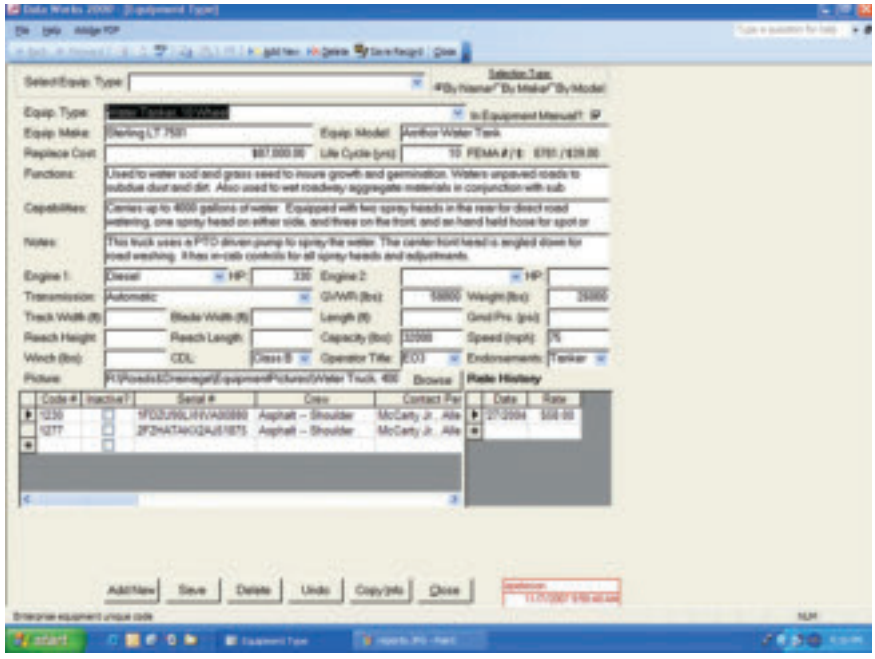
The first completed portion of the database development was the personnel costs, including regular hourly wages and overtime. "Out-of-class" pay was also incorporated in the database to account for the additional pay received whenever the employee works at a higher level of responsibility. Employee benefits were to be added into the overhead cost.

The cost of supplies was easy to identify, but care had to be taken to identify price fluctuations for some materials (such as asphalt) to keep updated data. The equipment costs were based upon the amortization of the actual acquisition prices and include repairs, maintenance, and fuel costs.

To determine the overhead costs, in the past the Roads and Drainage Division evaluated the amount spent during a three-year span for items that could not be directly charged to a spe-



The user interface—or front end—is stored on each user's hard drive while a series of large databases—the back end—are stored on the network.



The equipment inventory of all equipment owned by the division includes equipment codes, license and serial numbers, usage and FEMA rates, and associated work crews.

cific job. Items included in the overhead costs included personnel benefits, administrative salaries, supervision by foremen and managers, office expenses, electricity and water, training, stockroom supplies, travel, communications, facilities maintenance, building renovations, licenses, and rental equipment. After extensive research and analysis, the overhead cost was determined so it could be multiplied by the labor cost of a project to incorporate it into the total project cost.

An Overhead Rate Study prepared for Orange County in April 2001 developed overhead rates that considered direct costs, indirect overhead costs, and direct overhead costs. An overhead factor of 2.2 has been used as a representation of the Roads and Drainage Division activities.

Overview of the Program

DataWorks is a networked relational database management system written in Microsoft Access 2000 and Visual Basic. It was designed by in-house staff for the Roads and Drainage Division to keep track of maintenance and operation activities, including contracted activities. It consists of a user interface ("front end") stored on each user's hard drive, and a series of large "back end" databases stored on the network.

The system stores and processes all information related to labor, equipment, and materials provided by employee worksheets. With that information, performance measures and cost analysis statistics can be calculated and viewed through reports.

Currently the system handles maintenance tasks performed by crews in the MSTU, drainage, construction, heavy equipment, and asphalt sections. DataWorks also stores data for the contracts section, such as release orders, invoices, and contract line items and work.

The maintenance task data is input into the system from daily employee worksheets. These worksheets show all the maintenance tasks performed by a crew for the workday. The data on the worksheet is in two sections. The first section shows the employee attendance, leave, and out-of-class work information. The second section shows tasks performed by the crew. This data denotes the employee, work code for the task performed, equipment number, amount of time to perform the task, and any materials used.

Performance measures and cost analysis information is derived from the information on the daily employee worksheets. The system enables the calculation of these measures and costs based on a crew and time period.

The performance measures show the distribution of work on various tasks measured in man-hours and dollars expended, and quantity of work completed.

In-house crew costs are calculated as labor, equipment, and material costs. The labor cost is the employee pay rate times the number of man-hours. The equipment cost is determined by the equipment rate times the hours used. The material cost is determined by the quantity used times the cost per unit. These costs are summarized by crew and also by the type of maintenance performed. For example, within the MSTU/Drainage section, maintenance tasks are categorized into mowing, spraying, cleaning, and miscellaneous costs.

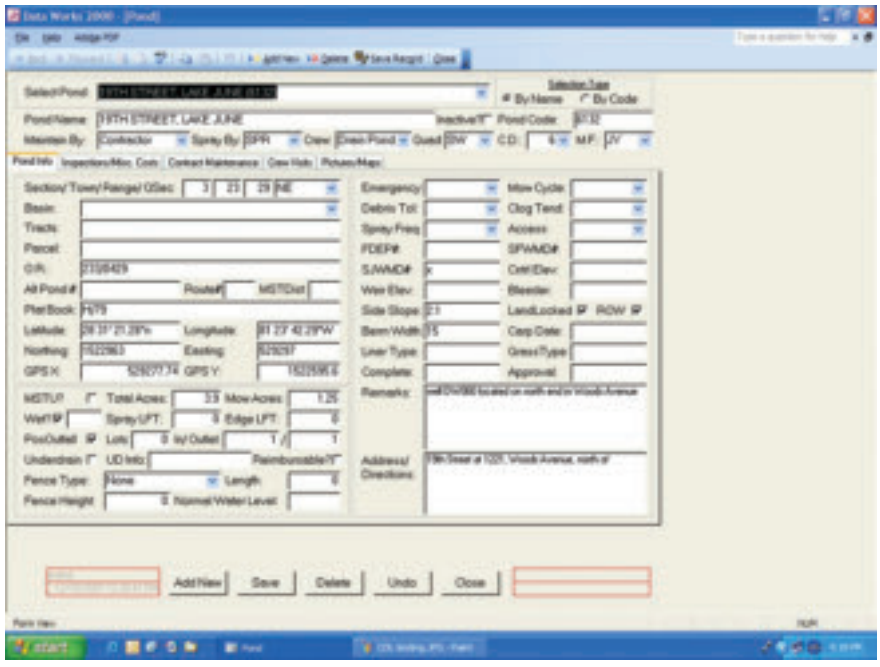
The following tasks can be performed in DataWorks:

Equipment Inventory: A comprehensive inventory of all equipment owned by the division. Includes equipment codes, license and serial numbers, usage and FEMA rates, as well as associated work crew. This data can be sorted and printed by make and model, code number, or work crew. Preventive maintenance and replacement cycles tasks can also be tracked.

Maintenance Item Inventory: Information on ponds, canals, drainwells, control structures, pump stations, and miscellaneous items within Orange County. Items are tracked by name, code number, and location, including GIS data. Also includes information on quadrant, commission district, size or length, and who is responsible for maintenance.

Employee Worksheets: Daily worksheets submitted by in-house maintenance work crew are entered into the system. Worksheets are tracked by work date, work crew, and maintenance items serviced. Labor, equipment, and material usage are stored, along with the associated work codes. Employee leave information can also be entered. Currently used for pond and drainage crews, asphalt, construction, and heavy equipment.

Cost Analysis: The system analyzes data stored in the employee worksheets



Ponds are tracked by name, code number, and location, including GIS data.

and generates cost analysis spreadsheets. The system can determine labor, material, and equipment costs, along with average costs per item (i.e., pond) and per acre. Spreadsheets can be generated for any date range, and can be broken down by item type or by quadrant.

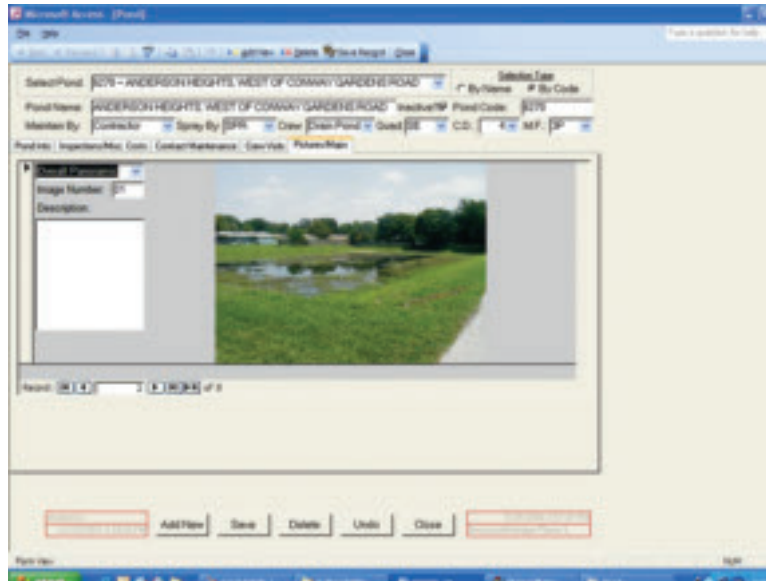
Contracts: Contracts, delivery release orders, and invoices are tracked. Term and cycle contract maintenance is also tracked. Cost analysis spreadsheets include contracted services costs.

Maintenance Item Visits: The surveys and other non-maintenance visits to maintenance items such as ponds. Includes the ability to link to external databases such as the pond survey, with photographs, maps, and structural drawings.

Miscellaneous: Other features include Golden Gem Pit (a clay pit from which material is taken for projects) hauling logs, performance measures, carp permits, and various system administration tasks.

Benefits of DataWorks

DataWorks is a user-friendly program that captures information in a consistent, accurate, and useful manner. DataWorks serves as a centralized source for information, presented in a consistent format. One main benefit of DataWorks is the elimination of handwritten record keeping and calculations, and the use of standard forms for record keeping instead.



External databases of pond surveys can be accessed that include photographs, maps, and structural drawings.

The program has data input screens that can be expanded for any of the personnel, material, or equipment costs to make proper reporting choices. It also allows for a variety of queries to be selected so that any of several cost analyses can be performed to determine how effectively the budget is being expended for a specific job, location, crew, or task.

DataWorks is updated daily to keep the data current and accurate. The system also validates user's entries to eliminate duplicate or inaccurate data. DataWorks is useful for data analysis as it generates cost analysis and performance measures for captured data. It also facilitates the decision making process about in-house maintenance activities versus privatization or outsourcing activities.

The development and implementation of DataWorks has provided the Roads and Drainage Division a versatile tool to manage and track maintenance and operation activities. DataWorks is a flexible, scalable system that can grow and change to suit the needs of the Roads and Drainage Division. DataWorks has also empowered the division to make educated choices about outsourcing for the benefit of Orange County citizens.

The existing database enhances cost-effectiveness by pointing out where inefficiencies exist. It provides information to determine which core services should be done in-house and which should be outsourced. It also provides measurable results of all jobs, which has resulted in cost reduction, or elimination of expensive programs, and is consistent with all management practices while promoting accountability. GE

Mr. Budhu, P.E., is the manager, and Ms. Torres, P.E., is the Acting Chief Engineer, Roads and Drainage Division, Orange County (FL) Public Works.