THE DEVELOPMENT OF A COMPUTERIZED MAINTENANCE MANAGEMENT SYSTEM AT THE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

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Abstract: Every asset, old or new, requires maintenance. Buildings, bridges, roads, dams, utilities and grounds; each requires some degree of maintenance to ensure long life cycles and safe operation. Maintenance is science, art and philosophy. It is science since its execution ultimately relies on most of all the sciences; it is art because seemingly identical problems regularly demand and receive varying approaches and actions; it is above all a philosophy because it must be carefully fitted to the operation or organization it serves and, because of the way it is viewed by its users, will ultimately determine its usefulness.

Introduction

The New York State Department of Environmental Conservation (DEC) is responsible for billions of dollars worth of land, public facilities and assets. This infrastructure is more diverse and geographically decentralized than any other state department or agency. We now estimate that DEC has 2,000 facilities and 30,000 assets including for example: dams, bridges, roads, levees, offices, laboratories, boat launches, education camps, wildlife management areas, game farms, state forests, recreation trails, campgrounds, air quality monitoring stations, communication systems, fish hatcheries, hazardous waste sites and much more. (See chart one)

During the 1970s and 1980s several issues contributed to a general lack of emphasis on maintenance and an inability to adequately care for these assets.

- Maintenance was *deferred* as a cost savings mechanism
- New facilities were acquired and constructed while maintenance staffs were reduced
- Maintenance budgets did not keep up with inflation
- Low priority was given to technical training and information transfer
- Poor planning and record keeping

- The DEC executive leadership initiated, in April of 1994, a pilot Maintenance Management System (MMS) to address our maintenance problems. Our goals included:
- Improve resource utilization
- Build budgets based on what we owned and what we needed to do
- Expand employee participation in decision making processes
- Improve management organization
- Provide a basis for evaluating results

Figure 1.
DEC FACILITIES AND LANDS*1997

Facility Type	Unit
Office Headquarters	
Central Office	1 each
Regional Office	9 each
Regional Sub - Office	19 each
Field Headquarters	22 each
Program Support	
Maintenance Center	26 each
Workshop Facility	7 each
Research Station	2 each
Fish Hatchery	12 each
Game Farm	2 each
Tree Nursery	1 each
Pollution Prevention	
Air Monitor Site	116 each
Hazardous Waste Facility	9 each
Public Use	
Environmental Educ. Camp	3 each
Environmental Educ. Center	3 each
Campground	51 each
Day Use Area	5 each
Historic Area	12 each
Cooperative Area	10 each
Ski Center	1 each
Boat Launch Sites	260 each
Fairgrounds	2 each
Horse Trail Area	2 each
Public Fishing Rights Area	425 each
Estuarine/Sanctuary	2 each
Scenic Vista Area	2,100 acres
Open Space	2,700 acres
Pine Barron Preserve	8,000 acres
Canoe Area	16,950 acres
Public Access Site	17,000 acres
Unique Area	17,500 acres
Wetland Area	20,000 acres
Intensive Use Area	60,000 acres
Multiple Use Area	102,000 acres
Primitive Area	112,200 acres
Wildlife Management Area	150,000 acres
Reforestation Area	580,000 acres
State Forest Area	700,000 acres
Wild Forest Area	1,130,000 acres
Flood Control Project	92 each
Storage Facility	1 each
Radio Facility	48 each
Laboratory	3 each
Lumber Cutting Facility	4 each
Wilderness Area	1,150,000 acres

Total DEC lands
approximately 4,00,000 acres
*Sample data 1997

We chose a pilot location and designated a lead project engineer. Also, it was agreed that our development approach would be to build the MMS from the *bottom-up*. That is, we would solicit input from the people who would

be using the system and from our maintenance customers because ultimately their support would be essential to the success of the project.

While there are many *shrink-wrapped* MMSs available in the marketplace today, we chose to build rather than buy our MMS. This paper is an overview of that project including a few observations and comments.

Figure 2. Land Inventory

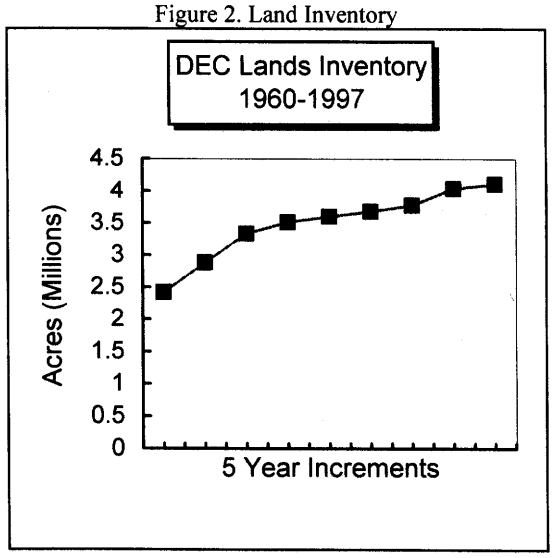


Figure 3. Operations Staff

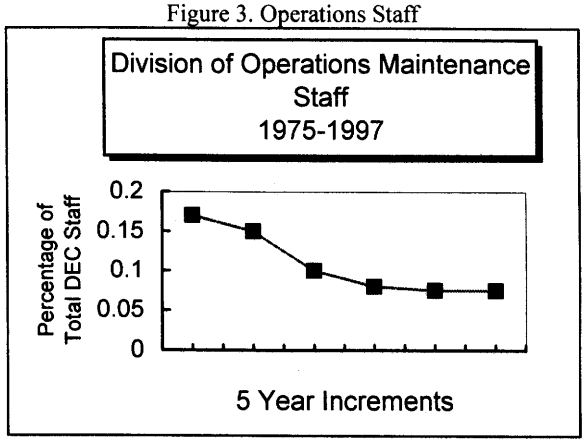
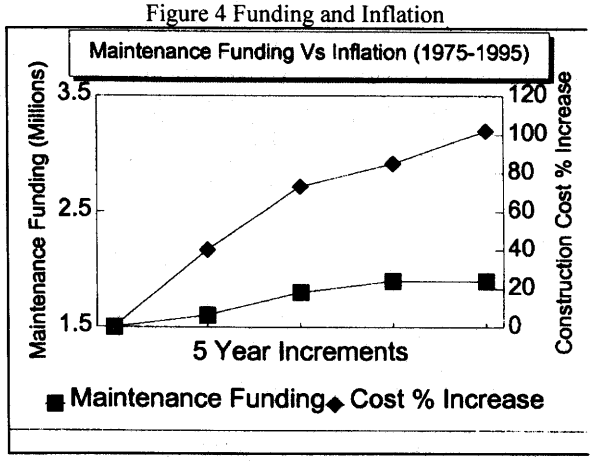


Figure 4 Funding and Inflation



Background

A large percentage of DEC's facilities were acquired or constructed in the 1960s and 1970s. Popular support for conservation programs and recreational activities resulted in substantial additions to the Department's asset inventory. Hundreds of thousands of acres of land that often included existing infrastructure assets such as buildings, roads, trails, bridges and utility systems were added. Campgrounds, boat launch sites and education camps were built and air quality monitoring and hazardous waste sites established.

Now, thirty years after the acquisition boom, it is time to pay the piper. Where maintenance had been neglected, the repair alarm was constant and loud. There was little opportunity to do anything but react to the crises. Fix it or lose it. Bridges were and are being closed, buildings abandoned, utility systems went off-line and recreational opportunities were lost. We began to realize that we needed a more organized, planned and controlled approach to manage these assets.

Steps Taken

The former Director of the Division of Operations called for a meeting to be held in the proposed pilot region. It was decided that all regional personnel would meet and jointly build their first comprehensive facility and asset inventories. These two inventories replaced the existing, multiple and usually inaccurate inventories in use at that time. They provided a starting point for the MMS team. We subsequently met individually with each regional group to continue and refine the inventory process.

We searched for other governmental agencies and private companies who had experience with MMSs and interviewed MMS managers from the United States National Park Service, Canadian National Parks, IBM, Niagara Mohawk Power Company and other NYS Agencies. Also, we evaluated twelve commercially available computerized MMSs. Their advice to us was unequivocally clear.

- Get support from upper management
- Build it bottom-up
- Communicate, communicate, communicate

Early in the data collection phase we were overwhelmed by the volume of facility and asset data coming to us; it became necessary to consider a database program to store and organize the data. We chose a simple, inexpensive, off-the shelf, ODBC database.

Building The MMS: The Bootstrap Approach

We began by reviewing our project objectives and seeking the input and participation of the regional staff. We created a set of priorities as guidelines for the development of the MMS as follows:

- Establish comprehensive facility and asset inventories (what do we own and where is it?)
- Identify maintenance activities (what do we need to do to maintain what we own?)
- Create a standard work order document
- Develop a work plan for each facility
- Structure the data for compatibility with other Department database systems

Further, we discussed associated issues such as: how much asset detail should be captured, who needs to know what, and how much time should be spent reporting work accomplishments and their costs.

Next, we built custom input, inspection, work order and work planning screens and created the links that make database tables relational. This was hardly a simple task although the object tools built into today's database programs are designed to be used by non programmers. Given the person hours spent learning the program, the many screen and table revisions and, our MMS product to date, we are satisfied that the *bootstrap* or build-it-yourself approach has been both productive and worthwhile.

We incorporated in our MMS what we considered the best features of other MMSs. Screen and table changes can be made on-the-fly rather than waiting weeks or months for the programmers to arrive. We can easily produce reports to fit any need, add graphics, tables and text documents. Additionally, the database skills learned have been applied to address other in-house needs. We have built databases for tracking the progress of design and construction projects, managing vehicle service records and organizing contract bidder lists.

Next Steps

A big debate regarding the implementation of databases is whether to provide local access at the desktop or remote access to a central computer. The advantage of local access is that the response should be faster while the advantage of central access is that there exists only one repository of information and the danger of using obsolete or invalid data is minimized.

We are presently in the local access camp, partly because our software offers limited networking features. However, we will be looking more at the central database option when those features become available.

Geographic Information Systems (GIS) are a natural extension of an MMS. Maps have historically been used to view geographic information and now with GIS we can link databases with spatial information thus creating a very powerful tool. We are beginning the process of capturing coordinate information for our facilities and assets.

Summary

This project is a work in progress. Not only are we continuing to learn more about maintenance work, computer software and hardware but also the needs of the people who depend on the tools and information an MMS provides. There are many important considerations for the successful development of an MMs, some of which we have noted previously. However, two that should be mentioned in closing are, build it bottom-up and realize that an MMS is only a management tool; it is not a solution in itself.