

# Evaluation, Selection and Planning the Implementation of a Pavement Management Optimization Model

Optimization Recommendations

Prepared for the  
Pavement Management Policy Committee and  
The Pavement Management Optimization Steering Committee  
Iowa Department of Transportation

Ames, Iowa

Iowa Department of Transportation  
Library  
800 Lincoln Way  
Ames, Iowa 50010

Prepared by  
T.H. Maze and Omar G. Smadi  
Iowa Transportation Center  
2521 Elwood Drive, Suite 125  
Ames, Iowa 50010

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## Iowa Department of Transportation Pavement Management System

This document briefly summarizes the pavement management activities under the existing Iowa Department of Transportation (DOT) Pavement Management System. The second part of the document provides projected increase in use due to the implementation of the Iowa DOT Pavement Management Optimization System. All estimates of existing time devoted to the Pavement Management System and project increases in time requirements are estimates made by the appropriate Iowa DOT office director or function manager. Included is the new Pavement Management Optimization Structure for the three main offices which will work most closely with the Pavement Management Optimization System (Materials, Design, and Program Management).

### Existing PMS Activities

(percentages are percents of full time equivalent personnel (FTE))

#### 1. Office of Program Management:

- a. Transportation Engineer Manager 4      15%
  - pavement projects programming
  - establish priorities and policies
  - pavement management policy meetings
  
- b. Transportation Engineer 2      22%
  - coordination with other management systems
  - pavement management optimization
  - pavement management federal regulations
  - planning and programming
  - pavement management meetings
  
- c. Transportation Planner 2      13%
  - update PMIS with 5-year program
  - send results to transportation centers
  - pavement management optimization
  - pavement management meetings

**Current Total Time Spent on PMS Activities: 0.50 FTE**

#### 2. Office of Design:

- a. Pavement Engineer      40%
  - pavement management analysis
  - pavement management research
  - pavement management meetings

- b. Design Technician 2                      100%
  - data analysis
  - data management
  
- c. Assistant Pavement Engineer            25% (new position)
  - pavement analysis review
  
- d. Design Technician 4                      20%
  - Data management

**Current Total Time Spent on PMS Activities: 1.95 FTE**

**3. Office of Materials:**

- a. Special Investigation Engineer         50%
  - pavement management development
  - pavement management improvements
  
- b. Engineer                                       40%
  - quality assurance of pavement management data
  - quality control of data
  
- c. Engineer                                       20%
  - pavement condition data
  
- d. Technician                                   20%
  - input inventory pavement management data

**Current Total Time Spent on PMS Activities: 1.30 FTE**

**4. Office of Maintenance:**

- a. Engineer                                       Minimal
  - determine the effectiveness of maintenance activities on pavement condition

**Current Total Time Spent on PMS Activities: 0.00 FTE**

**5. Information Services:**

- a. Senior Systems Analyst Supervisor    90%
- b. Systems Analyst                            95%

**Current Total Time Spent on PMS Activities: 1.85 FTE**

**6. Office of Advance Planning:**

- a. Transportation Engineer 5%
  - summarize overall pavement network condition
  - use will increase with optimization

**7. Transportation Centers: (Central Iowa Transportation Center as sample)**

- a. Planning Engineer 5%
  - review pavement management information
  - develop rehabilitation programs

**Current Total Time Spent on PMS Activities: 0.30 FTE**

**TOTAL TIME FOR THE IOWA DOT ON PM ACTIVITIES: 6.0 FTE**

**Projected PMS Optimization activities**

**1. Office of Program Management:**

The Office of Program Management predicts an additional **0.15 FTE** in effort due to the implementation of the PMS optimization. The total projected FTEs devoted to pavement management activities are **0.65**.

**2. Office of Design:**

The Office of Design predicts an additional **1.00 FTE** in effort due to the implementation of the PMS optimization system. The increase will be devoted to building the optimization model parameters, developing investment strategies, and calibrating the model. The Office of Design is planning to hire a 6-month temporary employee to help with the work load. The total projected FTEs devoted to pavement management activities are **3.00**.

**3. Office of Materials:**

The Office of Materials predicts an additional **0.50 FTE** in effort due to the new optimization system. The total projected FTEs needed are **1.8**.

**4. Office of Maintenance:**

The projected effort for the Office of Maintenance will be at **0.25 FTE**. Since the old PMS was not utilized, then the total FTE's devoted to pavement management activities are **0.25**.

## **5. Office of Information Services:**

No additional effort will be added due to the implementation of the optimization system. The office will prepare some new routines for data down-loading and up-loading to the new optimization system, but the development is an one-time activity.

## **6. Office of Advance Planning:**

The Office of Advance Planning predicts an additional **0.10 FTE** in effort due to the new optimization system. The additional effort will be devoted to providing more summaries and generating long-range plans using the new optimization model. The total project FTEs devoted to pavement management activities are **0.15**.

## **7. Transportation Centers:**

No additional effort is foreseen for the Transportation Centers due to the new optimization system. It will make the dissemination and availability of information more efficient.

**Project total additional FTE's needed for PMS optimization: 2.00**

**Estimated total effort on PMS: 8.00 FTE's**

### **Iowa DOT PMS Optimization Structure**

This section describes the recommendations for the Iowa DOT PMS optimization structure. Covered are the major offices involved in PMS Optimization activities - from data preparation to decision making. The offices included are:

1. Office of Materials
2. Office of Design
3. Office of Program Management

Before describing the structure of the PMS optimization system, a brief summary of the PMS optimization software recommendations is given. The figures following the recommendations identify the recommended location for the new PMS optimization software and hardware. In the figures, software is indicated by a floppy disk symbol and hardware is

indicated by a computer symbol. Computer data links are indicated by a dashed line. Data sources are inside circles.

### **PMS Optimization Recommendations:**

As a result of phase II, the Pavement Management Optimization steering committee and the ITC/ISU researchers recommended the procurement of specific pavement management optimization software. The selection process considered the following criteria:

1. Iowa DOT pavement management system (PMS) objectives.
2. Analysis methodology (optimization was one of the Iowa DOT PMS objectives).
3. Analysis level (the system should perform network and project levels analysis).
4. Software requirements (ease of use, flexibility, and customization).

The recommendations are divided into four sections.

1. Database:

dROAD, provided by Deighton Associates, was selected to manage the Iowa DOT pavement management optimization database. One copy of dROAD will be used by the Office of Materials for development of pavement management databases which will be used to update the PMIS. The second copy will be used by the Office of Design and will receive data from the PMIS and prepare the data for input to the pavement management analysis software. Two copies are required @ \$10,000 each.

2. Project Level Analysis:

dTIMS, provided by Deighton Associates, was selected, with minor modifications to the analysis methodology (a one-time cost not to exceed \$5,000). dTIMS performs project level resource allocation. The software utilizes the incremental benefit cost analysis to select and schedule projects. Two copies are required @ \$10,000 each.

3. Network Level Analysis:

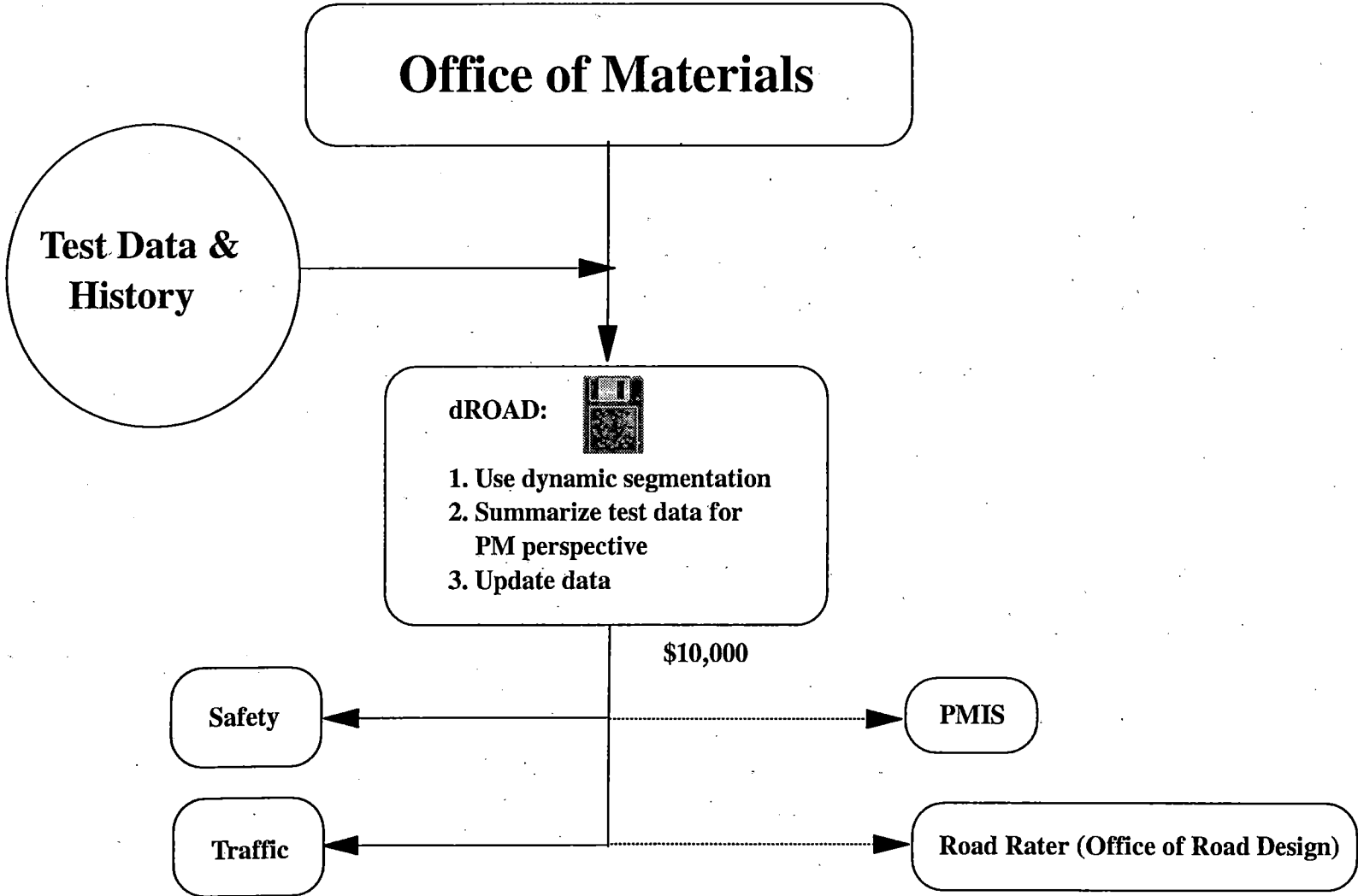
FNOS, provided by Decision Focus Incorporated and Clayton, Sparks and Associates Limited, was selected to perform network level resource allocation. FNOS provides network level analysis information primarily for use in planning and budgeting. dTIMS' project level information can be aggregated to also provide network level results. Each model operates on fundamentally different principals, but the difference will allow Iowa DOT pavement management staff to compare and contrast the results of the two approaches. Comparisons of the results will provide useful insight into the models and assist in model calibration. Two copies of FNOS are required @ \$2,500 each.

4. Bayesian Statistics Analysis:

BSTAT, provided by Decision Focus Incorporated, was selected to assist pavement management staff in the calibration of performance prediction parameters. BSTAT can be purchased through an annual license of \$3,750. A training session for the Iowa DOT staff on the use of BSTAT is \$6,000.

**Total cost = \$60,000**

# PMS Optimization Structure, Iowa DOT



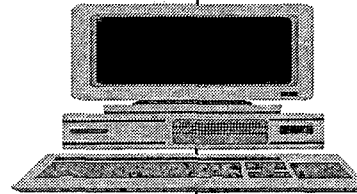


# PMS Optimization Structure, Iowa DOT

Office of Design

Data from dROAD  
Materials section

Data from PMIS



BSTAT:



1. Performance prediction
2. performance curves

\$3,750 / Year plus an  
additional \$6000 for  
training

Total = \$10,000

dROAD:



1. Develop model parameters
2. Produce condition reports
3. Provide dTIMS data:

Road Design  
Program Management

\$10,000

dTIMS:



1. Project level analysis
2. Model calibration

\$10,000 + \$5,000 one  
time modification fee

FNOS:



1. Network level analysis
2. dTIMS budget or  
performance constraints
3. Model calibration

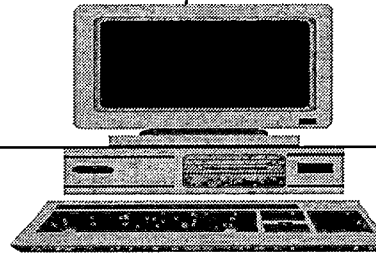
\$2,500

# PMS Optimization Structure, Iowa DOT

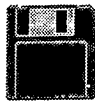
## Program Management

Data from the Office of Design (dTIMS and FNOS):

1. Inventory
2. Test data
3. Performance data
4. PM model parameters



dTIMS:

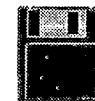


1. Project level analysis
2. Short term planning

\$10,000

Formulate 5-year Program

FNOS:



1. Network level analysis
2. Long range planning

\$2,500