

Management Assistance Program for Township Highway Officials

DAVID L. CHICOINE and NORMAN WALZER

ABSTRACT

In recent years, rural governments have experienced fiscal austerity as tax revenues dwindled concurrently with substantial price increases of road and bridge construction materials. Recommended solutions to the fiscal problems range from collecting additional revenues to expenditure cutbacks with employment reductions. An option being adopted increasingly by governments involves improving management methods. Taxpayers are demanding efficiency before additional taxes will be accepted. Accessibility to low-cost microcomputers with user-friendly management software has permitted local governments to significantly upgrade management practices. Reported in this paper is a management assistance package designed for rural township officials using a relatively low-cost IBM personal computer. The user-friendly program provides local officials with estimates of the revenues available based on existing tax funds and rate limitations, and compares these revenues with the expenditure requirements to provide acceptable roads and bridges. The data to drive the system can be collected in state government based on existing data-collection efforts. The program informs users of the expected revenue shortfall or surplus and indicates several policy options available for correcting the problem. The prototype is based on revenues for townships in Illinois, but the program can easily be altered to reflect the revenue and expenditure structure in other states by renaming files provided for this purpose. The program requires no computer background and is suitable for individual governmental units or for groups of governments working together.

Rising prices of inputs used by local governments to provide services, combined with shrinking resources, pressure local public officials to find methods of financing the same or additional services at less cost. Local road personnel have faced revenue austerity as property-tax relief programs reduce tax bases. Price increases for petroleum-based products (including road material) have eroded transportation budgets.

Improved planning and management procedures are at the heart of any long-term solution to the fiscal austerity issue. State townships provide a major component of the total road mileage. This is particularly true in midwestern states with strong township governments. For example, townships provide 65.9 percent of the roads in Illinois, 46.7 percent in Minnesota, 42.5 percent in Ohio, and 63.3 percent in Wisconsin. However, the management capabilities of township officials typically are not extensive. The personnel are often part-time with relatively little formal training in either business practices or road construction techniques.

With the advent of a sophisticated, relatively low-cost, and user-friendly microcomputer, transportation officials can incorporate improved planning techniques into daily management activities. The information and technology transfer possibilities offer a basic building block permitting local transportation officials to continue providing high-quality services at reasonable cost.

An information transfer program is described,

D.L. Chicoine, Department of Agricultural Economics, University of Illinois, 305 Mumford Hall, 1301 W. Gregory Drive, Urbana, Ill. 61801. N. Walzer, College of Business, Western Illinois University, 442 Stipes Hall, Macomb, Ill. 61455.

which can be used by township highway officials in cooperation with organizations of county highway superintendents or a university extension service. Township officials are neither required to own a microcomputer nor are they expected to be computer-literate. The educational levels and backgrounds of township officials suggest that computer literacy will not be forthcoming in the near future. However, information transfer agencies are being improved throughout the United States, and are showing a serious interest in upgrading management local government practices. The large increase in user-friendly software for management practices has permitted traditional service units such as community colleges and cooperative extension divisions of universities to participate fully in improving management practices in local governments. Cooperative efforts between township highway officials and transfer agencies will improve management practices, which is the key to successful operations in the latter half of the 1980s.

PROFILE OF TOWNSHIP OFFICIALS

A basic understanding of the characteristics of township officials is needed to appreciate the requirements of a successful information transfer program. The educational background and orientation of local highway officials are particularly important. Socioeconomic characteristics of township officials were collected in a recent study of nearly 3,000 townships in Illinois, Minnesota, Ohio, and Wisconsin. A profile of the educational background, age, and occupational experiences of township board members and highway commissioners is given in Table 1.

In general, the average township official respon-

**TABLE 1 Characteristics of
Midwestern Officials**

Socioeconomic Variable	Mean
Age, yr	52.1
High school graduates, %	56.7
Years of service, yr	8.5 ^a
Salary, \$	4,571
Employed in agriculture, %	63.4

Source: David L. Chicoine and Norman Walzer. Financing Rural Roads and Bridges in the Midwest. Office of Transportation, U.S. Department of Agriculture, 1984.

^aIllinois is not included.

sible for road construction and maintenance is 52 years old, with a secondary school education and employment in agriculture. The average official has worked in township government for 8.5 years and earns a relatively low salary for performing township activities. Most of the townships have one full-time employee and fewer than one-half employ a part-time worker.

MANAGEMENT ASSISTANCE PROGRAM

A successful information transfer program must recognize the relatively unsophisticated backgrounds of

township officials. A complete program for selecting policy alternatives will not be used by many local officials. The management assistance package (MAP) described in this paper provides local officials easy access to estimates of the effects of policy alternatives on local expenditures and revenues. The program includes a hypothetical situation so that users can postulate changes in revenues, costs, or service levels. The analysis then shows the effects on the local budget if these changes occurred.

A schematic of the management assistance program is shown in Figure 1. The program has five basic components: (a) data entry, (b) data display, (c) data editing, (d) cost and revenue computations, and (e) sensitivity analysis. The computer program is written in BASIC and operates on a 256-K IBM-PC. Printed copy and screen display are provided, and the analysis can be performed for all townships within a county or by township. After each function has been completed, users are automatically returned to the main menu for selection of further tasks.

MAP performs three primary tasks for users: (a) expected expenditures based on engineering estimates of unit road and bridge costs per foot are computed; (b) expected revenues generated from current tax rates, intergovernmental revenues, and other revenue sources can be determined; and (c) the budget condition is available based on information on anticipated revenue shortage or surplus.

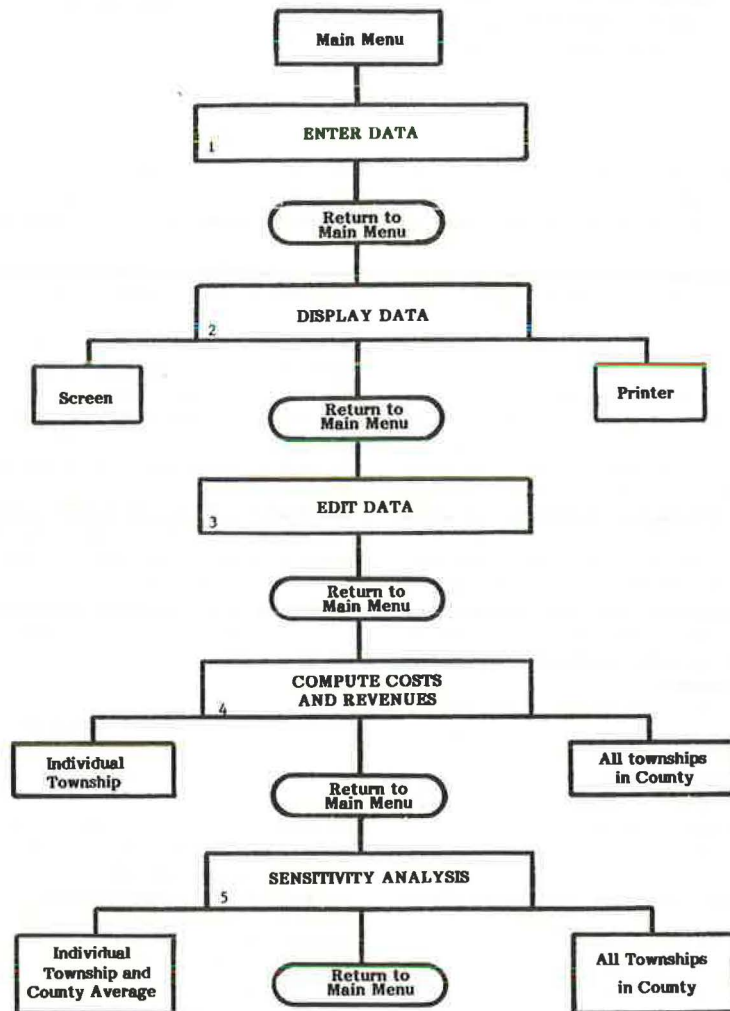


FIGURE 1 Schematic for management assistance program.

Costs of Roads and Bridges

MAP informs users of the expenditures needed to maintain roads and bridges in their townships. Unit cost estimates for roads and bridges based on engineering data and statewide expenditure patterns are incorporated in the computer program with an option for users to replace system information with data for their township. The road cost data are based on type and width of surface, maintenance schedules, and snow-plowing estimates. The unit bridge cost information is based on width, length, and type of structure. Preliminary information for the pilot program was obtained from the Illinois Department of Transportation and county highway superintendents who, in Illinois, must be registered engineers.

Information on number of miles by surface type is inserted into the program and matched with unit cost data to generate an expected expenditure for townships to maintain roads at the quality level on which cost information is based. The square feet of bridges at three federal sufficiency ratings is multiplied by the estimated cost per square foot of upgrading bridges to at least a rating of 75. Thus, bridges rated between 0 to 25 have a per square foot cost estimate, those between 26 to 50 have another, and those between 51 to 75 have a third cost. The square feet in each category are multiplied by the unit cost to obtain an estimate of expected bridge costs.

The expected road and bridge expenditures are combined to provide an accurate estimate of township road and bridge expenditures for levels of service on which the cost information is based. There is nothing prescriptive about MAP. The aim of the in-

formation transfer program is to equip users with a tool to better understand estimated changes in revenues or costs, or both.

An example of cost information is given in Tables 2 and 3. The format allows users to determine quickly the source of expected expenditures. By using the data edit routine, users can adjust cost estimates, assessed valuations, or any revenue sources.

Revenue Information

In addition to cost information, township officials need to estimate revenues. MAP is organized so that users can insert any of several revenue sources in addition to property taxes and intergovernmental aid. For property taxes, the rate appropriate to fund is included along with the assessed valuation against which the rates are applied. The assessed valuations are also adjusted to accommodate differences in assessment practices. For example, in Illinois, farmland is assessed based on productivity, rather than market value, as with commercial, industrial, and residential property. In at least one fund, the revenues must be shared between townships and municipalities.

Several entries are included to accommodate differences among states in intergovernmental (federal or state) aid. Because the program was intended for use in more than one state, sufficient flexibility was needed to allow for differences in distribution programs. Virtually the only adjustment required is a new title for each fund. The format used in reporting revenue information is given in Tables 4 and

TABLE 2 Example of Cost Information for Bridge Expenditures

Agency	Bridge Costs				Total Conditions 1-3 (ft ²)	Condition 1 Costs	Condition 2 Costs	Condition 3 Costs	Avg. Costs ^b	Bridge Needs ^c
	Condition 1 (ft ²) ^a	Condition 2 (ft ²) ^a	Condition 3 (ft ²) ^a							
Township A										
Costs and square feet ^d	0	0	2,148	2,148	50.00	30.00	10.00	30.00		
Costs x square feet ^e					0.00	0.00	21.48			21.48
County Average										
Costs and square feet ^d	854	1,220	752	2,826	50.00	30.00	10.00	30.00		
Costs x square feet ^e					42.72	73.17	15.04			86.83

^aSquare feet of bridges at the three federal sufficiency ratings. Condition 1: less than 25; Condition 2: 26 to 50; and Condition 3: 51-75.
^bAverage costs for upgrading township bridges.
^cFunds needed to upgrade bridges (in 1,000s).
^dCosts of upgrading 1 ft² of bridge.
^eFunds needed to upgrade bridges (in 1,000s).

TABLE 3 Example of Cost Information for Road Expenditures

Agency	Road Costs						Total Miles of All Road Types	Road Needs ^b	Road and Bridge Needs ^c
	Earth Roads	Oiled Roads	Gravel Roads	Low Bituminous Roads	High Bituminous Roads	Paved ^a Roads			
Township A									
Costs per mile	100.00	0.00	1,890.00	2,350.00	3,000.00	5,000.00		87.40	108.90
Miles of type of road	2.63	0.00	12.66	28.71	0.13	0.03	42.95		
County Average									
Costs per mile	100.00	0.00	1,890.00	2,350.00	3,000.00	5,000.00		92.20	179.00
Miles of type of road	2.63	0.00	12.66	28.71	0.13	0.03	44.48		

^aPaved roads are of concrete or asphalt.
^bFunds needed to upgrade township roads (in 1,000s).
^cFunds needed to upgrade township roads and bridges (in 1,000s).

TABLE 4 Format for Reporting Nontax Revenue Information

Agency	Nontax Revenues										
	Motor Fuel Tax (\$/mi)	Federal Revenue Sharing Allocation	State Bridge Replacement Fund	Federal Bridge Replacement Fund	OLR 1 ^a	OLR 2	OLR 3	OSR 1 ^b	OSR 2	OSR 3	OSR 4
Township A	23,466	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
County average	23,466	6,634,316	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000

Note: All values represented in 1,000s.

^aOLR = other local revenues.

^bOSR = other state revenues.

5. Users can see rates, assessed valuations, and receipts from each revenue source.

Budget Status

The third major component of the program includes a budget condition presentation resulting from expected expenditures and revenues. Expected revenues are matched with expected expenditures and presented as a revenue shortage or surplus (Table 6). This part of MAP is useful in budgeting because it indicates to township officials, early in the year, how closely they are meeting the engineering cost estimates. The program does not advise township officials to provide

the level of service on which cost estimates are based; the level of service remains a local decision. Currently local officials are not in a position to evaluate proposed spending activities against objective standards. With MAP they can judge revenues according to financial requirements to maintain roads at a specified condition level. The program also permits users to adjust cost estimates to better reflect local conditions. Thus, in townships with higher costs of providing roads and bridges--perhaps because of soil conditions or terrain--users can increase the per mile or per square foot costs. The reverse is true also.

The main purpose of this program is to stimulate users to consider costs and revenues in estimating

TABLE 5 Format for Reporting Tax Revenue Information

Agency	Tax Revenues										
	Assessed Valuation Within Incorporated Areas	Assessed Valuation of Farm Areas	Assessed Valuation of All Land	Road and Bridge Tax Rate	Permanent Road Fund Tax Rate	Bridge Joint Construction Tax Rate	Equipment and Building Tax Rate	Bond and Interest Tax Rate	Local Revenue Generated by Foregoing Tax Rates	Local Revenue Capacity ^a	
Township A Rates	0	5,499	5,744	0.3300	0.1670	0.0500	0.0350	0.0100	3,400	3,400	
County Average Rates	5,091	6,678	12,670	0.2448	0.1670	0.0435	0.0321	0.0100	5,146	5,941	
Township A Revenue				1,896	287	959	201	57			
County Average Revenue				2,583	441	1,691	334	101			

Note: All values represented in 1,000s.

^aRevenues generated from maximum tax rates.

TABLE 6 Budget Condition Presentation

Agency	Shortfall and Surplus										
	Total State Revenues from OSR ^a	Total Local Revenues Generated from Taxes and OLR ^b	Total Local Capacity ^c	Total Revenue ^d	Current Revenues Shortfall or Surplus	Capacity Revenues Shortfall or Surplus	Current per Mile Shortfall or Surplus	Capacity per Mile Shortfall or Surplus	Property Tax Dependence	Per Capita Current Revenues	Per Capita Capacity Revenue
Township A	2,448	3,400	3,400	5,849	5,740	5,740	134	134	100	16	16
County average	3,300	5,146	5,941	7,682	7,502	8,297	136	148	113	11	11

Note: All values represented in 1,000s.

If Township A has a revenue shortfall, options are to

- Increase tax rates by
 - Increasing road and bridge tax rate to 0.33 to increase revenues,
 - Increasing permanent road fund tax rate to 0.167 to increase revenues,
 - Increasing bridge joint construction tax rate to 0.05 to increase revenues, and
 - Increasing equipment and building tax rate to 0.035 to increase revenues;
- Decrease expenditures;
- Increase township debt;
- Downgrade miles of high bituminous to low bituminous roads;
- Downgrade miles of low bituminous roads to gravel; and
- Not upgrade bridges.

^aTotal OSR = OSR 1 + OSR 2 + OSR 3 + OSR 4.

^bTaxes + OLR 1 + OLR 2 + OLR 3.

^cRevenues generated from maximum tax rates + OLR.

^dRevenues from OLR + OSR + revenues generated from tax rates.

budgets. Second, it provides an opportunity to determine the effects of policy changes. The ability to model policy changes assists officials of small rural townships in management. No new information is generated; however, available information is organized into a useful format for policy management.

SENSITIVITY ANALYSIS

The final section of MAP provides users with an ability to study policy changes. Users indicate changes in specific variables and run the program. The revised output includes the effects of hypothesized policy changes. The number of policy changes to be modeled is limited only by the imagination and interest of users.

A potential use of MAP in Illinois is to review alternative farmland assessment levels. Recent legislation changed the method of assessing farmland, and reduced assessment levels in many rural townships. Township officials had to rely on best estimates by county supervisors for assessment level decreases, but could not easily determine the effects on overall revenues. MAP allows users to insert a new assessment level and trace its effects on revenues generated.

Because the sensitivity analysis works through the entire budgetary process, users receive information about expected shortfalls and surpluses. Thus, in preparing budgets, township officials can estimate the effects of a tax rate change, for example. By running several analyses, officials can establish a band in which the true effect is likely to be contained. This approach provides an easy procedure for contingency planning.

IMPLEMENTATION AND DELIVERY OF MAP

When implementing MAP, note that most township highway officials in midwestern states neither have nor will have, in the foreseeable future, access to computers. Most of the local officials are part-time and manage the township road budget from their homes or hire an accounting firm to prepare legal documents. A complicated system could not function in this environment.

One possible delivery mechanism involves either county highway superintendents or university extension offices. Many county highway superintendents are developing microcomputer capabilities and, because they are in a unique information dissemination

position with township officials, are a natural entry point in any information transfer network. In Illinois, county highway superintendents regularly meet with township highway commissioners to assist with preparation of bid specifications and other technical matters. Although the county highway superintendents are not directly involved in township budgeting functions, they can be useful in assisting commissioners to examine policy alternatives. Initial reactions of superintendents have been generally favorable toward the MAP concept.

An alternative dissemination mode is to incorporate MAP into the Cooperative Extension Service of land-grant universities. The extension services are becoming more involved in assistance to local governments nationwide. For example, in Illinois each regional extension service office has an IBM-PC and the staff can work with township officials to provide computer access and results analysis. Similar arrangements are possible in other midwestern states.

GENERAL OBSERVATION

The fiscal condition of local governments providing roads and bridges is perplexing. In recent years, taxpayer relief programs have slowed the growth in revenues to which they had become accustomed. Inflation, especially in road-building materials, has played havoc with local budgets, causing officials to seek lower cost methods for providing desired services.

Improving management practices will be a critical element in any long-term fiscal solution. Local officials must develop more sophisticated planning techniques and upgrade management activities. One possibility for better management is to increase the information available. However, more effective use of existing information through an improved information transfer program is equally important. MAP does not develop new information but organizes available data into a more readily usable format. In this way, MAP can be a valuable management technique.

ACKNOWLEDGMENT

Financial support for this project was provided by the Office of Transportation and Agricultural Marketing Services, U.S. Department of Agriculture. The authors claim responsibility for any errors, and any views expressed should not be attributed to the sponsors.