



# NASCIO 2007 Recognition Awards Nomination

## Michigan



### **Title of Nomination: Transportation Asset Investment Reporting & Management System**

### **Category: Cross-Boundary Collaboration and Partnerships**

#### **Nomination Information**

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## Summary

Michigan's future relies on the combined monetary, social, and economic impact of its roads and bridges. But enormous challenges stemming from deferred maintenance, structural deficit, urban issues, greater user expectations, dwindling funding, expanding levels of service, increased use, legislative requirements, rising standards, and improving safety—all add to the growing demands placed on an aging transportation network.

Michigan's economy is at a historic shift. Its success will greatly hinge on how well we move people around the state and how well we move products to the world. Examples of recent or pending remedial actions include an accelerated road construction program as part of the Governor's \$3.8 billion "Jobs Today" initiative and an aggressive five-year Department of Transportation plan expected to generate 24,400 jobs and \$1.3 billion in economic activity

However, because only 8% of public roads are state-owned while 92% are owned by over 600 individual local government entities, until now there has been no equitable and consistent means of addressing the upkeep of the road system as a whole. This has resulted in wide variations of pavement condition, even between adjoining jurisdictions, and difficult issues for state leaders tasked with funding decisions. New IT asset management tools are a powerful, dynamic part of an innovative solution that is uniquely cross-governmental in all aspects.

Traditionally, public sector transportation management has targeted the immediate and most severe problems. Repairs often waited until deficiencies became evident to even the untrained observer. By then, this "complaint-based" planning style left road agencies with no choice but very expensive major rehabilitation or complete reconstruction because of irreversible damage to the underlying road structure.

Asset management methods take a more strategic "stitch-in-time" approach. Using various investment strategies, decisions are made with regard to the long-range condition of the entire system rather than individual projects. For example, it has been shown that for every dollar spent on capital preventive maintenance (CPM) it is possible to delay spending four to six dollars on reconstruction. Put another way, these kinds of fixes can cost an average \$55 thousand per lane mile while a fully reconstructed road costs \$1.2 million per lane mile.

To enable government leaders to break the consume-and-construct cycle, an asset management process must forecast future road and bridge conditions and perform investment analyses with various network-level funding and fix scenarios. Previously, the two main inputs needed for predictive modeling were lacking: accurate and directly comparable data for the current state of the local roads and for the amount and location of most local road investments. So it was impossible to predict the effects of managed funding on statewide road conditions.

The formation in 2002 of a broad-based statewide Transportation Asset Management Council (TAMC) has promoted the development of methods and tools to correct this situation by bringing together the interests of the hundreds of Michigan road-owning entities. A significant achievement was attained during 2005 when the TAMC in cooperation with the Michigan Center for Geographic Information and representative local governmental units developed an Internet-based means of collecting investment data. The 2007 Annual Report of the TAMC to the Legislature included the first strategic predictions drawn from statewide investment data gathered by the Asset Investment Reporting System.

This tool gives all 617 local and county road agencies a standardized way to collect and submit road improvement investment information with little technical or financial commitment. Along with the statewide Pavement Surface Evaluation and Rating System (PASER) road condition data, this application is a low-cost solution that enables development of a strategic analysis model for effective asset management at both the local and statewide levels. "Placing the right treatment on the right road at the right time" saves taxpayer dollars and provides an enhanced overall infrastructure at a time when the state's economic condition is in desperate need.

## **Description: Problem & Solution**

The majority, about 80,000 miles, of public roads in Michigan are under the jurisdiction of local governments. Often, a “worst-first” methodology has been adopted, spending much of a road budget on full reconstruction of the pavements in worst condition. But postponing or avoiding maintenance fixes increases the severity and repair costs of pavement defects. According to the National Center for Pavement Preservation at Michigan State University, delaying preservation fixes for even one year can reduce pavement service life by 5 to 6 years.

Based on solid data and predictions from new IT solutions, the more balanced asset management approach includes the maintenance of pavements in fair or good condition in order to maximize the overall service life of the road network and protect the investment of past construction projects. A typical rule of thumb is that for every dollar spent on preventative maintenance procedures, six dollars in future construction costs are saved.

A carefully coordinated “mix of fixes” plan aims for “the right fix in the right place at the right time” and allows an agency to proactively *manage* pavement condition. This creates the ability to postpone costly reconstruction activities by extending the remaining service life of the original pavement. At the heart of a sound asset management program, strategically targeted capital preventive maintenance repairs can generally extend the service life of a given road by 3 to 10 years, depending on traffic characteristics and the methods used. A significant benefit of such a comprehensive program is that it gives managers control over both future network conditions and associated funding requirements, allowing decision makers to anticipate routine maintenance work loads, safety deficiencies, and ride quality needs.

If the benefits of asset management are to be realized throughout Michigan, then it is imperative that the tools and procedures of asset management be utilized by local road agencies. The TAMC has selected RoadSoft (a management system developed by Michigan’s Local Technical Assistance Program) as a tool that local agencies can use to implement the various aspects of an asset management program. The TAMC supports the development of the strategic analysis portion of the software and helps train local agencies to use the tool.

RoadSoft uses a logistic growth model that is very data intensive. Until now data needed for asset management has been gathered for the state trunk line system but comparable information from most local agencies has been missing, difficult to obtain, or available only in several different incompatible formats. Trials using input from the state highways demonstrated that RoadSoft is able to provide extremely valuable asset management analysis when sufficient data is available. But to gather that data for the local roads, two major collection activities were required: one to learn the condition of the system, and the other to track the investments made to improve it.

First, a *consistent* comparison of road condition was needed. To establish a uniform condition rating scale, the TAMC chose the Pavement Surface Evaluation and Rating (PASER) method developed by the University of Wisconsin for determining the condition of roads, and the National Bridge Inventory for bridges. PASER is based on sound engineering principles and measures visible “surface distress” at a 1:10 scale. Because it is one of the easiest and most inexpensive means of pavement rating, PASER was already very widely-used, well-supported, and ideal for even small agencies.

The collection of roadway condition data by the TAMC is a joint effort in which raters are trained at the beginning of each data collection cycle, and then organized into teams based on County by the respective planning agency. Each team consists of at least a planning agency member and a member of MDOT, the county, and any city that is being rated. Team members collectively agree on the condition classification at the time it is entered.

In 2006, during the months of July through November over 100 teams of trained pavement raters drove 54,500 miles in cars with laptop data collectors and map information in order to assess the condition of the state’s 43,000 miles of federal-aid eligible roads (nearly 93,000 lane miles). This effort was coordinated by 21 regional Transportation Asset Investment Reporting and Management System

or metropolitan planning organizations. The same consensus-driven data has also been collected on 9,475 miles or about 11% of the local system. Rates average about 5 miles per hour at a cost of \$11.65 per mile.

A second crucial data collection activity was needed to determine the location and amount of improvement investments—completed and planned—since these naturally affect road condition and how it changes. Until now, there has never been a detailed way to collect investment information and relate that to a particular section of the local road. In the past, fiscal reporting processes revealed in a general way where funds disbursed through the state government were spent but this was not consistently related to a road-level engineering view.

In the fall of 2003, the TAMC selected the Center for Geographic Information (CGI) of the Michigan Department of Information Technology to serve as the central data agency for collected asset management data. The TAMC wanted an “honest broker” whose only interest in the data would be focused on receiving it, storing it, and making it available for reports. Since it also maintains the underlying Michigan Geographic Framework—a single, statewide geographic information system (GIS) base map--the CGI was a logical partner for development and maintenance of the Asset Investment Reporting System to be used by local agencies for reporting their annual road projects and investments.

The Asset Investment Reporting System provides the first opportunity for all communities to report in a uniform way so results can be aggregated for analysis and comparison. Available on the internet, the new application is completely web-driven and is similar in feel to Google Maps or MapQuest. It is also a completely decentralized system. Although this tool is the brainchild of the TAMC which includes broad-based representation and reports to State Transportation Committee, user accounts are not administered in Lansing. Instead, security is set to enable local administrators to manage their own accounts. All 617 communities have complete control of who uses the system so they can add and remove accounts according to changing needs or changing personnel. “Central” only does the initial registration of one administrator for each community.

The tool allows any road agency to securely log in to enter information for their respective jurisdiction. If an agency does not have Internet access, authority can be given to another entity (for example, a regional planning organization) to input and maintain the information for that jurisdiction.

Phase 1 is currently being implemented to include the collection of Capital Preventive Maintenance (CPM), Routine Maintenance (RM) and Structural Improvement (SI) activities. All asset information collected through the tool, such as “what did you do?”, “where did you do it?”, and “how long do you anticipate it lasting?” will be available in the GIS data management system. The web-based GIS tool allows for input and reporting of asset investment and is useful for supporting both statewide and local needs of asset management. Because it uses the standard linear referencing system for the state, other asset management software products currently being used by communities can communicate through a standardized import and export function. The application leverages statewide geospatial data layers in the state’s spatial data warehouse, including the statewide transportation data layer, statewide digital ortho-photography, and statewide PASER road rating data.

In May of 2007 a momentous milestone was reached when, for the first time, the Annual Report of the TAMC to the Legislature included predictive scenarios and strategies rooted in local investment data gathered from across the state by the Asset Investment Reporting System. And that the State Transportation Commission unanimously adopted the following TAMC recommendations:

**Recommendation #1:** That an on-going, comprehensive educational and training program be conducted that provides local and state agencies with the information needed for them to develop and implement their own asset management programs

**Recommendation #2:** That local agencies be encouraged to implement capital preventive maintenance activities for the bridges under their jurisdiction

## **Government Benefits:**

1.) Although Michigan has earned the reputation of being a national leader in public management, particularly in the areas of information technology and transportation, pavement conditions around the state have often told a different story. This has stemmed largely from the absence of a single, unified approach to management for a road system which is mostly independently owned and maintained by hundreds of local governments. An outgrowth of this ownership arrangement has been a politically competitive process for the allocation of road funding, contributing to a severe lack of good data about local road quality. Historically, each jurisdiction has supported its financial case by developing its own data which often conflicted with that presented by others.

Today, the TAMC has teamed with local communities to reduce the role of politics in the process by providing government with a more standardized impartial appraisal of current and future infrastructure conditions, along with suggested statewide strategies for improvement. The same tools providing this assessment also offer all jurisdictions a practical aid for managing the maintenance of their own road system quality in alignment with the Governor's emphasis on preservation in lieu of expansion.

2.) Computerized models that allow agencies to consider a number of alternatives before deciding the best approach for their system have enabled the state's leaders to gain a much deeper understanding the relationships between repair strategies, funding levels and condition. Providing these expanded capabilities via the Internet in an easy, inexpensive, and accessible format to local entities across the state promotes improved effectiveness of infrastructure management at every level, and at the same time advances the quality and benefits of the road system as a whole.

3.) As part of a state urban policy focused on the redevelopment of older industrial cities to make them more attractive to residents and economically viable for businesses, this program can help local governments manage their infrastructure assets. Wise investment to improve the transportation network is key to revitalizing underperforming urban centers and their struggling satellite communities. Enhancing the connectivity between and within regions by fixing the aging infrastructure makes urban sites more marketable and creates a competitive cost climate for businesses and residents alike. By helping cities transition to the new economy, infrastructure management tools promote the transformation of cities previously viewed as deficits into assets for both the region and the state.

4.) The entire program is also a positive example of the Michigan Cabinet Action Plan aim of streamlining government by promoting innovative cross-boundary partnerships, by prioritizing decisions on the basis of shared cross-governmental themes rather than the parochial concerns of separate units, and by concerted strategic planning efforts that focus on measurable results.

5.) Additional benefits to government include: increased collaboration and easier comparison of information through common definitions and standardized evaluation, easier implementation of benchmarks, identification and adoption of best practices among agencies, better communication of strategy and more effective management within agencies, reduced information fragmentation and greater ease of access providing increased productivity and more decision-making involvement by a wider range of staff, prioritization and impact analysis of funding allocations and policy decisions, use of standard accounting concepts to improve communications and negotiations with non-engineering budget holders and outside decision-makers, greater ability to relate asset inventory and performance to state or community-wide needs and priorities while deferring lobbying pressures from special interest groups, improved credibility of the decision-making process, confident expenditure allocation with assurance of the best overall value within given budget constraints.

## **Public Value**

The initial impetus for the program was largely directed toward improving the ability to make prudent data-supported decisions at the state level. Initial successes indicate that this is being accomplished to an ever greater degree. However, local partners have also derived key benefits through their involvement in the collaboration.

Easily Used Software: The application includes many features to make it easy for local governments to enter and track their current and proposed road treatments and budgets. Created as an interactive editing tool to capture that information, the user-friendly interface offers a graphical way to select and add treatments to the system. Driven by the CGI Framework base map, the program also has completely integrated aerial imagery to aid location searches. A separate layer provides the latest PASER information to help locate treatments since work often starts and ends where pavement conditions change.

Training & Support: The TAMC's education and training activities are a cooperative effort involving the metropolitan and regional planning organizations, the Michigan Local Technical Assistance Program (LTAP) at Michigan Technological University and the National Center for Pavement Preservation at Michigan State University. These training efforts extend to counties, cities, villages, MPOs, and regional planning groups.

The Center for Geographic Information conducts annual training classes for using the system, with over 20 training sessions in widespread locations throughout Michigan and presentations of the new tool at gatherings such as the Asset Management Conference held in the state last May and again this April. Each local planning organization promotes the system and provides one-on-one customer assistance while practical on-line tutorials and user guides make aid universally accessible. A help desk that is staffed year-round during business hours handles 30+ calls per day during the reporting season.

Communication & Flexibility: By establishing standard definitions, the TAMC has ensured that for the first time all communities can use the same language to report treatment categories or treatment specifications. However, system flexibility enables it to meet the widely varying needs of these diverse local agency users. For example, some communities receive allocations covering little more than snow removal, so local units have the option of entering "No Treatment" when they are unable to apply any improvements in a given year. The application also allows communities to enter budgeted amounts if an exact location has not been determined but dollar amounts and kinds of treatment are known. If a specific treatment is intended but not yet completed, communities can click a "Planned" box to record that information—both for themselves and for state leaders.

Availability & Protection: The information from the web application flows into a central database that offers access, security, and privacy through three authorization levels. Registered communities and MDOT can only see and edit the data for their own roads. Regional and metropolitan planning organizations can see but not edit data for their areas. All TAMC members can view and draw reports from all collected information, but they do not report statistics by community. Instead, results are aggregated for the state or region. Communities can check a box to indicate "Completed for the Year" so the TAMC can get a status report showing whose data is included and how complete the information is.

Useful Results: Each community is different but the application rolls up the results and makes them meaningful. Communities can get detailed budget and treatment reports and can also view or print results filtered by various categories, such as the year, or produce summaries by treatment type. Output is available in any of several popular formats (Excel, Word, and PDF) or as a simple text file to enable import into other GIS products for analysis at the local level. For example, in addition to the basic functions available from RoadSoft, one county road commission uses other GIS tools to perform sophisticated spatial and statistical analyses allowing the county to identify relationships between road assets and a wide range of social, economic, and environmental elements. The ability to explain asset conditions and safety problems with a broad range of factors increases the likelihood of relating needs and problems to a wider public audience.

Every agency, when revenues are tight, is forced to make trade-offs regarding expenditures. Examples include:

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- Routine Maintenance versus Capital Preventive Maintenance or Structural Improvement: The recent rapid erosion of funds directly affects the CPM and structural improvement work that can be done, but it also affects routine maintenance, which must be done for safety and liability reasons. Raising maintenance expenditures reduces funding for condition improvements to the overall system. In a year with unusual snowfalls, a planned annual construction budget can be entirely spent during the winter.
- Preservation versus Capacity & Traffic Operations: This trade-off concerns the amount of money allocated to preserving the existing system versus the amount allocated to improving traffic conditions and addressing the increasing congestion problems.
- Transportation Work or Other Community Services: In most communities transportation funds disbursed by the state are insufficient for road needs and must be supplemented with locally-collected general fund or special assessment monies. In times of severe budget strains on local governments, street repairs may actually be forced into a funding competition against police, fire, or other local services.

In the face of such tough decisions, the asset management tools and techniques offered by the TAMC have been a boon to local agencies floundering with difficult budget issues. In one city for example, in order to make the case to fund an additional amount from other city funds, agency officials presented their asset management plan to the City Commission. The plan provided the Commissioners with a long-term estimate of how much money would be needed annually to achieve the desired road condition. By measuring the performance of the system and setting condition targets, the department was able to clearly present its case to the Commission. The Commission not only adopted a special assessment to provide the needed funding but also has renewed the assessment for each of the last 3 years.

There is a solid business case for the application of asset management to maintenance of the state's infrastructure, but the main goal is to get the "right fix at the right time at the right place" in order to improve the quality of roads within the constraints of available funding. In 2005, the most recent year data is available, investments in the road system totaled nearly \$2.83 billion. Of this total, approximately \$1.96 billion was directly attributable to improving road condition, that is, work in the capital preventive maintenance and structural improvement categories. **Following the rule of thumb that every dollar spent on preventative maintenance saves six dollars in future construction costs would mean a savings of up to \$11.75 billion.**

MDOT alone dedicates approximately \$1.4 billion annually for the preservation, maintenance, and enhancement of the state's road and bridge system. Economic benefits resulting from these transportation investments are well documented. At this rate for example, studies by independent research groups and universities provide estimated household travel-time savings worth an average of about \$43 million per year, with comparable savings for Michigan businesses. Assuming similar ratios per dollar of investment, the 2005 statewide road condition improvement dollars produced over 33,000 jobs along with about \$2.5 billion in Gross State Product and about \$1.7 billion in personal income.

As important as the economic contributions are, they do not represent the program's full value to the state's residents and businesses. A well-maintained surface transportation system that operates efficiently improves Michigan's economic health but the primary advantages are human and social: the public's safety and quality of life. Of these advantages, none is more significant than the enhancement of safety. The prevention of auto-related injury and death is the most compelling reason for upkeep and improvement of infrastructure. Now the principles, methods, and tools of asset management can give direction to that effort in Michigan or in any state.