

APPENDIX D

Asset Management and Investment Strategies: An Update

Introduction

This document, the *1999 Status of the Nation's Highways, Bridges and Transit: Conditions and Performance Report (C&P Report) to Congress*, focuses on current system condition and performance and future capital investment requirements to achieve specified system performance levels. The Report also provides an assessment of the relationship between investment requirements and current spending. The Report's content does not include an explicit discussion of potential options appropriate for responding to anticipated system conditions and requirements.

This Appendix is the first in a series of updates on initiatives to expand State capabilities to meet highway and bridge user requirements through improved decision-making processes with respect to resource allocation, programming and project selection. Provided in this Appendix is an assessment of current practice: What do we have? How is it working? What do we need? How do we get there? Subsequent editions will report on State progress in specific areas such as implementing Engineering Economic Analysis (EEA) principles and techniques. EEA decision-support tools include life-cycle cost and benefit/cost analysis. In addition, future updates will address the extent to which the decision-making approach is oriented toward multi-modal considerations.

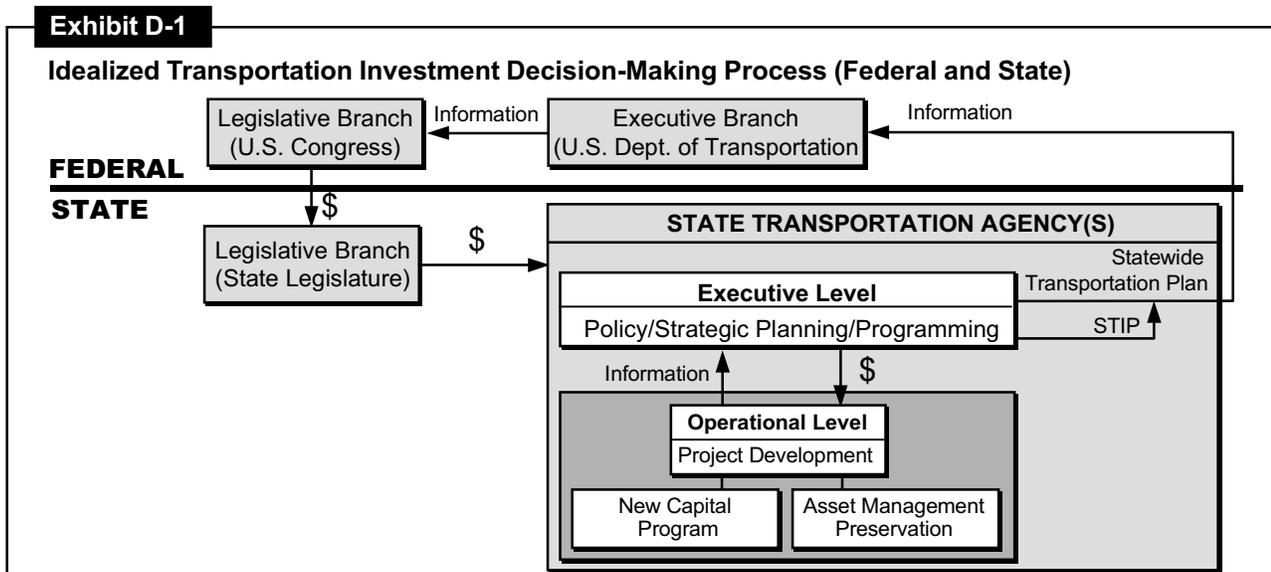
Current Practice (What Do We Have?)

Much of the current paradigm for State-level transportation decision-making was defined by the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 which required each State to develop a Statewide plan. Ideally, this plan presents a fiscally realistic vision, covering 20 years or more, of strategies for addressing a State's mobility and economic requirements. It reflects the full range of modal choices, covering for example highways, rail and transit. The plan also covers the management of existing assets to include maintaining, monitoring, and improving transportation system performance. This requirement for a statewide plan was continued under the Transportation Equity Act for the 21st Century (TEA-21).

Also required by ISTEA and TEA-21 is a "financially constrained" Statewide Transportation Improvement Plan (STIP). This is a list of projects that a State plans to advance over, at minimum the next 3 years. The STIP must indicate the source of funding for included projects, as well as the financial plans for ensuring the continued operation and maintenance of the existing system. It is intended that the short-term capital investment and operational decisions provided in the STIP will be consistent with the policies and objectives delineated in the Statewide plan.

Most State highway agencies currently have some of the more common elements that provide information into the Asset Management process. The two most common are pavement and bridge management systems. These systems are intended to cyclically monitor the condition, measure the real-life performance, predict future trends, and recommend candidate projects and preservation treatments. In addition, many include analytical tools such as deterioration models and optimization algorithms designed to evaluate the impacts and trade-offs of current and future alternative policies, programs, and projects. All of these features are not, however, necessarily used in every State.

In summary, although each State has a unique approach to making transportation investment decisions, three dimensions are common to all highway agencies. First, each State has a long-term, strategic planning element that is intended to provide guiding policies and objectives. Second, each State has a requirement to produce a short-term program of projects intended for funding. And, finally, each State has mechanisms for evaluating and selecting projects for actual implementation. Underlying this general process are data and analyses as well as policy considerations. (See Exhibit D-1.)



Assessment of Current Practices (How Is It Working?)

During the decades of the 1960s, 1970s, and even into the 1980s, transportation preservation projects were selected and developed without the benefit of today's vast technology expansion and the information resources made possible by the technical revolution in computers, automated data collection, testing equipment, design procedures, analytical tools, and so forth. Investment decisions were project driven, and asset preservation and upgrading were frequently by-products of facility expansion and new construction. Over the past two decades, progress in the planning and programming arena of system preservation, upgrading, and operation has been considerable, with asset management becoming a more important element in the State's overarching policies and transportation plans.

Today, most State transportation plans include more explicit policies and goals relative to asset management. However, the link between the transportation plan and actual programming and resource allocation decisions may be tenuous if state-of-the-art engineering, economic and business practices are not in place. The policies and objectives regarding Asset Management and investment are intended to guide project selection and development. In the past, transportation investment and maintenance decisions within and among asset classes tended to reflect tradition, intuition, personal experience, resource availability, and political considerations, with systematic application of objective analytical techniques applied to a lesser degree because of lack of availability. Further, success was often measured in terms of controlling backlogs, not in optimizing system performance, maximizing return-on-investment, or minimizing user impacts. Currently more States are developing performance measures and targets to guide the overall decision-making process.

Achieving the situation where programs and projects reflect predetermined goals and policies is difficult for a number of reasons. First, available analytical tools are subject to technical constraints related to data inputs, assumptions and theoretical understanding. Second, practical realities related to institutional considerations, social objectives, and political goals may circumvent the process. And, third the planning, programming, and project development process in many States must deal with antiquated data systems, disparate management systems (such as for pavements and bridges), and limited communication channels, especially along horizontal lines.

Technical Considerations

Although management systems, such as pavement and bridge systems, have been under development for many years and these systems have inherent investment analysis capabilities, few States use economic efficiency criteria to assess the relative merits of overarching alternative investment strategies within all asset classes, e.g., one highway facility versus another based on relative costs and benefits.

Most States limit application of their management systems to monitoring conditions and then plan and program their projects on a "worst first" basis. Existing management systems typically function at the operations level and focus on one particular asset. The current approach to asset management in general and resource allocation and investment analysis, in particular, is tactical rather than strategic.

Another technical issue facing State DOTs is the requirement for appropriately trained analysts with the ability to translate the results of complex analytical processes into relevant conclusions that can be readily understood by the lay person. Furthermore, it is important for the analysts to have a full understanding of the important concepts and techniques. States face some difficulty in finding and retaining staff with these capabilities due to the personnel situation described earlier.

Practical Realities

Beyond the technical hurdles, State practitioners are faced with a host of practical realities that confound objective, analytically based decisions. Institutional considerations, social objectives and political goals have the potential to dominate the resource allocation and project selection process.

Examples of institutional considerations include the legislative earmarking of Federal and State funds. In addition, State budgets generally cover time horizons of 1 to 2 years. Therefore, committing available funds over the long-term is difficult. The short budget cycle, combined with uncertain future funding levels, creates pressure to select the alternative with the lowest initial cost, regardless of total life-cycle cost and return-on-investment. In other words, the cost-effective solution may not be the most politically practical solution.

A further complication arises from the competition between political objectives and the technical decision-making process. For example, elected and appointed officials may find a strictly long-term perspective demanded by the analytical approach to be untenable. In addition, the public often measures the success of such officials by their ability to advance specific projects and services. As such, decisionmakers may prefer a process that will accommodate individual efforts, as opposed to a technical approach that does not specifically reflect such efforts. Long-term cost-effective solutions therefore may not be the most attractive because of competing policy objectives.

Integration

In many of the State DOTs, communication across asset classes (horizontal) and from the day-to-day manager to the highest executive (vertical) has historically been limited. This situation inhibits a systems approach to managing assets. States that have established management systems have done so by focusing on individual asset classes. The result has been so called “stovepipe” operations with limited horizontal coordination. For instance, bridge management systems were developed by bridge engineers and pavement management systems were produced by pavement engineers. Typically, there is little, if any, data exchange between systems. Furthermore, there is little consistency with respect to investment decision procedures. As a result, these systems are not able to evaluate trade-offs between various classes of assets, for example, highways versus bridges.

Complicating coordination across asset classes is the typical State DOT’s organizational structure. Many State DOTs experienced most of their growth and development during the Interstate Highway construction years. As a result, most of these organizations have budgets, staffs, and other internal resources that support the requirements of a highway construction program and are not necessarily geared to highway preservation and modal system efficiencies.

Improving the Process (What Do We Need?)

“Asset Management” is a still-emerging concept in the highway industry. But at its heart, it provides a solid foundation from which to monitor the transportation system and optimize the preservation, upgrading, and timely replacement of highway assets through cost-effective management.

Although the transportation community continues to refine the definition of Asset Management as it gains more experience with it, the following “working definition” may be offered:

Asset Management is a systematic process of maintaining, upgrading, and operating physical assets cost-effectively. It combines engineering principles with sound business practices and economic theory, and it provides tools to facilitate a more organized, logical approach to decision-making. Thus, asset management provides a framework for handling both short- and long-range planning. [Source: Asset Management: Advancing the State of the Art into the 21st Century Through Public-Private Dialogue, Federal Highway Administration (FHWA) / American Association of State Highway and Transportation Officials (AASHTO) Sponsored Workshop, September 1996.]

An Asset Management decision-making framework is guided by performance goals, covers an extended time horizon, draws from economics as well as engineering, and considers a broad range of assets that include physical as well as human resources. Asset Management provides for the economic assessment of trade-offs between alternative improvements and investment strategies from the network- or system-level perspective—that is, between modes and/or asset classes within modes. At the same time, it allows for the more complete comparative analysis of options for individual projects.

Asset Management links user expectations for system condition, performance, and availability with system management and investment strategies. An Asset Management system will report on progress made in achieving goals and will also evaluate the process relative to the goals. Furthermore, the impact of alternative management and investment strategies on realizing the expressed goals may be readily determined and communicated.

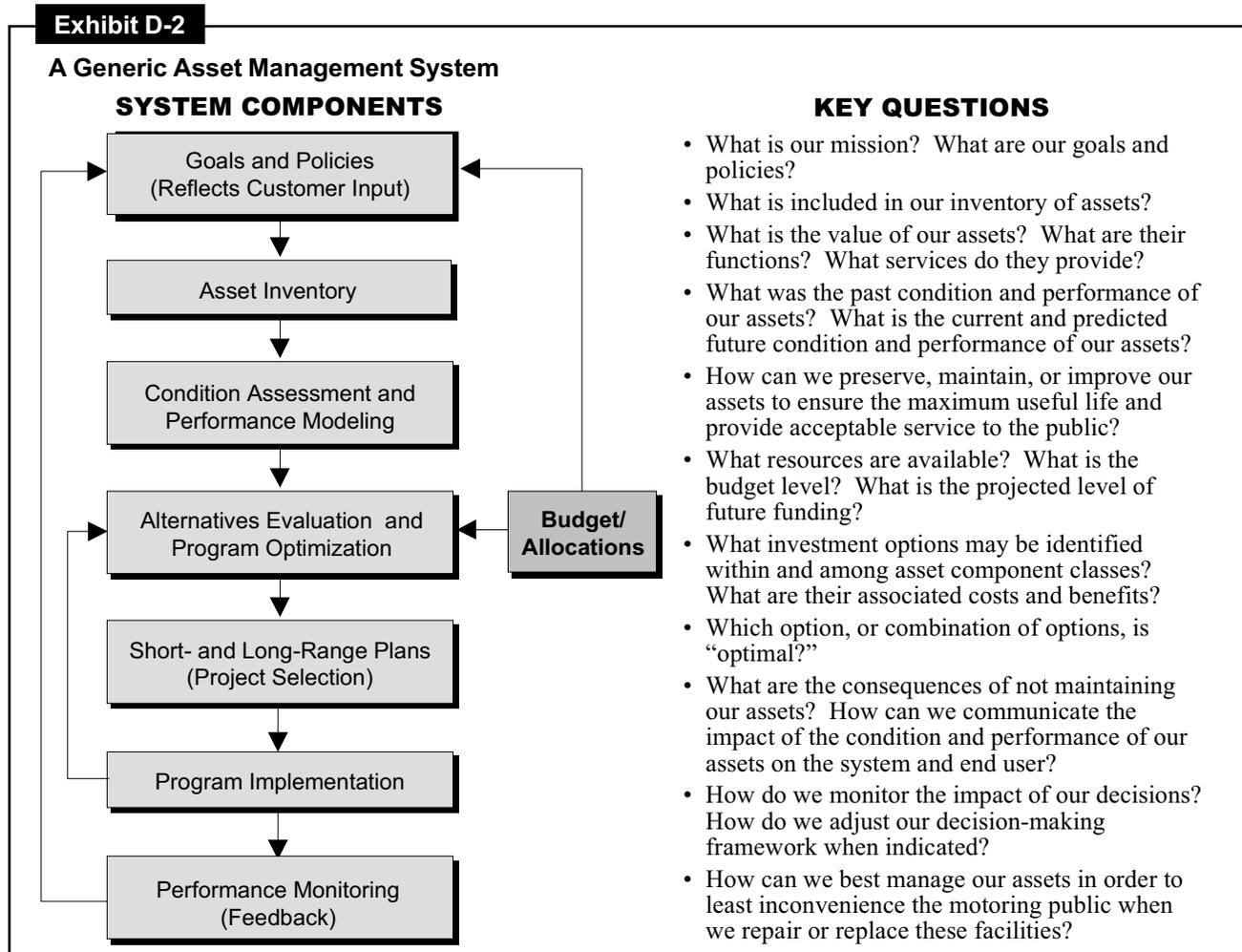
The focus is on assets (dollars, people and physical resources) and system performance and includes return on investment, maximizing economic efficiency, accountability, opportunity costs and future requirements. This broad approach to resource allocation and programming decisions can provide greater value to the system and overall satisfaction for end-users. Program quality and system performance will improve.

Asset Management not only aides in the decision-making process, but also provides for a fact-based dialogue between system users and other stakeholders, State government officials, and managers concerned with day-to-day operations. This results from relevant, objective and credible information being accessible to all participants in the decision-making process. As such, decisions can be based on detailed input regarding available resources, current system condition and performance, and estimates of future performance. The information underlying Asset Management—sometimes raw data and other times data generated from the analytical process—results in an improved understanding of the economic trade-offs, return on investment and potential value of the end product.

Asset Management provides easy access to quantitative and qualitative data and allows decision-makers to more readily identify and focus on key issues. Further, the ability to weigh and articulate the impact of choosing one alternative over another through “what if” analyses is enhanced. And, importantly, the documentation explaining the selection of a particular strategy is improved. A fact-based, reproducible, systematic approach can enhance the dialogue among decision-making bodies regarding capital investment levels.

Distilled to its essence, Asset Management is a strategic, as opposed to tactical, approach to managing assets. The process works as follows: First, performance expectations, consistent with goals, available budgets and organizational policies, are established and used to guide the analytical process, as well as the decision-making framework. Second, inventory and performance information is collected and analyzed. This information provides input on future system requirements (also called “needs”). Third, the use of analytical tools and reproducible procedures produces viable cost-effective strategies for allocating budgets to satisfy agency needs and user requirements, using performance expectations as critical inputs. Alternative choices are then evaluated, consistent with long-range plans, policies and goals. The entire process is reevaluated annually through performance monitoring and systematic processes.

Exhibit D-2 illustrates a generic Asset Management system and lists key questions that inform the analytical process. The components are indicated as well as the relationships among them. Various issues, tools and/or activities are associated with each component. For example, “trade-off analysis” would include the application of an array of engineering economic analysis (EEA) tools including benefit/cost analysis, life-cycle cost analysis, and risk analysis.

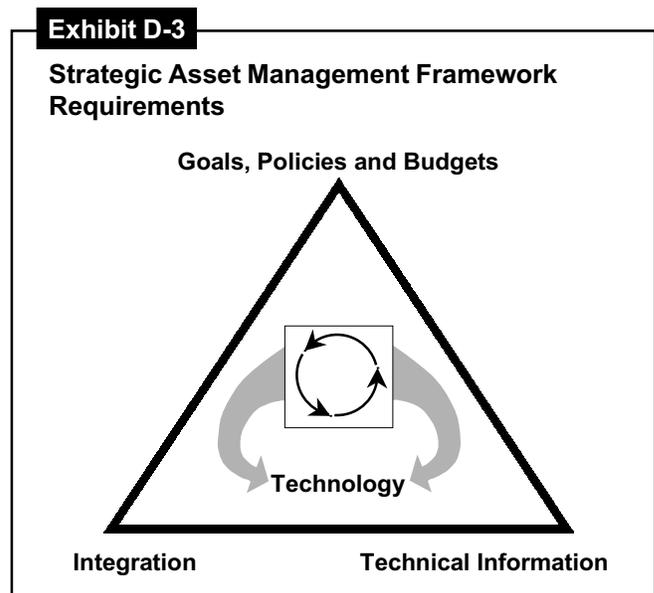


The components indicated would typically be included in any Asset Management approach, although the specifics of any given system would differ to suit a particular highway agency. States will define the parameters of their own systems based on State decision variables, such as policies, goals, asset types and characteristics, budgets and State operating procedures and business practices. Furthermore, any Asset Management system should be flexible enough to respond to changes in any of these variables or factors.

The assets likely to be included in a State's initial Asset Management implementation efforts will depend on the organization's existing capabilities, particularly in the area of technical, financial, and human resources.

What is needed to support the Asset Management approach is a logical sequence of decision steps constituting a decision framework. The framework is supported by (1) information regarding organizational goals, policies, and budgets; (2) horizontal and vertical organizational integration to implement the decision steps in practice; and (3) technical information to support the decision-making process. The critical inputs to the Asset Management decision-making framework are depicted in Exhibit D-3.

Technology enables an Asset Management system to function. Asset Management relies on technology in two key areas. First is the collection, storage and analysis of data. Data can be gathered more quickly with higher quality and spacial accuracy than ever before. These data can then be stored, retrieved and analyzed with powerful data servers and software. For example, with the advances in geographic information systems (GIS) and global positioning systems (GPS), the important spatial component of analysis can be more fully explored. With the development of faster and more capable computers, the application of more robust and sophisticated modeling software is possible.



The second important aspect of technology relates to the presentation and communication of the analytical results to decision-makers inside and outside the agency. Most DOTs have their computers on networks which allow for greater levels of communication than ever before. Again, advances in software, including GIS, allow for the presentation of these results graphically. Through advanced multimedia capabilities, today's software can effectively paint a picture of what the analysis predicts, markedly improving the communication of ideas.

The critical inputs to the Asset Management decision-making framework are addressed in the following sections.

Organizational Goals, Policies, and Budgets

Asset Management is a customer-focused, goal-driven management and decision-making process. Organizational goals, policies, and budgets establish a consistent evaluative philosophy. Goals and performance indicators are literally the levers that drive the Asset Management decision framework,

establishing investment levels that reflect service levels and resource commitments consistent with the perceived needs of the public. Analysis procedures regarding alternative options are implemented within this framework.

Decisions regarding program investments are optimized according to goals established by elected officials and policy makers. Performance goals provide a way to convey to the public how DOT officials are managing the public's assets. Asset Management provides a logical, fact-based approach to dealing with and explaining the impact of the practical realities discussed earlier.

The success of program strategies and practices is measured by changes in performance and remaining structural life. Performance criteria and measures also help decision-makers identify and target critical system requirements.

Organizational policies may be thought of as a broad overlay to the process. Nonengineering/noneconomic factors that reflect an agency's values, perceptions and predispositions may modify performance-based decisions. For example, established policies, or "rules of thumb," may direct an agency to select an investment alternative based on historic practice or other reasons. Also, management may assign noneconomic resource constraints to some asset components.

The key to establishing performance goals is determining user priorities, values and standards related to areas such as ride smoothness and overall level of service; travel time; overall system mobility; accessibility to the system; and availability of facilities. Goals may be defined in terms of the percentage of assets that meet agency performance levels, as one example.

Integration

Key to an Asset Management decision-making framework (see the triangle at Exhibit D-3) is organizational integration. The strategic orientation of Asset Management demands a system that (1) includes channels of communication which will transmit the overarching information required by legislators, the public and other stakeholders, agency executives, and front-line practitioners; and (2) will supply information and coordinating mechanisms across functions and asset classes within the organization.

The prevalent "stovepipe" approach to managing assets (discussed earlier), in which decisions are primarily driven by the objectives of individual organizational units, will be coordinated and integrated in an Asset Management approach so that communication occurs horizontally as well as vertically. A comprehensive, fully integrated Asset Management system weaves together information on all asset inventories, condition and performance databases, and alternative investment options.

Vertical communication channels start at the traditional asset management systems and continue to the highest executive-level decisionmakers. Vertical communication is essential to the success of Asset Management in two ways. First, effective communication between the various organizational levels will assist in overcoming implementation challenges by helping senior managers to understand the factors that drive decisions at the operational, or working level. Those workers on the frontline will be supplied the information necessary to appreciate the connection between the agency's strategic goals and tactical decisions resulting in particular actions. In this way, buy-in and support for incorporating Asset Management principles, concepts, and techniques into an agency's organizational culture and decision-making are facilitated.

Second, vertical communication is important in facilitating the flow of information from one level of the organization to another and beyond. Effective information flow within the DOT and from the DOT to the customer—the traveling public—is critical. Performance goals and measures, discussed in the preceding section, facilitate the education and involvement of users and decisionmakers.

Legislators and political appointees need information regarding the importance of long-term time horizons. An example of where this is important is in the need to communicate the merits of system preservation, needed upgrades, and continued operating reliability which customers expect of all the facilities and assets a highway agency manages. The relationship between preservation, upgrading, operation, and return on investment and customer satisfaction must be effectively articulated and clearly demonstrated to decision-makers.

Horizontal communication implies organizational integration and is important to the Asset Management decision-making framework because input from functions ranging from finance to planning to information management to human resources is required. To make Asset Management a viable process, managers in these various disciplines will need to be comfortable with Asset Management analyses and will need to incorporate the findings of an Asset Management process into their work. In addition, horizontal communication between those responsible for the various asset classes is crucial.

There are both opportunities and constraints facing organizations embarking on Asset Management systems. In particular, the component “stovepipe” structure provides a foundation from which to build more sophisticated data collection procedures and advanced analytical approaches. However, the stovepipe structure also fosters a sense of ownership and may discourage communication and cooperation.

State DOTs, however, have already begun to lay the groundwork in varying degrees for new formal or informal organizational structures. Many have recognized the value of communication as essential to a productive work environment and are engaged in reengineering their organizations consistent with these principles.

Technical Information

Since much data is already available, the goal is to take that data and convert it to information. This requires (1) the ability to collect, process and evaluate the data; (2) the analytical tools to evaluate and select the most cost-effective alternative investment strategies, both within and among program areas; and (3) the tools and expertise to effectively communicate this information to other groups who may not be familiar with the programs or situation. As indicated earlier, DOTs will build on current capabilities. Agencies will integrate the new with the old. They will also work to improve current approaches and tools.

Information Management

The technological strides made in information management—gathering, processing, analyzing, storing, retrieving and communicating enormous quantities of data—has made comprehensive Asset Management a feasible goal.

Asset Management is a data-intensive process and information management is at the center. It requires, for example, inventory-based information on all the assets in the portfolio of interest. This includes descriptions, types and numbers, functional responsibilities, and past, current and anticipated future condition and performance.

Many State DOTs have established databases and collection procedures that support existing component asset management systems such as for pavements, bridges and maintenance. States have made significant strides forward in deploying these systems, yet much remains to be done in terms of establishing mechanisms for bringing the data from these disparate systems to a common decision-making platform.

New Asset Management structures will build upon the existing systems and capabilities. The new tools will need to be compatible with the established systems. It is interesting to note that component management systems are not expected to be replaced, as they will continue to be appropriate for consideration of asset-specific issues such as those related to project design.

Asset Management requires much more than co-locating a collection of pavement, bridge and maintenance management capabilities under one umbrella. Improved information systems (including hardware and software), analytical tools, and interfaces between functions and asset classes need to be linked so the required information is communicated to the relevant decision-makers in a universally comprehensible form. This does not necessarily imply a single database; separate databases that include compatible referencing systems for information exchange may be appropriate. In addition to relational databases, key technologies in this area are likely to include GIS and GPS.

Questions about what data to collect, at what frequency, with what level of quality, and at what cost, need to be addressed in the context of what is required for the “bottom line” decisions. Data collection is not an end in itself. As indicated earlier, data collection procedures should be consistent with an agency’s goals as expressed in their performance measures.

Analytical Tools

Engineering, economic and behavioral models are an integral part of an Asset Management-based decision-making process. Analytical tools used in the course of Asset Management relate investment to performance of the system. The fundamental objective is to maximize benefits for users while minimizing agency costs. Asset Management recognizes the impact that the condition and performance of the transportation system has on the user as well as the more traditional perspective which focuses on the impact that the user has on the system.

The analytical tools facilitate the discussion underlying the decision-making process by providing the ability to articulate the impact of choosing one alternative over another through engineering and economic-based “what if” analyses. Increasingly sophisticated analytical applications, greater understanding of key relationships and concepts, and improved procedures contribute to the ability to credibly calculate and report the results of alternative investment scenario evaluations. These tools provide a means of quantifying and communicating the importance of transportation investments to the public and decision-makers.

Engineering Economic Analysis (EEA) provides a broad collection of tools which collectively allow competing investment options to be prioritized according to relative economic efficiency levels. These tools include life-cycle cost analysis, benefit/cost analysis, optimization and prioritization, and risk analysis. These analytical procedures consider initial and discounted future agency, user and other costs (such as external costs) over the life of each alternative investment option. They attempt to identify the option that will achieve established performance objectives at the most viable long-term cost, or provide maximum benefit for a given investment/funding level.

EEA can also quantify the risk of not realizing, in practice, the level of benefits and costs predicted by the economic/engineering modes for the strategy implemented. There is inherent uncertainty in many of the assumptions—such as resource availability, costs, weather, and travel demand—that drive the engineering/economic models. The risk is important to decision-makers and should be provided for consideration. Risk analysis models can assist with this.

Forecasting Tools. Forecasting tools are critical to Asset Management, particularly those that relate future investment levels to future condition and performance. These tools help to assess the impact of say, inadequate routine maintenance and deferred capital maintenance. Examples include probabilistic and deterministic performance prediction models and traffic forecasting models.

Group Decision-Making Analytical Methods. As a cautionary note, implementing an integrated systems approach to investment analysis presents the potential of creating adversarial situations as a result of the competition between assets within and among modes or assets. This is most probable in the case of setting performance standards where higher or lower standards imply changes in funding levels. Objective tools are available to assist in conflict resolution by helping the parties to find “win-win” solutions where all participants gain.

It should be noted that while many of the above tools appear promising to Asset Management, some have not been tested in actual practice. Therefore, future research may be called for to ascertain their applicability.

Strategies for Implementation (How Do We Get There?)

Recent Federal and State Initiatives

The American Association of State Highway and Transportation Officials (AASHTO) and FHWA have made Asset Management a national priority. AASHTO is providing national leadership and guidance to States as they work to incorporate Asset Management principles and practices into their business process. The goal is to supply generic Asset Management approaches to organizational integration, performance-measure development, application of analytical tools, and information management. These generic processes and tools may then be directly utilized (“as is”) or be applied after in-house and/or customized revisions. The potential advantage of adopting the generic approach is cost effectiveness, as well as the opportunity to share technical expertise and experience with other States.

Although the fundamental tenants of Asset Management will be visible in each State practicing the discipline, the assumptions made, the tools employed, and the information used will vary from State to State. Each State will bring its unique organizational strengths and perspective to the implementation process. In addition, each State’s Asset Management system will reflect its unique decision-making process. One size will never “fit all” in State Asset Management.

AASHTO and FHWA jointly sponsored two major executive workshops in 1996 and 1997 to explore and benchmark the application of Asset Management in transportation agencies. These workshops introduced the Asset Management concept and provided information on private-sector activities in this area. The first workshop emphasized the importance of a comprehensive approach to managing the Nation’s transportation system. Participants included high-level executives from AASHTO, FHWA and State DOTs and leaders in Asset Management from non-transportation sectors that shared Asset Management-related concerns with the transportation community.

During the second conference, participants were charged with evaluating current Asset Management practices and techniques. As discussed earlier in this Appendix, the current approach to managing assets is component-by-component. Participants also began to explore what an integrated, comprehensive approach to managing assets might mean for their agencies. A major goal of the workshop was to formulate a strategy for advancing Asset Management as a national initiative. AASHTO responded to input from this conference with the establishment of an Asset Management Task Force, development of a Strategic Plan, and sponsorship of an Asset Management Guide for State Transportation Agencies.

The AASHTO, with technical assistance from FHWA, is sponsoring a National Cooperative Highway Research Program (NCHRP) project to develop the Guide [NCHRP Project 20-24(11)]. The objective of this project is to provide:

- A synthesis of current Asset Management practices and available tools;
- A framework for an Asset Management system;
- Recommended research for filling gaps in existing knowledge and developing tools for the next generation of the Guide; and

- A first generation Asset Management Guide for use by AASHTO member agencies which will (1) offer advice on how to effectively apply and/or enhance Asset Management principles to their unique organizations; and (2) highlight case studies of best practices among the States.

This work will lay the foundation for defining initiatives to advance integration efforts within State DOTs. Upon completion of the NCHRP activity in 2001, AASHTO, in consultation with FHWA, will determine the appropriate next steps to continue to assist the States in advancing Asset Management.

The executive workshop series is recognized as a valuable forum for exchanging information and was continued with a peer review seminar in December 1999 that focused on current State capabilities in various aspects of Asset Management to include:

- Moving from a concept to an action plan
- Integrating maintenance management systems
- Integrating management systems
- Integrating data
- Assessing preservation and improvement trade-offs.

Details of State experience in these areas were shared as part of the peer exchange.

American Association of State Highway and Transportation Officials Initiatives

AASHTO has traditionally set standards and provided guides for many different aspects of transportation system design, construction, management and investment. This information provides a point of reference and guidance for AASHTO member agencies as they develop their own approaches; AASHTO standards and guides are intended to suggest and not to mandate.

In this context, AASHTO is assisting States in improving their business practices through the advancement of Asset Management principles and practices. AASHTO has taken the lead in bringing together States and facilitating knowledge sharing and resource pooling to enhance existing tools and procedures and to develop new approaches and tools.

Task Force

On November 16, 1997, AASHTO created an Asset Management Task Force of nine experts drawn from State DOTs. The Task Force's mission is to provide guidance for State Asset Management activities and develop and distribute to member States innovative Asset Management approaches, processes, and tools. Early work has included organizing the executive seminars which were discussed earlier, developing a strategic plan (see below) and sponsoring the NCHRP Guide, also discussed previously.

Strategic Plan

In November 1998, the AASHTO Board of Directors approved an Asset Management Strategic Plan. The plan establishes AASHTO's vision, mission, goals and it recommends actions regarding Asset Management. It also points the way toward work that will fill technological gaps.

The goals specified in the Strategic Plan are to (1) document the state-of-the practice; (2) conduct major seminars and information sharing; (3) develop an Asset Management guide that will document the state-of-the-practice and state-of-the-art and will bridge the gap between the two; and (4) provide needed training.

Federal Highway Administration Initiatives

In conjunction with AASHTO efforts and as part of the Agency's reorganization, the FHWA created an Office of Asset Management in February 1999. The Office affirms the Agency's commitment to partnering with AASHTO to advance Asset Management principles. The Office's primary role is to provide technical assistance by developing tools, techniques, training and consultative services to the States, as they work to adopt a comprehensive, fully integrated Asset Management program.

The Federal government is uniquely suited to provide technical assistance in the area because all 50 States can benefit from a nationally coordinated technical program, rather than 50 disparate efforts. Although the States own and operate the assets targeted by Asset Management, AASHTO has asked FHWA to help with research and development, training and other technical areas because of the expense and requirements for staff expertise associated with these activities.

The Office is composed of a multidisciplinary staff drawn from economics, engineering, policy, planning, and technology assessment areas. Three teams make up the new Office:

- System Management and Monitoring;
- Construction and System Preservation; and
- Evaluation and Economic Investment.

The teams work together on overlapping activities.

The Construction and System Preservation Team is responsible for construction and maintenance, technical support and outreach, quality management, pavement smoothness and system preservation. FHWA has placed a special emphasis on preservation as the Agency's mission has shifted from building the Interstate System to preservation of infrastructure assets. The National Quality Initiative (NQI), a partnership effort among AASHTO, FHWA, and related industry associations, is housed within this team. The NQI objective is to focus attention on continuous quality improvements within the highway industry. New team initiatives include the establishment of a joint AASHTO/Industry/FHWA agreement for optimizing highway performance.

The System Management and Monitoring Team is charged with refining and advancing pavement and bridge management systems and with developing and promoting new systematic approaches for assets where they presently do not exist, such as for tunnels and roadway hardware. The team is partnering with States and FHWA field units to develop a toolbox for implementing the new AASHTO pavement standards for the International Roughness Index, rutting, faulting, and cracking that were issued in the summer of 1999. In a related area, the team initiated a pilot study with selected States and with FHWA's Office of Pavement technology to analyze the real-life performance of Superpave pavements through the use of PMS data as an "engineering analysis tool." This project will also demonstrate how PMS data can be used as input to future pavement designs.

The Evaluation and Economic Investment Team's portfolio includes outreach activities designed to explain and promote Asset Management. It also has the lead in developing, recommending and advancing initiatives to facilitate Asset Management principle-centered strategic investment decisions. Two primary tracks have been identified: (1) identification and development of procedures to facilitate horizontal and vertical integration and (2) development and promotion of an array of procedures for inclusion in an EEA toolbox, such as life-cycle cost analysis and benefit/cost analysis.

Essential to the FHWA Office of Asset Management are cooperative programs with AASHTO, the Transportation Research Board, industry, and other Federal and State agencies to support and advance Asset Management.

Conclusion

AASHTO and FHWA are convinced that Asset Management is a better way of doing business. An Asset Management philosophy focuses on the benefits of investment as well as its costs, and takes a comprehensive view of the entire portfolio of transportation resources. Objective, fact-based tools and techniques are systematically applied to determine how best to deploy available resources in order to achieve system-wide agency goals. Asset Management is an improved way of doing business that responds to an environment of increasing system demands, aging infrastructure and limited resources.

Asset Management also provides the ability to show how, when and why resources were committed. Transportation officials are being held increasingly more accountable to their customers—the American public. The public demands a high return on the portfolio of transportation assets which, of course, represents a collection of public resources.

Making Asset Management a reality requires new information and analytical tools, new approaches to organizational communication, and new management practices. AASHTO and FHWA are both committed to continuing to work together as partners to identify knowledge gaps, develop and fund a long-term research agenda, and assist the States in implementing new tools, techniques and enhanced management approaches and business practices in Asset Management.