

Chapter 5

Performance-Based Planning, Asset Management, and Management Systems

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Implementation Issues in Performance-Based Planning

This presentation is based upon our experience at the Minnesota DOT and a review of NCHRP Project 8-32(2), entitled “Multimodal Transportation: Development of a Performance-Based Process.” This project is presently in the review stage, but for this conference, we received permission from NCHRP and principal investigator, Steve Pickrell of Cambridge Systematics, Inc., to use the information in the draft report. This report contains 10 case studies: 4 states, including Florida, Oregon, Washington, and Vermont; 3 MPO areas—the Albany, N.Y., area, the Twin Cities in Minnesota, and St. Louis—and then 3 service providers: AMTRAK, UPS, and the Regional Transit Authority in Dayton, Ohio.

The focus of the project is the application of performance measurement and monitoring in the multimodal transportation planning process. This project was conducted in two phases. Phase 1 produced Research Results Digest 226, published in July 1998.

Those of you who were at the midyear meeting last year know that Steve attended that meeting and reviewed that product with us. Phase 2 is now in draft form and the reports we reviewed for this presentation are the Final Report, the Performance-Based Planning Manual, and the Performance Measures Library.

The manual itself presents a step-by-step guide for performance-based planning. I decided to actually highlight the steps (Figure 1) because what appears on paper as a simple process is, in actuality, very, very complex and in some cases can be extremely arduous. The first step simply describes how we get started, and I think this manual is a good product for review by states that are about to enter this arena. It is also a good check for those of us who have actually gone through all of these phases. It first describes how to get started, and one important ingredient that I would like to highlight is how you have to maintain a high degree of support at the executive management level in the organization.

Not only that, but you have to consider what happens when you change administrations as we did rather abruptly in Minnesota.

Step 2 is to establish consensus as to what your agency’s activities will be, applying performance-based planning. For example, in Minnesota, we have actually now applied the process, both in the statewide and regional long-range planning.

Step 3 is to develop a working group, and the manual recommends including persons outside the agency. In our first iteration of this, we did not, and I think it was a mistake.

Step 4 is to develop goals and objectives. Now, this seems like a pretty obvious process, but the manual and the study indicates that what we mean by goals and objectives can vary among state agencies.

Step 5 is actually to develop the performance measures themselves, and this is obviously the most critical step in the process. The most important point is that the organization must reach consensus on the appropriate mix and balance of measures.

The organization must also focus on outcomes. We will talk about outcomes versus outputs; that is, trying to achieve and develop understandable measures and the context for when we go to the public. What are we going to be talking about and then how will you integrate the measures into the overall planning process?

Step 6 is to identify data needs. A lot of discussion this morning, I think, will focus on that arena by making sure that the goals determine the performance measures and the data, not vice versa. The organization may have to begin by identifying the ideal measure, but then settling for a surrogate that can be developed with more readily available data.

Step 7 is to identify analytical tools. The use of GIS and cost-benefit analyses are a couple of examples.

Step 8, and that is where we are at in Minnesota, is to report on the results.

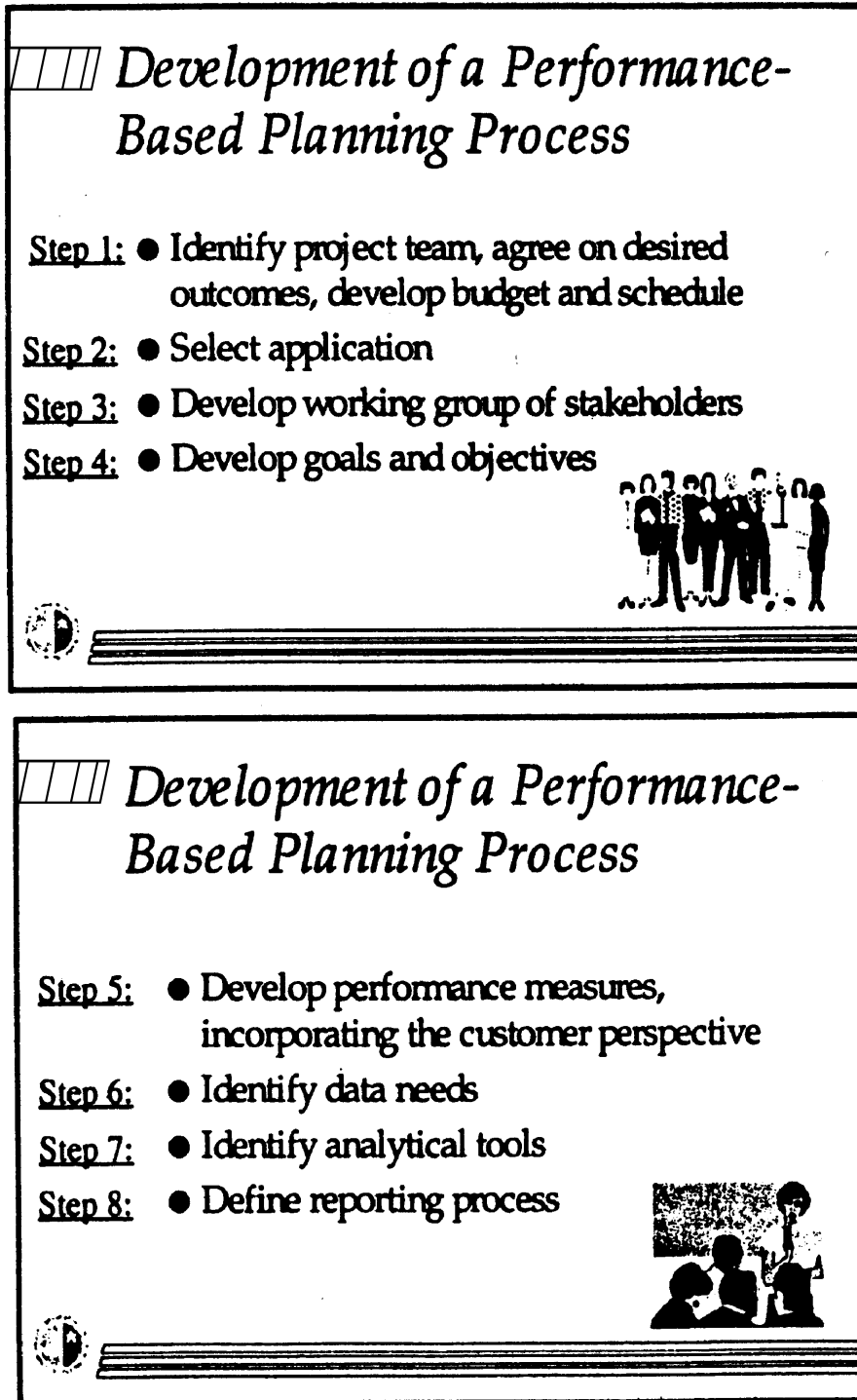


Figure 1

Generally, the amount of information provided and the level of detail will vary, moving from the least specific to the more specific down the organization.

I am adding a Step 9, and I add it because it is something we started to do last week in Minnesota, to reassess the measures in light of the data report and the data actually collected; and I will talk more about that later.

After reviewing the NCHRP report, and considering our experience in MDOT, we saw some common implementation issues throughout the country. The NCHRP Phase 2 work, as I mentioned before, analyzed 10 case studies, DOTs, MPOs, and service providers.

Implementation issues can be grouped into three categories; general observations, performance measures themselves and data collection and maintenance. There are six general observations to be made (Figure 2). The first one, we are serving an increasingly diverse customer base and undertaking new and different missions. Performance-based planning can help us to address these changing demands.

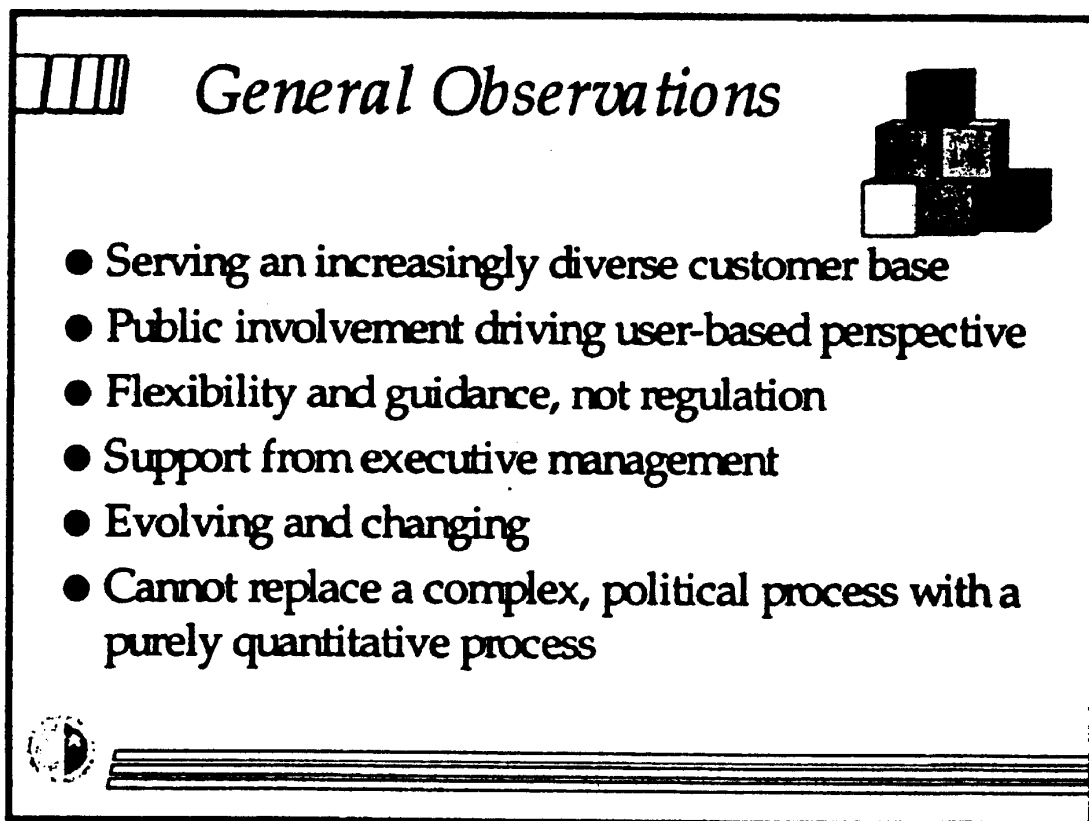


Figure 2

Number 2, a high degree of public involvement in the planning process is driving user-based perspective. Both are interrelated and the public must be involved in our process so we can understand what they value, but we in turn must provide feedback so we can explain how, in fact, their involvement affected the decisions that we make.

The third one is just an observation that states and MPOs prefer flexibility and guidance, as opposed to prescription and regulation. The context of this point has really

been the recent discussion between the federal government, the states, and MPOs regarding the extent of federal regulations.

The fourth point is as we found in MDOT and was evident in the case studies: solid support from the executive management is critical to success. Since results will not happen quickly, management must be committed to continue the program over time.

The fifth point is universal. It is a certainty that the process will evolve and changes will have to be made and we are doing it right now in Minnesota. Our review is based upon the information that we have actually collected.

Then, six, we must all remember that we cannot replace a political decision-making process with a purely quantitative process. Performance measurement can bring better quality of information to assist, not replace, a political process.

The next implementation issue concerns performance measures themselves (Figure 3). First, we have had a lot of discussion about outputs and outcomes. We feel that the focus should be on outcomes or what we are trying to achieve. A simple example I often use in Minnesota when we have this discussion refers to what our customer expectations are after a snowstorm. The outcome they expect is a quick return to safe driving conditions.

As an agency, we sometimes focus too much attention on our outputs, the number of miles of road we actually plowed, the tons of salt we actually spread, and forget sometimes what our customers really expect and want to know.

Second, the mix and balance of measures is important. The number of measures can't be too many or can't be too few. The measures selected must focus on the critical things that we do. This is an area where many ideas will be proposed before the right family measures are selected in your individual jurisdiction.

Third, another widely debated topic is agency control. Should an agency only measure things under its direct authority? If this philosophy is adopted, then how can we measure safety since many factors related to crashes are actually outside our control and are more related to driver behavior, which traditionally—but I know in not all cases—are outside the purview of the DOTs.

For example, in Minnesota lots of crashes are caused by drivers who are drunk, who are speeding, and who are not using their seatbelts. The Minnesota driving laws are enforced by the Department of Public Safety. I know in Wisconsin the state patrol is actually a part of the DOT. But in any case, measuring and what your agency controls is a big issue.

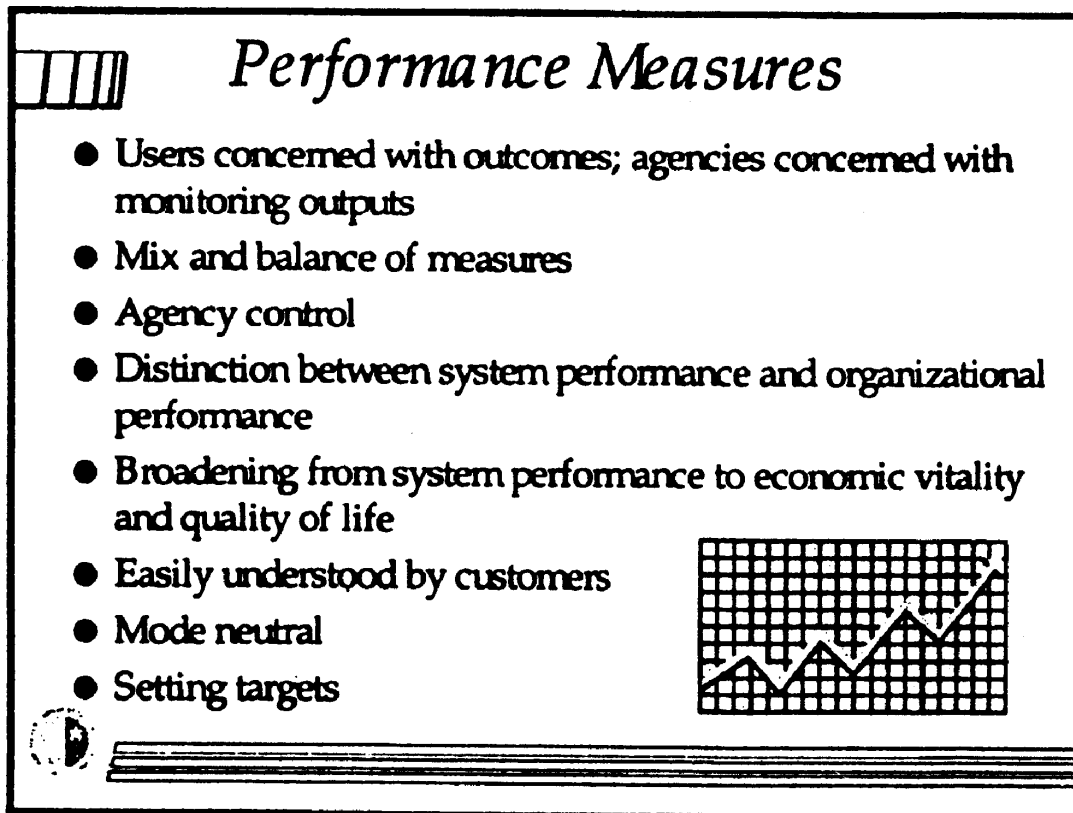


Figure 3

Fourth, there is also a lack of agreement about what performance to measure. Many organizations use performance measures only for system performance, not organizational performance. At MDOT, we are developing measures for both applications.

Fifth, system performance measures include the more traditional, quantitative measures, such as pavement or bridge conditions as we are using at MDOT. We are just beginning to use cost-benefit analysis for economic assessment, trying to develop quality of life measures is proving to be much, much more difficult.

Sixth, the performance measures should be easily understood by our customers. However, even at MDOT, we still talk to our customers about pavement quality index (PQI) and actually expect them to understand that PQI equals the square root of surface rating (SR) times present serviceability rating (PSR). So we are now finally just talking about smooth roads, which is the SR portion of our formula.

Seven, we have had a raging debate about the worth of a mode-neutral measure. Mode neutrality may be a concept in my view that is nearly impossible to attain, an ideal measure to analyze alternative passenger transportation services that does not consider the specific mode of transportation, but only considers outcome.

Then, finally, number eight, setting performance targets, which you may think of as standards or benchmarks to be achieved, is a difficult process in our agency. We have not developed a consistent process but have let each unit in the organization really

determine its own method. We are going to be revisiting that within the next two months also.

What is the appropriate role of performance measurements? Throughout the country organizations are trying to use measures for different purposes with mixed results. For example, should we use performance measures simply to monitor performance? This is almost monitoring for monitoring's sake. This is probably the least controversial and most easily accepted.

Second, should we use the measures to provide a standard by which to measure success? This gets less support since there must first be consensus on the standard.

Third, should we use performance measures to guide resource allocations? Currently at MDOT we have a process for targeting funding for each district based upon a formula, and the formula is really size and use of the system. The most controversial use of the measures will be to allocate funding to the districts based upon their performance set around a set of measures.

Fourth, should we use measures to grade and compare? This use of performance measures has prompted resistance and, again, the context for this has been the debate between the federal government and state government. If we have a set of performance measures at the state level, will those measures be used to compare states, one to another? I have to admit that debate even occurs at the state level, district to district. District engineers have asked if we are actually going to use our measures to compare performance among districts within our state. Such a comparison is still a scary prospect.

Fifth, could we use performance measures as a process for prioritization? MDOT is trying to incorporate this philosophy by using performance measures in our district plans to determine the extent and staging of our highway investments. We are also in the process of determining a statewide system of interregional corridors and using travel speed as a performance measure and actually prioritizing those investments.

Finally, the last option would be to determine funding requirements based on performance measures. This role allows us to make recommendations to policy makers, to help them make decisions by giving them good information regarding how much money we actually need to keep the system operational.

The third implementation area concerns some issues in data collection and maintenance. Data collection is labor intensive and it is expensive; therefore, executive management must make a long-term commitment not only to data collection but also to analysis.

Freight data is becoming increasingly important to planning. These data are even harder to collect since cooperation with the private sector is necessary and often not easy to obtain.

Customer surveys, especially customer satisfaction surveys, must be used carefully. This information must be professionally collected and analyzed. There is a need for a balance of perspectives, rather than a customer-only dominated view or an agency-dominated view. In Minnesota, we strive to get a balanced perspective.

Accessibility and mobility are major categories of performance. However, we often do not have the data to measure ease of access, which may require detailed surveys of time, which may not be routinely collected.

Finally, we must be able to create information out of the masses of data that we collect.

The NCHRP project, like any good research report, suggests some topics for future research. So, to prime the pump for the discussion this afternoon, they suggested three:

- The need for inexpensive, easily used analytical tools to evaluate transportation alternatives other than highway investments and to estimate future scenarios;
- Investment in ITS technologies for automated data collection; and
- Use of the World Wide Web as a two-way forum to share information quickly.

And as a final comment, I would note that what I have said about Steve Pickrell's work hasn't done it justice. I remember when I looked at the first phase of the work last summer, as a practitioner well advanced in this area, I frankly didn't find it too helpful. It talked a lot about typologies and matrices and it was rather abstract. I didn't have that same reaction to Phase 2. I hope that it comes out very soon. Yesterday we were talking about a performance measures conference in the spring, and I think that the quality of this work is so good it could be the centerpiece of such a conference.

TAREK HATATA, *Booz Allen and Hamilton*

Performance-Based Decision Making in California

For the presentation, we will quickly go through the background and tell you a little bit about the outcomes versus outputs and show you some of the preliminary results we have been able to achieve in California.

California has a bit of a different environment primarily because a couple of years ago the legislature took devolution of decision making to a level that is not seen in many other states. Basically, what happened was that the legislature decided through Senate Bill 45 that 75 percent of the STIP money of the state—and that is a considerable amount—is now in the hands of the regions for planning and decision making.

So the state now has only 25 percent of the decision-making authority as far as STIP is concerned, and one of the reasons performance measures became important was the two have to talk to each other. The regions are in charge of the regional portion of the STIP, called the RTIP, and the state is in charge of the interregional component, which is the ITIP. Obviously, there will be many projects that will both serve a regional and an interregional need or goal.

Therefore, we were hoping that, among other things, the performance measurement will create a similar language if not an identical language for the MPOs and regions to talk to the state and vice versa.

The goals that were set for the project were (1) to develop indicators and measures to assess the performance of California's multimodal transportation system to support informed transportation decisions by transportation officials, operators, service providers and system users; and (2) to establish a coordinated and cooperative process for consistent performance measurement in California.

The informed decision-making part of it is the agreement that there is a political process involved and the best thing we can do is to inform, give them the best information possible. And then have the decision makers make the best decisions with that information, as opposed to not giving them anything or giving them too much.

The other goal is to do a coordinated, cooperative process. Because they wanted to speak the same language, we developed the stakeholder involvement group, both on the policy and the technical side. The way that we wanted to do that is we want to do monitoring and forecasting, not just monitoring, but we wanted to be able to see where we are today and, given different levels of investment, where are we going to be tomorrow. We need to inform decision makers but also to inform the users so they know what they are paying for and they know where they are going. There should be no surprises thus helping to establish public accountability.

Two years ago, when this project started, the California DOT (CalTrans) was probably way behind the national trend in implementing and adopting performance measures. I think there is a feeling now that at least we have caught up, if not in some cases gone ahead. We had a recent performance measurement conference in Sacramento where we saw what the other states were doing and they saw what we were doing. I think the feeling is that we have caught up.

The overall approach was to start with outcomes (Figure 1). We didn't want to start with indicators; we wanted to start with outcomes, come up with candidate indicators, test them before we go and do a whole lot of data collection or a whole lot of system tools, and then do gradual implementation.

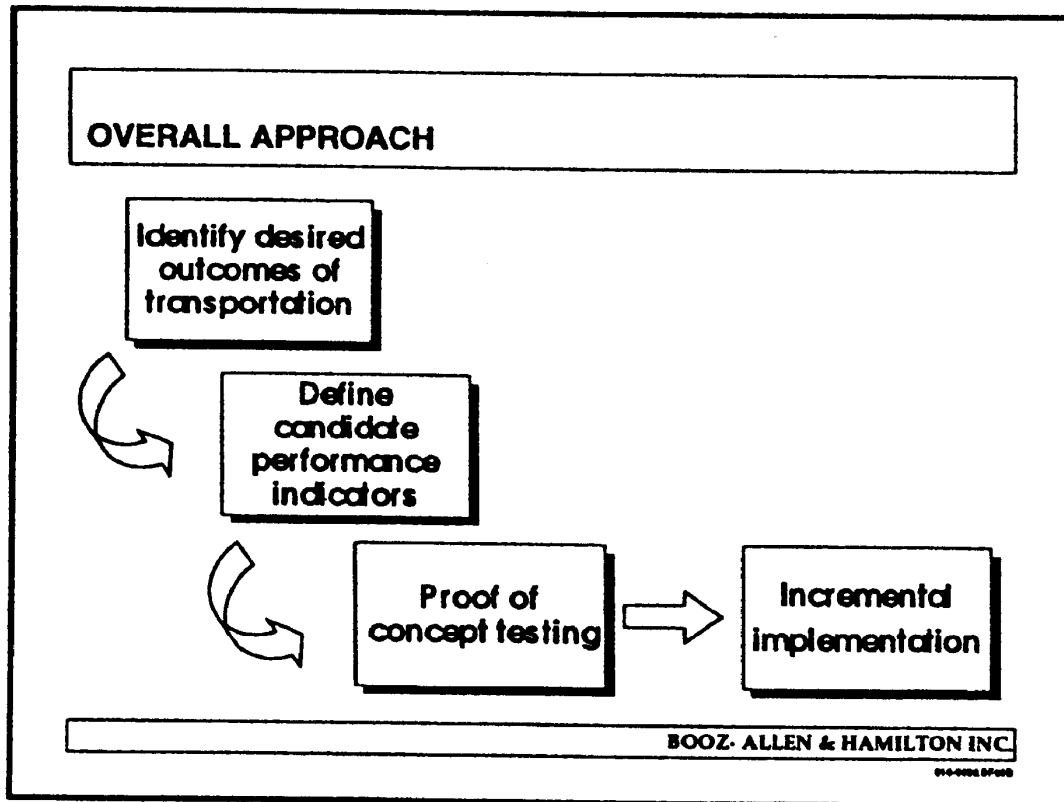


Figure 1

There were nine outcomes selected:

- Mobility and accessibility
- Reliability
- Safety and security
- Cost effectiveness
- Economic well-being
- Sustainability
- Environmental quality
- Equity
- Customer satisfaction

If that seems like motherhood and apple pie, that is for a reason. We wanted to come up with a group of outcomes that could be as encompassing as possible. So, if one region wants to focus on an environmental quality, they can do that. If another region decides, for whatever reason, they want to focus just on mobility and accessibility, they could do that and everybody could still talk the same language.

That doesn't mean that every region has to look at all nine or even that the state will look at all nine, but it tells you that if you select one of those or multiple ones, then you have these outcomes to monitor and forecast over time.

The relationship between outputs and outcomes is shown in Figure 2. Traditionally we have been looking at outputs such as vehicle miles, center lane miles, and so forth. We want to move toward outcomes. Outcomes, however, cannot be measured directly, and that is one of the reasons why a lot of the states, including CalTrans, have had a hard time coming up with one indicator that best describes an outcome. That is why we are talking about candidate indicators.

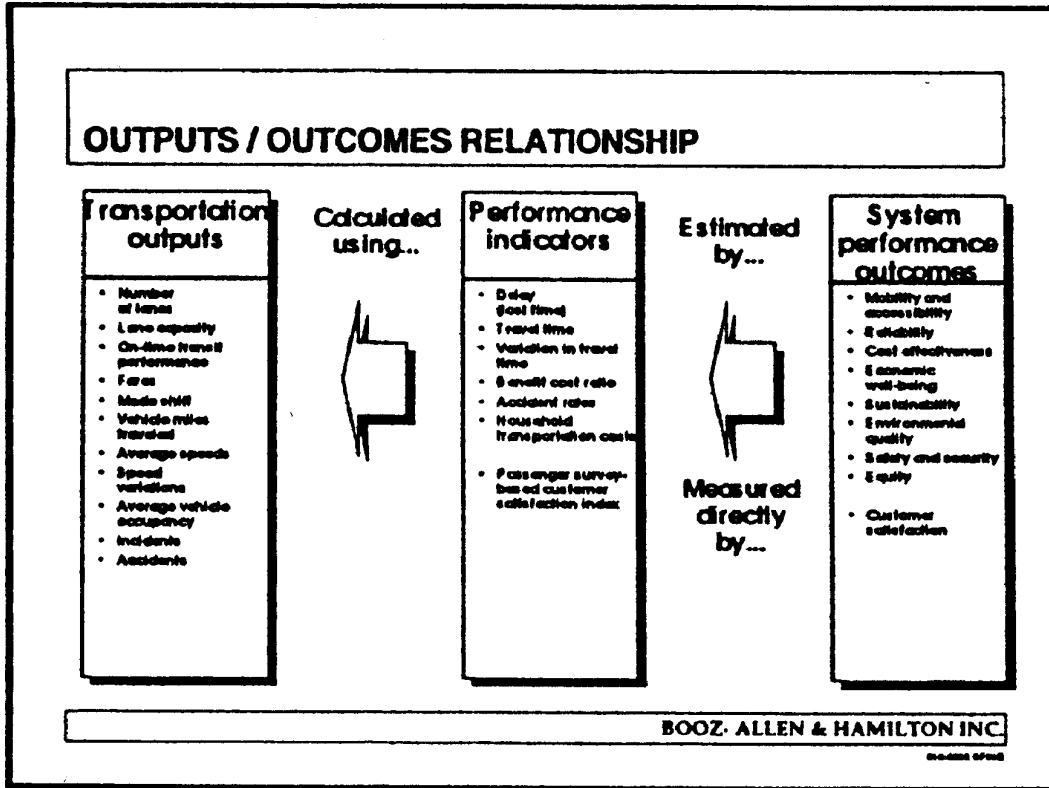


Figure 2

The performance indicators use the outputs in a manner to reflect the outcomes. The indicators themselves may have to change over time. They may have to be modified and revised or tailored because if one indicator is used for a long time period, people will learn how to get around it. I will give you one such example. Booz Allen was doing a job for the Russian Railroad system, and as part of job we had to send one of our senior members traveling all around the country on a freight rail train. I asked, “What is your origin and what is your destination?” The distance was only 300 miles, but they were traveling in the neighborhood of 2,500 miles because their performance measure was ton miles. So, by God, they were going to meet their performance measure even if they had to do a circuitous route for a very short distance. That is why we have to be very careful of the indicator part. People know how to break the system.

We wanted to do an incremental implementation and partnership with the regions, an approach that is similar to what other states have done. In California, they have to do it because of Senate Bill 45. Seventy-five percent of the money is going to be decided by the regions, so this coordination is a must.

Once we came up with the outcomes and the candidate indicators, we started in the testing phase. In the testing phase, we said let’s see what can we do with existing data, fully understanding that the existing data is not going to meet all of our needs. But let’s see how far we can go with existing data, get it from around the state, and also try to see how close can we get to having mode-neutral indicators.

We wanted to also look at both the monitoring and the forecasting phases. If you just monitor and you cannot do a what-if analysis, it doesn't take you very far. We tested travel time, delay, accessibility to desired location, and accessibility to transportation systems. Since the initial effort, we also tested economic well being, safety, and others. In the end, there were two that we focused on in the first phase of testing.

The first is door-to-door travel time, which is really the ideal mobility indicator, at least as far as our constituents tell us. It is very difficult to calculate at this time. There are very promising technologies being developed and implemented that may allow us to do that in the near future, but right now it would be very expensive to come up with door-to-door travel time taking into consideration items like intermodal transfers and access to the highway and local streets. Therefore, we focused on the delay indicator for mobility. We used loop detector data, which are very prevalent in California in almost every urban area, and we looked also at the regional models and how comparable they are. For delay indicators on public transportation systems, we looked at the schedules and the on-time performance.

When we tested these indicators in the San Francisco Bay area, one of the things that we found is that just looking at average daily traffic or peak volume doesn't tell you what is happening with delay. In many, many cases, and we have over 5 gigabytes of data analyzed, you will find is even though the volume is lower for a number of reasons, be it ramp metering, the number of incidences, the way that people get on and off the freeway and so forth, there are many instances where peak demand was lower but delay was significantly higher. That is an interesting phenomena where I think performance measurement and indicators can help planners try to understand what is happening there and develop some relational tools.

Regarding public transit, where we don't have the same electronic data available, we looked at schedules. In order to have a delay indicator similar to the one for highways—for highways it is the difference between posted speed and actual speed—we decided that it should be the difference between the optimal travel time and the scheduled travel time because the scheduled travel time takes into consideration the delay that the bus company or the rail company expects.

We feel that the delay indicator really is multimodal, at least as far as this definition is concerned.

We also looked at accessibility indicators. The prevalence of GIS and, hopefully, the 2000 census will give us a whole lot of accessibility data and analysis capabilities that 10 years ago were not available. For example, we put a contour around highways to see how many people live within one or three or five miles from a highway segment or a ramp.

We did the same thing for transit routes. With this method you can look at accessibility, both to the highway system, to the transit system, and so forth.

Another very interesting indicator is what we call reliability. There was a survey in Los Angeles a couple of years ago that came up with an interesting conclusion; the customers fully realized they are not going to be able to drive free-flow speeds during peak hour anymore, and that we are not going to build ourselves out of congestion.

But one of the things that they did stress in the survey was that if we can just be sure or almost sure that my trip from home to work or from home to shopping will almost be around a half an hour, I can plan for that. What they don't want is for it to take 20

minutes 1 day, 45 minutes the next day, up to 1 hour and 10 minutes the day after, and then 15 minutes the day after that. This is what the reliability indicator tries to look at.

Here is a very quick example. You could have two highway segments or two rail segments or two bus routes that have the same average travel time, but one stays very close to the average and one goes up and down. The one is very reliable and the other is not. We have a lot of data on this, and if you want to look at the research, please contact myself, Yonel, or even CalTrans and I am sure they will be happy to share that information with you.

One of the things we found is that reliability differs very much among segments. There were some segments where reliability was as low as 45 percent and others around 80 percent during the peak and, again, that is very good information for research and planning.

Before I summarize, one of the things I want to say is that the current generation with access to the information superhighway is demanding more information. We are not sure yet what are we going to do with the results of the reliability indicator. We don't know how to forecast reliability. We don't know how to say if you do this and this with ramp metering, you are going to improve reliability. But starting with a base of good information will really, hopefully, explode the research and get us further along in terms of modeling and simulation.

If you look at the Internet, there is a lot of useful information that all of us browse through and look at. If we bring enough information about the transportation performance and the system performance, there will be people who will be able to develop the tools and methodologies to take us to the next step.

The final figure (Figure 3) provides a summary of our findings.

SUMMARY OF FINDINGS

- **Mobility indicators can be computed for both monitoring and forecasting purposes for both highways and transit**
- **Loop detector data and schedules are good sources for mobility monitoring**
- **Regional models can be used for forecasting**
- **Gaps in data exist, but most congested areas are well covered**

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SUMMARY OF FINDINGS

- **The reliability indicator can be computed only for monitoring purposes**
- **Tools for forecasting reliability have not been developed**
- **Reliability is most critical for urban areas where data are generally available**

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Figure 3

MARY LYNN TISCHER, *Volpe National Transportation System Center*

Asset Management as a Tool for Statewide Planning

I will talk about asset management and how it fits into the long line of approaches developed to provide a more systematic way of thinking about transportation questions. I will describe what it is and how the components interrelate. I will also report on a survey by the AASHTO task force on asset management.

The desire to have a more coherent objective and systematic approach to transportation decision making is, of course, not new and if we view federal laws and regulations as being illustrative of that and indicative of the increasing requirement to develop objective approaches, we can see the evolution.

Certainly, the planning requirements themselves can be considered as a major approach to generate systematic decisions in terms of providing transportation services and making transportation decisions. They also provide for a packaging of projects to address situations throughout the state, as well as looking at items on a project-by-project basis.

The planning regulations and requirements also have a direct effect in requiring the transportation professionals to address the impact of transportation projects and decisions.

The seventies introduced the concept of system management, albeit not in terms of long-range planning but rather in terms of short-range decisions that were made. And, of course, the Clean Air Act required the transportation program to relate to the environment and with the conformity requirement, the need to address an air-quality budget.

ISTEA literally required management systems and, by forcing the long-range plan to be fiscally constrained, also added greater discipline to the transportation planning process. Other concepts have been introduced into the transportation field disciplines from the business environment including the need for systematic planning and for accountability in transportation decisions, whether that be strategic planning, quality initiatives, or performance-based planning as we just discussed.

The most recent concept is asset management. The first question, of course, is what is it? There are a lot of definitions that are bandied about in the literature. Some focus on the physical components alone and deal with development of inventories, essentially knowing what your assets are, knowing where they are, and having basic information of a descriptive nature and limited information about the condition of those physical assets.

Some would go the next step, adding not only condition information, but also information on how that condition results in a performance on one of those assets. Some would go even further and include investment analysis information as a key component of asset management itself and that then goes the next step of relating performance to investment levels.

AASHTO has sponsored two conferences on asset management. The proceedings of the second conference defined asset management as a “systematic process of maintaining and operating physical assets cost effectively.” They also go a little bit

further in that “asset management must provide the critical ability to clearly demonstrate the implications of all of the investment alternatives.”

So, essentially the AASHTO definition includes the systematic approach, involves cost-effective operations and looks at the implications of investment alternatives.

As it is generally described, it is a decision-making tool, allowing for objective investment with the aim of resulting in a bigger bang for the bucks. I would sum those all up and define it in this way: “asset management is a systematic approach to maintaining, upgrading, and operating transportation systems, which seeks to maximize system performance through cost effective investments.”

The focus is on the entire system, not just on the components of the system, and it addresses the whole system over time. Thus, it introduces the concept of a life-cycle perspective so that the performance at any one point in time is the result of accumulation of the actions taken previously. Asset management is the sum of those individual actions, and it is the sequencing that is evaluated rather than each separable action.

What that does, of course, is to result in different decisions than if you were to evaluate each decision individually. One might say that the differences between existing or perhaps old asset-management systems and current asset-management systems could be described in this way. The scope is different. Some of the older management would deal with individual asset classes; for example, a pavement system or bridge system, whereas the current concept of asset management is actually to deal with a total system to essentially take all the classes and how they relate to one another.

The focus of the older systems was generally on physical condition, whereas a current asset-management system would go further and talk about conditions and performance and then also relating these to investment levels and how they affect those conditions and performance.

A number of management systems were used to evaluate maintenance strategies; however, an asset-management system, in general, would support the decisions about maintenance versus capital expenditures and assume that there are investments that can be traded off and that you can, indeed, do that.

The approach is, obviously, interdisciplinary. The asset is viewed not just as an engineering element, but rather as an economic unit. The goal is to address the system performance, as we have discussed before, and to make efficient decisions to ensure mobility. This approach assumes that tradeoffs can be made and implies, by definition, that there is an optimization process that is being pursued.

An example at the national level would be the Highway Economic Requirements System (HERS) model that provides the condition and performance report to Congress. It is only at this point a report on the National System of Roadways, although the report contains also some bridge discussion.

The HERS model itself includes a series of strategies that are estimated over the life cycle of the pavements and then assesses which strategy is most effective in comparison with the others. You can reestimate strategies based on a level of funding if you want. The concept here is, of course, to progress beyond just a pavement system to include the entire transportation system.

So, in essence, the steps in an asset-management system would be the inventory of the assets, identifying their condition, relating them one to another, and determining

how that total affects the system performance, relating expenditures to performance and condition and then evaluating different investment levels and, therefore, different maintenance capital and operating strategies.

Currently, most state transportation departments have systems for managing physical infrastructure, particularly pavement and bridges, and most of the systems enable the agencies to target budgetary resources for the maximum effect on the condition of the infrastructure.

The AASHTO task force on asset management has sent out a survey, and here are the results to date. There are 30 states that have responded to the questionnaire.

All 30 states have inventories and management systems, all have pavement- and bridge-management systems. About 23 of them have safety systems, and just about all of them have transportation inventories and management systems. Twenty-nine of them have condition information that is associated with those systems, particularly for pavements and bridges, and then various states have various other levels of information relating to some of the other systems that they have.

Twenty-seven states have performance information specifically for pavements and bridges. Fifteen of the states, about half of those that have responded, have performance information on the safety system as well as on the transit system. Twenty-five of them have at least one management system that includes a way to assess the impact of different levels of investments.

Another element in asset management is the idea of being able to know what you have in economic terms, which is, in essence, the evaluation of the assets. Eleven out of the 30 states have attempted to value the assets in some way, most of which used replacement costs.

Implicit in the concept of asset management is that it evaluates assets over a lifetime or a life cycle, and it allows for tradeoffs among the investment decisions. About 83 percent of the states that responded have some kind of a life-cycle analysis; 30 percent have some type of tradeoff analysis. Eighty-seven percent have some cost-benefit analysis, and 13 percent have some other type of quantitated investment analysis. Twenty-three percent of the states analyze across modes.

About 1/3 of the states use investment or cost-benefit analyses for determining capital versus maintenance investment decisions, maintenance expenditures, or operational investments. Sixty-seven percent quantitatively evaluate the effect of expenditures on system performance. Forty percent have some kind of a mechanism that will automatically update system conditions based on expenditures.

Because the concept of asset management is holistic and in theory would address all of the elements within a DOT, I was interested to see how the states were organizing themselves to address asset management. One way to get at this question was to analyze who responded to the AASHTO survey. About 10 percent of the people who responded were the financial people in the state, 30 percent were in the engineering area, 23 percent in planning, and then 37 were other, so it was spread all over the map. One state even has a division of asset management.

The other thing I was interested in was whether 1 individual had been assigned the responsibility for asset management, and 40 percent of them said yes, indeed, there was 1 person, 1 point of contact for asset management.

In summary, most of the states have the building blocks and, indeed, many are already doing some aspect of asset management, although they may not call it that. But to wholly implement asset management is not as simple as it seems. In theory it is easy and in practice it is not. Implementation assumes, for example, that one has the basic data to drive the decision process. And, yet, there are still many questions that we have been talking about for many years: how much information you need, what kind, whether it is worth the cost of having large inventories, and whether it is worth the cost of continuing to update it, and if so, how often?

Implementation also assumes that the relationships between condition and performance are clear and known. I think there are many areas where we can't say that and if we can say it about a specific component of a specific physical infrastructure, we can't necessarily say how the individual components together combine to produce the performance of a system.

Implementation also assumes that a framework is available to allow comparisons and it assumes the tradeoffs can be made because you have that basic framework. It also assumes that we know how investment decisions affect performance. These are still basic planning questions however.

Asset management helps us, I believe, to think about those questions in a very productive way. It reminds us that planning is all about making good investments and improving the transportation system, enhancing the mobility of individuals and the movement of freight.

Asset management is part of planning. But it is not all of planning and it depends most fundamentally on an explicit understanding of the values that each state and local government assign to the components and how the transportation system is seen in relation to other systems—economic, social, and environmental.

PETER KOLAKOWSKI, *Virginia Department of Transportation*

Management and Management Systems Use in Statewide Planning

I would like to present to you Virginia's experience with asset management. Mary Lynn did a nice job of setting the table by pointing out that while everybody thinks they know what asset management is, it is very difficult to do because it involves change. And everyone who has been involved in trying to achieve change knows the difficulty involved.

Thank you for the opportunity to present Virginia's experience because I think we do have something that we are trying to do as the whole picture of asset management.

Let me start off by giving you just a brief overview of what I am going to talk about in the next few minutes. We look at asset management in the whole transportation system in the great Commonwealth of Virginia and we tie it to our mission and values and purpose of the Virginia DOT. So, therefore, I want to give you a very brief overview of what VDOT is, how asset management is tied into our strategic plan, what our definition and practice of asset management is and where it is headed and then give you a quick summary.

The commercial message is in Figure 1. We are responsible for 56,000 miles of roads in Virginia. As VDOT, we are the third largest state-maintained system.

Predominantly, it is the secondary system that makes up most of that mileage. This fiscal year, we are at \$2.6 billion, and you can see how much we are pushing through each one of the maintenance and construction programs.

VIRGINIA DEPARTMENT OF TRANSPORTATION OVERVIEW

- Highway System
 - 56,000 miles of Interstate, Primary, Secondary, & Frontage Roads
- \$2.6 billion budget for FY 00
 - Highway Maintenance Program- \$771.4 million
 - Highway Construction Program- \$1.3 billion
 - Street Maintenance Payments- \$202 million
- Other Modes Support
 - Department of Rail and Public Transportation
 - Virginia Port Authority
 - Department of Aviation
- 10,500 employees in 300+ offices throughout Virginia

22 July 1999 - Virginia DOT

TRB/ AASHTO Asset Management - Peter R. Kolakowski

Figure 1

We also provide dollars to the other modes: transit, ports, and aviation. We have 10,500 employees to help us do this, as well as close to 7 million citizens in the state of Virginia who tell us what to do.

Our strategic plan was developed in 1995 (Figure 2). Our purpose in life is to “Keep Virginia Moving.” We established a mission statement at that time to become the most effective customer-oriented public agency in Virginia by the year 2000. We have revised our mission statement over the last few months. We kept our purpose the same, but we revised our mission statement. We plan to publicly announce the changes in the next few months.

We felt we have declared victory with our current mission statement. Our new mission statement is going to state that using outstanding customer service, we will build, maintain, and operate a surface transportation system that represents the highest standards of safety and quality in the year 2006. That is going to be our goal as we move forward into the next millennium.

Our strategic plan has been tied to strategic outcome areas. Back in 1995, we established four: customer satisfaction, employee satisfaction, construction program

AGENCY STRATEGIC PLAN

Purpose Statement:

“WE KEEP VIRGINIA MOVING”

Mission Statement:

*“WE WILL BECOME THE MOST EFFECTIVE
CUSTOMER ORIENTED PUBLIC AGENCY IN
VIRGINIA BY YEAR 2000”*

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Figure 2

delivery, and maintenance and operation systems. We established a number of baselines and we have updated those since 1995.

We have gone from 13 to 18 performance measures with our update of our strategic plan and we have added two more outcome areas that we need to provide measurements for: financial management and technology and information management.

Now, what is asset management as far as we are concerned (Figure 3)? What we look at as our asset management concept looking at our total system is that we want to make sure that we identify and manage customer expectations. It is not only telling the customers what to expect, but also hearing what they have to say. Every day they are telling us stuff, whether they say it verbally or through letters or they don't say anything at all about what we are doing, we are getting feedback from our customers. As indicated through our performance measures and our strategic outcome areas, we are trying to make sure that our strategic plan is customer service driven. We want to make sure we develop optimal products and services and it is done either on the stateside or with public-private partnerships or total privatization.

ASSET MANAGEMENT CONCEPT

- Identify and Manage Customer Expectations
- Align Agency Strategic Plan with Customer Service Focus
- Develop Optimal Products and Services
- Assess Current and Long Term Infrastructure Asset Needs
- Plan and Execute Resource Commitment Strategy Targeting Net Outcomes vs. Gross Inputs/Activities
- Involve Stakeholders in all Steps

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Figure 3

We want to make sure we assess current and long-term infrastructure needs and are able to fully document, plan and execute. The bottom line is to make sure we have a return on investment and then, very importantly, that we involve all the stakeholders in every step of the process.

The following is our definition of asset management: VDOT's asset-management program facilitates an environment for people, processes and technological services to come together for optimal maintenance and operation of Virginia's road transportation infrastructure assets, as well as providing a framework for planning, the promotion of safety and providing customer service. As you can see, we want to make sure that this is an integrated and comprehensive approach to the planning, construction, and maintenance of our surface transportation system and all components of it in Virginia.

Now, how are we doing this? We have defined asset management, and we needed to start somewhere.

We are starting with our maintenance and operations program. We want to roll it next into our construction program and then finally roll it in through our transportation planning processes. In maintenance and operations, what we call our state force effort, is really what we are doing with our own maintenance forces and with our own maintenance and operations program. We have tied this effort to what we are doing with our information systems and the use of technology. You have to keep in mind that technology is a means and not an end. With that in mind, we have developed what is called an integrated maintenance management program that encompasses a number of

subsystems that have clients, are real time, and are interconnected with our GIS system and our financial management system.

In doing so, we came up with an overarching framework that is called the integrative maintenance management system (Figure 4). This system includes developing an inventory and condition-assessment system. You can see the 6 groups that we are inventorying, including all of the assets within the 56,000-mile system that we have within Virginia.

MAINTENANCE AND OPERATIONS STATE FORCE EFFORT

- Integrated Maintenance Management Program (IMMP)
- Encompasses systems that support:
 - Integrated Maintenance Management System (IMMS)
 - Inventory and Condition Assessment System (ICAS)
 - Assets categorized into six groups:

Pipes and drainage	Structures
Roadside	Special Facilities
Traffic	Pavement
 - Pavement Management System (PMS)
 - Bridge Management System (BMS)

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Figure 4

We are also updating our pavement-management system as well as fully integrating our bridge-management system into this desktop environment that is available to literally the 300 locations within Virginia. Probably more important, what we have underway for the last 2½ years is for 25 percent of our 1,100-mile interstate system in Virginia. The Public/Private Transportation Act of 1995 (PPTA) allows for public-private or privatization partnerships to be established for maintenance, construction, and really any effort that goes on in Virginia.

A firm called Virginia Maintenance Services (VMS), a consortium of firms, came together to provide for a total turnkey maintenance operation of 25 percent of our interstate system (Figure 5). We have a number of assured outcomes of all inventoried items on half of our I-95 corridor and a third of our I-81 corridor, which are 2 major north-south routes through the state of Virginia on the East coast.

MAINTENANCE AND OPERATIONS PUBLIC PRIVATE PARTNERSHIPS

Highway Asset Management

- Turnkey Maintenance Contract Based on Asset Management Principles
- Assured Outcomes
- Guaranteed Savings
- Work Includes:

•Pavement	•Snow and Ice removal
•Bridge/Tunnel	•Traffic Control
•Aesthetics	•Roadside
•Drainage	•Emergency Response

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Figure 5

The work includes everything from pavements to bridges, the aesthetics, drainage, snow and ice control, traffic control, all roadside side maintenance, and emergency responses to any major incidents. This is a 5-year pilot and it is a long-term fixed project that, as I indicated to you, is 2½ years in the making.

Figure 6 shows the time line to give you an idea of what we are doing with asset management. You can see where we have the state effort underway in 1999. We have pilots going on to do an inventory in an urban, suburban, and rural county. We have the VMS, which is represented by the PPTA arrow, halfway through, and we are looking into the years 2001 and 2002 to do a statewide rollout of asset management for our total-maintenance program, our construction program, and our planning program. These are all tied back to our outcome areas to measure and assess the results.

In summary, the challenge that asset management is a different way of doing business. There are a lot of cultural issues that need to be addressed both internally and externally. Not only at the executive level, to get that executive buy-in to make it work, but also down at the maintenance levels. You wouldn't believe the number of letters and concerns that we got from employees, legislators, and even the industry about the way it changes the approach to business, as well as bidding and letting of contracts.

To achieve partnerships for success, you need to look at what the industry provides you and the flexibility and the ability to change with the industry. With the VMS contract there have been new techniques, new ways, and cheaper ways to do maintenance. This has brought us the work in a more cost-effective way, optimally using

technology and changing the services incrementally, not all at once, because change comes hard.

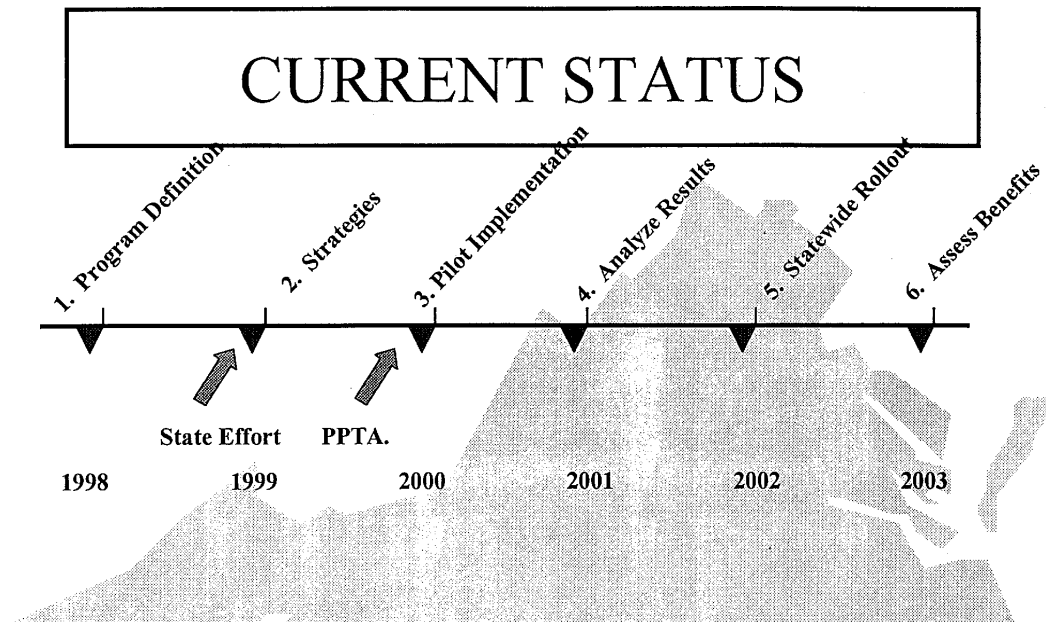


Figure 6

More important, it is all tied into your strategic plan and it helps to promote both internally and externally what your purpose, mission, and values are as an agency.

SUMMARY OF DISCUSSION

- There are three types of performance measure evaluation strategies: peer-to-peer, measurement against a standard, and tracking performance of an agency against itself over time. The experience has shown the last method to generally be the best.
- We have not been focusing on the right outcomes and outputs. Regional models deal with averages, but customer and user needs relate to real conditions such as system reliability.
- The right performance measures and measurement analysis process can be very effective when dealing with the budget process and the legislature.
- One of the major questions for asset-management systems is how to make multimodal tradeoffs. Some systems can deal with modal interconnectivity. But if it is difficult to get highway-management systems to talk to each other, then it is more difficult to get highway systems to talk to transit systems, particularly when transit systems are owned and operated by different agencies.

- Private sector maintenance was difficult in the first year in Virginia, but now is doing very well.
- There is a need to consider systems management in asset management, and much work remains to be done.
- There was a discussion on whether asset-management systems were worth the effort. Some of the comments were:
 1. A different approach would be to take the value of the commodities that flow over the system and relate that to the economic viability of the state.
 2. There is value from an institutional viewpoint in just trying to implement an asset-management system.
 3. An asset-management system will keep your assets in the best condition for the lowest buck. A performance-based planning system will identify the investment for improvement that will give you the best benefits for the lowest dollar. System management is going to be as important, if not more important, than the other two because you are not going to get too many more dollars for improvement. At best, if your asset-management system is perfect, you are going to keep your current condition well. As the demand increases, system management is really one of the more promising areas for being able to maintain the overall performance of the system.

SUMMARY OF WORKSHOPS

Most of the discussion was oriented toward system investments/management. There was little discussion regarding applying performance planning to the internal management of transportation organizations.

There was general consensus that peer-to-peer reviews are inappropriate and counter-productive.

Most states were moving in this direction, but “startup concerns” were expressed; for example,

- What are the right outcomes?
- What are the right indicators to measure these outcomes?
- How to deal with delay from the time of the investment to the measurement of the outcome?
- How to minimize risks of the learning curve?

The interrelationship between hard-side and soft-side drivers was discussed. Some felt programming decisions should be driven entirely by customer-oriented outcomes, and some felt cost-beneficial asset preservation of the physical plant was an a priori responsibility of departments’ investment decisions.

All groups recognized importance of politics/policy makers. They can effectively support, or can dismantle.

An approach that recognizes all three legs—policy, technical customer input is appropriate (Figure 1).

Relationship Between Performance Planning and Asset Management within Agency Resource Allocation

Graphic B

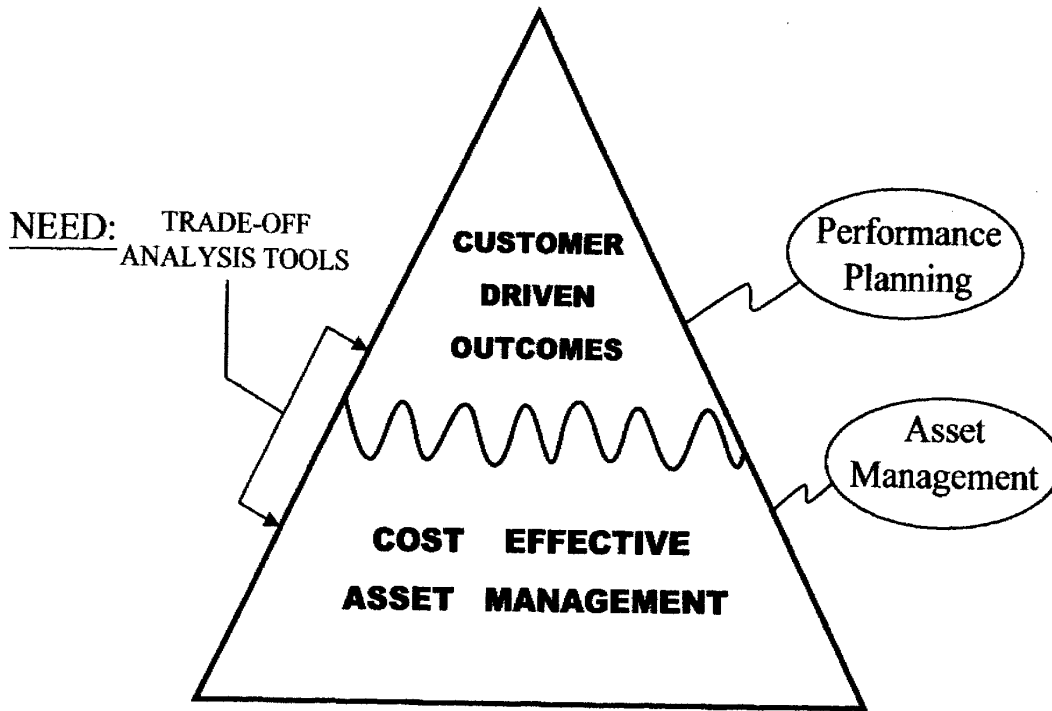


Figure 1

There was also clearly a need for technical tools that can analyze tradeoffs between customer-driven outcomes (performance planning) and cost-effective asset management for use in investment decisions (Figure 2).

Data

The general consensus was that managers need better/more/cheaper data. How to best turn an avalanche of ITS data into useful information? What’s the right data to describe and track outcomes? How to best frame surveys to get at what customers really want, and how to get these to reflect differences including intrastate regional differences? What’s the link between outputs and outcomes? How much precision is needed? For example, in Atlanta they need real-time ITS information to manage congestion. On the other end of the continuum is a rural state like Alaska where a panel of citizens would all reach the same conclusion regarding what is congested. Be pragmatic—discontinue unused databases and make all data accessible.

The Three Legs of Balanced Decision Making

Graphic A

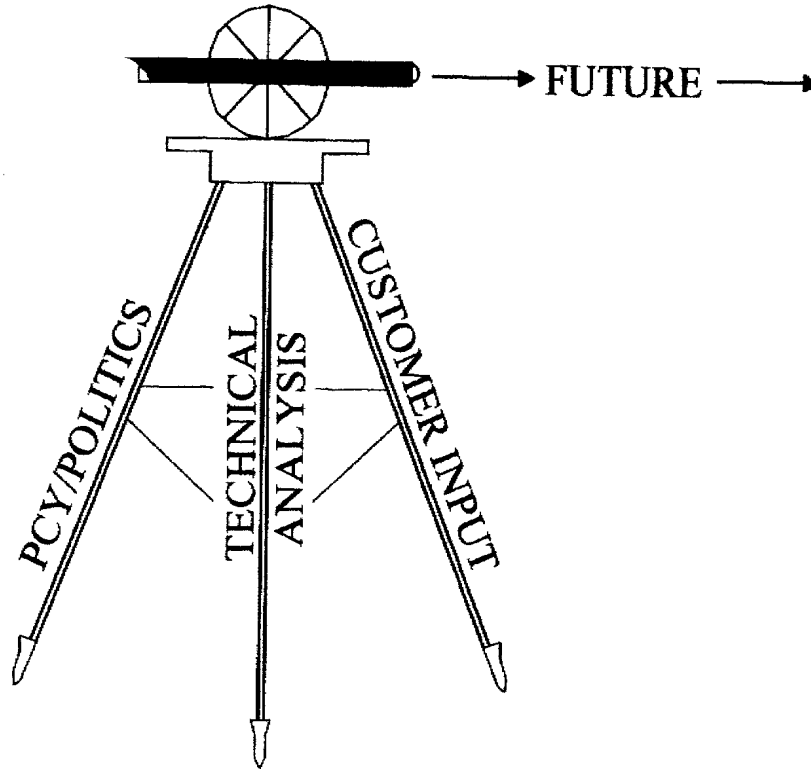


Figure 2

Jurisdictional issues were identified as a concern with no consensus on an approach. In short, the question is how or whether to develop performance objectives for modes or areas not under the jurisdictional control of the agency.

Research Topics

Multimodal tradeoff analysis tools, including tools to analyze tradeoffs between outcome driven performance planning and fiscally driven asset management.

There is a need to gather information to better understand freight movements and the areas of freight movement that state DOTs can impact. Also, what are good freight performance indicators?

There is a need to evaluate the human resources needed to drive these systems. Not only staff size, but also staff skill sets and where they're located within the organization's structure.

There is a need to develop new communication tools to obtain good customer information and communicate with policy decision makers.

There is a need to gather information on how states are incorporating less quantifiable objectives into investment decisions (economic development/quality of life).

Where is the most effective work being done on pavement and system management and what are the most successful institutional arrangements?

It was also suggested that there is a need to develop alternatives to indices because of their rigidity.

A useful synthesis would be to monitor states (outcome measures, data sets, etc.) and see what similarities are emerging as common points of departure?

Research Technology

How to incorporate remote sensing? How to anticipate advances that will impact the performance of the systems? ITS/GIS interaction and how to customize to support decision making.

Customer Surveys

Research into

- Case studies on effectiveness of communication
- Methodologies
- Need to investigate privatization and outsourcing on maintaining the costs/condition of the asset.

No one suggested research into a set of national performance objectives.