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# ABC Logistics

## Background

ABC Logistics is the logistics operating division of a \$16 billion high-tech distributor of electronic components, ABC Company. The parent company provides wholesale electronic components, subcomponents, and technology solutions to Electronics Contract Manufacturers (ECM), electronic component suppliers, and manufacturers of electronic products such as computers, DVD players, cell phones, and flat-screen televisions, as well as value-added resellers (VARs) who supply those manufacturers. It intermediates between the high-volume needs of global ECM companies and the large and fragmented base of smaller suppliers that deal in small orders and typically process orders in a job-shop, one-by-one fashion. About half of its revenue comes from parts and about half from technology and configuration services. It competes with other global electronics distributors.

ABC Logistics provides transport carrier and inventory management, incoming product inspection, and warehousing services for ABC Company as well as for independent customers. It also installs and configures electronic units such as point of sale scanners and related apparatus. Though critical to the delivery and customer satisfaction, it represents about one percent of the parent company's revenues.

The company's supply chain resembles that of other distributors. ABC Logistics functions as a non-asset-based third-party logistics provider that supplies transportation management, warehousing, distribution, and planning services to the parent company. It does not own trucks or planes, and it leases two thirds of the warehouses that it operates. Its main asset is inventory.

Most of the orders that it processes are shipped via airfreight, and most of those move by next-day or second-day air. Given the global nature of the company, most of the airfreight both originates and terminates internationally. Larger products move by the truckload, including large preassembled configurable electronic solutions and racks of multiple servers. A small proportion of the total is shipped via LTL or parcel. The company uses no rail services. Inbound and outbound requirements have a similar modal composition.

ABC Logistics' core competency is matching demand with supply. Logistics is the core competency, and transportation helps deliver reliability in demand-supply balancing through reliability of pickup and delivery timing.

About 60 percent of the cost of operating its supply chain relates to transportation. The rest is procuring value-added services from partners, and making IT system-operating expense. ABC Logistics has no capital expenditure, and as such has only skeletal processes for capital budget requisitions and authorizations.

## Performance Feedback and Management

Performance-based management has always been a prominent practice in the company. The firm targets financial goals, and these flow through to operational targets, which in turn require excellence in managing the end-to-end supply chain. The annual budgeting process includes the setting of the operational targets, which are reviewed quarterly.

Both hourly and management workers' incentives are geared directly to individual performance. Hourly workers are compensated based on their performance against "piece rate" targets (the more they produce, the more money they make). Management is compensated based on monthly metrics. Both management and hourly workers compensation includes rewards for the attainment of team goals. For example, the warehouse team is compensated based on overall warehouse performance and transportation and procurement execution is rewarded based on overall transport cost.

ABC Logistics exhibits all five elements of performance-based resource allocation (PBRA):

1. The goal-setting process begins with top management, who passes its goals to the business units for review and comment. Executive management is more involved in project justification, while the business unit's engineering departments determine target levels of productivity.
2. "You can't manage what you can't measure," says a senior vice president, so it uses metrics to monitor health. Using metrics is especially important when working with new customers. As the interviewee said, "taking on business without clear agreed-to objectives and deliverables is the worst kind of misalignment." The company also mines many data for which specific targets may only emerge after a bottom-up analysis of many details.
3. All goals have targets...everything is operated on lean principles. The company's sets financial goals related to revenue and "cost to serve" on a per-order basis (cost divided by sales revenue). The company also measures sales, general and administrative (SG&A) expenses as a percent of sales and as a percent of gross profit. It sets operational goals related to activities that it believes will help improve performance on the financial goals, such as dwell time, time at dock, time to process from receipt of order, and time to deliver to ultimate customer. Other targets are considered trade secrets, and are therefore confidential. Its targets stem from the promises made to its customers in their contracts. Its customer care program monitors the company's performance relative to these targets and relative to the customer's expectations, and establishes a feedback mechanism. Performance on "order to promise," which measures the timeliness of order delivery versus the date the company promised the customer, is 99.8 percent.
4. Resource allocations – for example, decisions about how much warehousing space will be needed – are made at executive levels, along with strategic direction and financial goal setting. Funds, systems, and equipment are costed and attributable to clients or projects as much as possible. Headcount and people decisions are all project-specific, and are allocated

based on the complexity of work and business unit requirements. The IT budget, at one percent of sales, is not considered a significant factor in resource allocation.

5. ABC Logistics monitors financial results through departmental cost centers and individual objectives. These items are part of standard operating procedures and are incorporated into each person's job description.

Customer service is the overriding objective, particularly since as an intermediary it has customers on both sides.

Target setting involves the use of stretch goals, but that is the extent of complexity involved. Often an initial target represents 80 percent attainment of the target, and time-phased progress milestones are set to achieve the full target over time. However, there is no clear linkage between targets and the amount or quality of resources that a business unit gets. Nor does the company use scenarios to assign resources based on alternative series of events. Finally, ABC Logistics has limited public policy considerations, except for several environmental concerns – all of its facilities are ISO 14001 (green) certified and warehouse zoning issues, which are local in nature.

“When you don't hit your numbers, all options are on the table,” explains an interviewee. Leadership is evaluated quarterly, and if managers miss their targets, they could see reductions in their compensation (lower raises or bonuses, or salary reductions) or lose their jobs. Executive management also could give the managers more resources, take away their resources, or restructure their agreement in an attempt to improve performance versus the target. Hourly workers see the result of missed targets directly in their paychecks, even other one of which includes a performance component. Whether manager or hourly worker, missed targets translate to postmortem analyses that review the process to establish what was wrong when the target was initially set. Was there scope creep? Did the customer's business change? Did the physical logistics change? Usually the results of such analyses are internal and not for public consumption.

Collaborative business approach has been the most successful element of performance-based management so far. Initial engagement with the client helps to understand what the client needs and wants, and facilitates configuration and execution of the business. On the other hand, competitive bidding is ineffective, says the interviewee. Customers that just compare bids without a collaborative process establish productive relationships with ABC Logistics only 8-12 percent of the time, versus 20 percent when combined with a collaborative process. “Don't chase every deal, especially if it is too costly and/or the customer is asking for too much for too little money,” states the interviewee. “Focus on specific customers with a high probability of success.”

## Data Support Systems

Financial performance is tracked by cost centers, which are rolled up to produce financial reports.

Operational data is available through very granular tracking. Small deviations can drive bad performance, bad behavior, and non-compliance, so the company is intent upon measuring and managing for consistency and flexibility. They generate the correct type of data to manage the

business dynamically. Physical production is tracked in units based on actual physical results. Operators pass a wand over their work to register the barcode on the material. The barcode relates to an operator, and the operator tied to their individual metrics such as number of warehouse picks.

Data quality is better today than in the past. The biggest gap is with trading partners that use different information systems. ABC Logistics relies on solid relationships with its partners to ensure continued attention to improving data quality.

Both the IT department and the businesses own data, since the IT department, like many shared service units, reports to both the corporate group and the business units in a highly structured matrix. While this practice has been criticized as ineffective in the past (having two owners is the same as having no owner, it is sometimes said), the groups have gotten better at managing the relationship and it is becoming more effective over time. Two elements make the relationship more effective than in the past: 1) 360 degree reviews, in which both of the owners exert control over bonuses and raises (ensuring a balanced process); and 2) the business unit pays for the systems, ensuring ownership and accountability within the relationship. The law of supply and demand prioritizes IT enhancements. If a business unit want an upgrade they are responsible for the cost, or they may lobby senior management to pay for it.

Some of ABC Logistics' clients are very advanced in data management and analysis, and they sometimes outsource IT to ABC Logistics, who provide web and server hosting. However, there is no procedure or framework for data governance. IT generates the plan. There are no data definitions, standards, or protocols. There is no procedure in place to monitor and track database changes or versions.

As the availability of data improves, ABC Logistics spends more time focusing on the choice of data format and the cleanliness of data than it does the availability of data. ABC Logistics occupies leadership roles on the boards of both EDIFACT and ANSI. There is a tight collaboration between the database users and IT policy-setters on open systems and file sharing, which is supported by the collaborative matrix between the business units and the IT staff.

ABC Logistics uses RedPrairie for its warehouse management system (WMS) through a linkage to its internal operating system. The system produces a daily report based on the previous night's production.

“Absolutely, [data systems] have helped improve resource deployment and resource allocation,” says an interviewee, characterizing the role of data systems in helping to understand resource deployment and resource allocation.

# Atlanta Regional Commission

## Background

The Atlanta Regional Commission (ARC) serves as the Federally designated Metropolitan Planning Organization (MPO) for 18 counties in the Atlanta metropolitan transportation planning area. It is responsible for developing the short-range Transportation Improvement Program (TIP) and long-range Regional Transportation Plan (RTP) which are used to program Federal, state, and local funding for regionally significant surface transportation projects in the Atlanta region, both highway and transit. The ARC also serves as a Council of Governments, responsible for intergovernmental coordination efforts in a smaller, core 10-county area; the region's Regional Development Center, responsible for comprehensive land use planning, also within the 10-county area; and the Area Agency on Aging. The MPO also is the lead agency responsible for demonstrating conformity of the RTP and TIP for the 20+ county Atlanta ozone and particulate matter air quality nonattainment areas, and staffs the Metropolitan North Georgia Water Planning District.

Because of the agency's varied responsibilities, its structure, organization, and staffing all lend themselves to providing a very inclusive approach towards regional planning. Within the ARC, the Department of Comprehensive Planning is comprised of Transportation Planning, Transportation Demand Management, Data Research, Geographic Information Systems (GIS), Environmental Planning, and Land Use Planning. These divisions integrate various aspects of physical planning and data resources to support a comprehensive approach towards developing the region's land use development plan (RDP), the TIP and RTP, and the region's water supply plan. The Department of Comprehensive Planning also is responsible for producing much of the demographic data used for ARC's planning activities. Because the commission is structured around multiple, functional planning areas, the planning and technical resources to support the agency's activities are sophisticated. The agency is particularly well suited in its ability to address regional transportation and development/growth issues, from both a technical and policy standpoint. The Transportation Planning Division, in particular, is able to draw upon resources provided by the Land Use, GIS, and Research Planning Divisions to support analysis of transportation plans and projects, and integrate the various technical and planning products of these divisions into its performance measurement activities.

## Resource Allocation

The focus for this case study is transportation resource allocation within the region's RTP and TIP. The ARC uses their performance measures program as part of RTP and TIP development in the following ways:

- As part of project-level evaluation of highway and transit capacity-adding projects, to support project selection efforts, and
- As part of systemwide analysis of the transportation plan and program.

The first area of performance measurement related to project-level evaluation is described in detail below as this is more specifically a performance-based resource allocation process with discrete project-level evaluation directly linked to regional goals and objectives. The second area of performance measurement, related to a higher-level systems analysis, is not documented as part of this case study as it serves as a more broad-brush quality control of travel model and systems performance after the RTP and TIP are developed.<sup>1</sup>

Specific-performance management processes used as part of project selection/resource allocation began to gain prominence in 2005 with worsening congestion and financing issues in the region, and the establishment of the Governor’s Congestion Mitigation Task Force (CMTF). In March 2005, the CMTF was established by Governor Sonny Perdue to develop strategies, benchmarks, and goals to cost-effectively reduce congestion in the metro-Atlanta nonattainment area and develop a benefit/cost methodology to be applied to project selection. The task force was comprised of members from the ARC Board, the State Transportation Board (GDOT), the Georgia Regional Transportation Authority Board (GRTA), and two representatives of the State Road and Toll way Authority Board. After convening for over a year, the CMTF developed three recommendations for incorporation into the regional transportation planning process as shown below:

- Refine the current project selection process for the financially constrained, Atlanta Regional Transportation Plan to increase the weighting of the congestion relief factor to 70 percent.
- Develop and implement a technically consistent and transparent methodology for benefit/cost analysis.
- Use the Travel Time Index (TTI)<sup>2</sup> to measure improvement in congestion. The Task Force recommended a regional Travel Time Index goal of 1.35 by 2030 for the Atlanta nonattainment area.

These recommendations were adopted by the State Transportation Board in December 2005 and the GRTA Board in January 2006. The ARC Board adopted the recommendations in

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<sup>1</sup> The systemwide performance measures are typically standard measures of travel demand and congestion (V/C, LOS, mode split, travel speeds, and VMT) and the resultant impact on air quality (NO<sub>x</sub>, VOC, PM emission). They are used primarily to assess if systems level mobility indicators are moving in the right direction, and if the draft plan/program are able to meet the region’s air quality conformity budgets. They are also often used to communicate systems performance at a very general level to decision-makers. These measures were not developed as part of a larger performance-based process.

<sup>2</sup> TTI = Travel Time Index = Ratio of congested travel time to free flow travel time.

February 2006, with additional clarification that it shall develop a multimodal transportation system, meet all Federal planning requirements, and implement a multifaceted approach to congestion relief.

The adoption of the 70 percent congestion weight for project selection and 1.35 TTI performance target marks the first time that specific weights and performance-based planning were mandated by the ARC Board to assist in development of the RTP and TIP. This initiated a larger project selection and performance measurement discussion in the region. ARC staff then spent the better part of the next year and a half developing a very specific-performance measurement and project selection process described below.

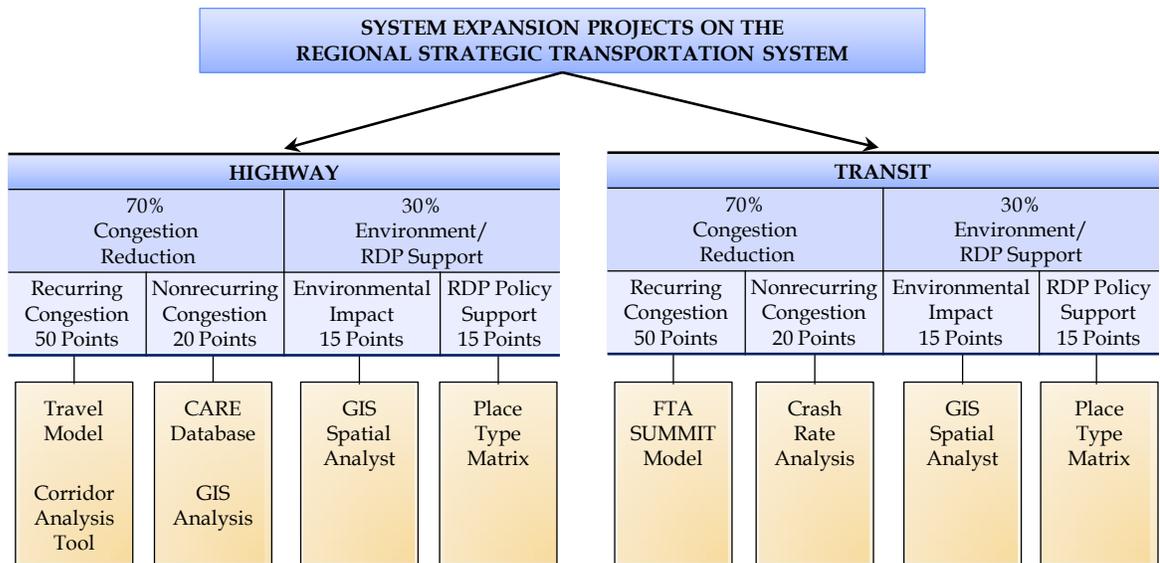
The performance-measurement process, as applied to project-level evaluation, currently only applies to highway and transit capacity-expansion projects (capital programs) that fall on the region's Regional Strategic Transportation System.<sup>3</sup> The framework for the prioritization effort is shown in Figure 1 below. Note that this process was implemented for the first time, for the most recent Envision6 RTP. Due to lack of funding availability, a call for new projects was not completed and this RTP update consisted of de-selecting projects to ensure the RTP was financially constrained in light of funding limitations. Hence, the performance measurement and project evaluation process defined below was applied to a pool of previously programmed projects, not to newly identified projects seeking Federal transportation funds. Projects were analyzed relative to one another within program categories (highway and transit) as shown below. Cross-program analysis that can be used to evaluate the impacts of different resource allocations across program categories such as highway or transit, has been discussed, but is not currently implemented.

The technical performance measurement process defined below was not directed by public input, but was greatly influenced by larger regional policy discussion which occurred as part of the CMTF process, e.g., the 70 percent congestion weighting to be implemented as part of project review and selection.

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<sup>3</sup> A network of pre-defined regionally significant transportation facilities, eligible for federal transportation funding.

**Figure 1. Prioritization Framework**  
*Areas of Performance Measurement*



The Congestion Reduction and Environment/RDP Support performance measurement emphasis areas align with the higher-level goals and objectives developed by the MPO to guide plan and program development. Goals and objectives are established as part of each major RTP update, typically through an interagency/interdisciplinary planning team structure. They deal primarily with reducing congestion and improving mobility in the region, and improving the environment and quality of life for residents of the region. While the wording of transportation goals may be refined slightly with each plan update, they tend to be static over time to demonstrate continued focus on a longer-term end state for the transportation system.

Goals are not prioritized by the ARC. Rather, ARC established three priority areas for funding as part of its most recent RTP, Envision6:

- Managing current assets – ITS, smart corridors, etc.
- Demand Management – TDM, bike/pedestrian., etc.
- Strategically Expand – Highway and transit capital expansion.

ARC also uses a number of system planning concepts to provide focus for RTP development and project selection within the three priority areas. These system concepts include: Transit System, Arterial System, Managed Lane Concept, and Bottleneck Relief.

The specific-performance measures included as part of project-level evaluation were developed to evaluate and score projects within the priority funding area associated with strategic expansion. The measures and project scoring process is documented below. Note that the performance measurement process focused on this priority funding area, because this is the area that existing agency technical resources and capabilities (e.g., travel demand model) can

support a rigorous analysis. Performance measures were weighted to align with regional policy, as established by the CMTF. Non-recurring congestion was weighted at 20 percent, recurring congestion at 50 percent (for a total congestion reduction weight of 70 percent as required of the CMTF process), environmental impact at 15 percent, and RDP policy support at 15 percent. Congestion reduction remains the primary measure in the region as noted by the 70 percent congestion weight; however, extensive debate over the best way to achieve this and how best to capture congestion reduction benefits of nontraditional measures, e.g., land use, access management, etc. remains an ongoing and critical discussion and key component of the MPO planning process.

There was no direct approval of the project-level performance measurement process. The overall process was largely vetted through ARC and planning partner committees, however. The performance measurement process is defined below, relative to each performance measurement emphasis area.

**Recurring Congestion:** Performance measures in this category are used to measure congestion that occurs as routine traffic volume exceeds available roadway capacity. Points are allocated based on how well each project scored in relation to three congestion metrics – intensity, duration, and extent. A travel demand model postprocessor (corridor analysis tool) was used to compare network performance of the 2030 Build scenario to a 2030 No-Build scenario, in terms of each project’s impact on the intensity, duration, and extent of congestion. The level of benefit for each project facility was assigned a point value of 0 to 17 across each congestion measure based on the percent rank of that project within the list of projects being evaluated.<sup>4</sup> Individual metric scores were summed to obtain the total highway recurring congestion score for each project (Figure 2).

**Congestion Intensity (Peak Person Delay Hours)** – Total delay the project corridor experiences during the most congested period of the day.

**Congestion Duration (Daily Hours of Congestion)** – Average total hours during the day that a facility exhibits congested conditions (as established by predefined volume-to-capacity thresholds).

**Congestion Extent (Daily Vehicle Delay Hours)** – Total daily delay experienced by all vehicles using the project corridor.

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<sup>4</sup> Note that a total possible 51 points could be assigned with each metric scored up to 17 points.

**Figure 2. Example Recurring Congestion Scoring**

Intensity = Peak Person Delay Hours						
	No Build	Build	Change	Percent Change	Percent Rank	Points
Project 1	41	23	-18	-44%	0.75	13
Project 2	55	32	-23	-42%	0.50	9
Project 3	66	62	-4	-6%	0.00	0
Project 4	13	8	-5	-38%	0.25	4
Project 5	25	13	-12	-48%	1.00	17

Duration = Daily Hours of Congestion						
	No Build	Build	Change	Percent Change	Percent Rank	Points
Project 1	3	2	-1	-33%	0.50	9
Project 2	4	4	0	-0%	0.00	0
Project 3	6	3	-3	-50%	1.00	17
Project 4	8	7	-1	-13%	0.25	4
Project 5	7	4	-3	-43%	0.75	13

Extent = Daily Vehicle Delay Hours						
	No Build	Build	Change	Percent Change	Percent Rank	Points
Project 1	1,000	950	-50	NA	0.00	0
Project 2	1,000	800	-200	NA	0.25	4
Project 3	950	700	-250	NA	0.50	9
Project 4	700	350	-350	NA	0.75	13
Project 5	2,000	1,050	-950	NA	1.00	17

	Total Score
Project 1	22
Project 2	13
Project 3	26
Project 4	21
Project 5	47

Note: For transit capacity projects the FTA Summit Model is used to evaluate recurring congestion benefits using the User Benefit Hours performance metric.

**Nonrecurring (Incident) Congestion:** The performance measure in this category is used to measure congestion that occurs as a result of traffic incidents. For highway projects, points are awarded based on a comparison of the project crash rate at a particular road segment (the segment within a project’s limits) to a regionwide crash rate on roadways of similar functional classification. Crash data used in the analysis was extracted from the statewide Georgia CARE crash database. Crash rates were calculated for a 5-year average, 2000-2004. Sample scoring is shown in Figure 3 below.

For transit projects, a modified approach is used where transit passenger-miles served are used to calculate the number of accidents removed from the roadway, as a result of a shift of trips from highway to safer non-road transit travel.

**Figure 3. Example Nonrecurring Congestion Scoring**

	Functional Class	Annual VMT	Average Annual Crashes	Crash Rate (per 100M VMT)	Crash Ratio*	Percent Rank	Points (Max = 20)
Project 1	Urban Interstate	63,963,120	172.00	268.00	1.0188	0.75	15
Project 2	Urban Interstate	122,818,800	217.20	176.85	0.6700	0.50	10
Project 3	Rural Minor Arterial	23,062,000	103.40	448.36	1.3587	1.00	20
Project 4	Urban Principal Arterial	44,294,640	139.80	315.61	0.6633	0.25	5
Project 5	Rural Minor Arterial	13,246,480	23.80	179.67	0.5445	0.00	0

\*Crash Ratio=Project Location Crash Rate/Regional Crash Rate by Functional Class.

**Environmental Impact:** This measure evaluates a project’s proximity to six environmentally sensitive areas. This is measured by spatial intersection of the project scope with any of six predefined environmentally sensitive areas (flood plains, wetlands, historic resources, significant bodies of water, small area supply watersheds and existing green space infrastructure). This was done using a raster-based (grid-based) GIS analysis that applies more points with greater cumulative environmental impact. Highway and transit capacity projects were mapped to the environmental areas and the cumulative environmental impact was calculated based on the number and type of sensitive areas that the project impacts (i.e., touches). Points were assigned based on the aggregate environmental impact and then inverted to avoid rewarding projects (i.e., higher score) with greater environmental impact. This work was done in ESRI’s ArcGIS desktop software with the Spatial Analyst extension. Up to 15 points were awarded in this performance measurement area.

**Regional Development Plan Policy Support.** The performance measure in this category is more of a qualitatively developed checklist used to evaluate how well a project supports ARC’s growth policies based on project location and scope. Each project (highway and transit) was evaluated based on the project’s ability to support “place-based” transportation objectives, as defined by the appropriate land use place type (e.g., central business district, suburban neighborhood, rural area, etc.). Place-based transportation objectives were developed through ARC staff and planning partner discussions on transportation elements that should be included as part of a project’s scope to support regional development growth policies. Points were assigned based on the number and type of objectives that are met as part of the project proposal. A unique distribution of points was determined for each of eight-land use place types, with the various objectives weighted differently based on their relative importance in the context of the specific-place type. Up to 15 points were awarded for each project.

Total project scores were calculated by summing points over each of the four performance measurement areas (Figure 4). Total scores were used to place projects into one of three tiers with Tier 1 representing the Top third (best performing projects), Tier 2 representing the middle third of projects (average overall score), and Tier 3 the bottom third (worst performing projects). Tier rankings were used as the primary criteria for determining which projects were ultimately selected for funding.

**Figure 4. Total Project Scores**

	Recurring Delay	Nonrecurring Delay	Environmental Impact	RDP Policy Support	Total Points (Max = 100)
Project 1	22	15	7	3	46
Project 2	13	10	8	6	37
Project 3	26	20	15	8	69
Project 4	21	5	12	3	41
Project 5	47	0	10	7	64

Project-level analysis was used to inform the project selection process, but ultimately resources were allocated based on a combination of project performance, benefit/cost,<sup>5</sup> project readiness, public input, and regional equity.

Per the ARC, the project evaluation and prioritization process used for Envision6 worked very well because it included a significant number of performance measures. Primary issues were related to measuring the potential benefits of new facilities (interchanges and roadway facilities) where No-Build data was not available to be extracted from the travel model for analysis, and measuring ITS and M&O projects which are too small of scale to be picked up in the travel model.

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<sup>5</sup> A benefit/cost calculation was used to determine the project’s placement within different years of the TIP and RTP. Project benefits reflect the dollar-value of time travel savings (delay reduction) for commercial vehicle and person time as well as fuel cost savings. Project costs reflect funding allocations for preliminary engineering, R/W, and construction. The annual project benefit was compared against planning level project costs to determine the payback period. If the annual benefit exceeded or met the estimated project cost within six years, the project was recommended for inclusion in the TIP (the first six years of the RTP); if not, the project was recommended to be programmed in the long-range portion of the plan.

## Target Setting

An overall regional target of 1.35 TTI was established by the CMTF and adopted by the Boards of ARC, GDOT, and GRTA. This is the only official target adopted in the region. This is not included as part of individual project evaluation and performance measurement, but rather is used as a systemwide measure of performance. The 1.35 TTI performance target is a long-term goal established for the year 2030. No short-term targets are currently established.

The specific 1.35 TTI was developed based on input provided by technical staff that supported the CMTF process. There is currently no process identified to update this target. Rather, the ARC Board-adopted resolution associated with the 1.35 TTI measure defines that the measure will be used to guide development of the most recent Envision6 RTP, with a commitment to reevaluate periodically project selection criteria to ensure regional land use and transportation goals are achieved. The ARC's Congestion Management Process (CMP) also incorporated the 1.35 TTI as the official measure for estimating one of the three dimensions of congestion: congestion intensity.

ARC is in the infancy stages of monitoring project effectiveness towards reaching regional targets. In 2005, ARC initiated a regionwide, ongoing travel time data collection effort organized under the CMP. The concept includes collecting “before” data on road segments scheduled for construction in the upcoming fiscal years of the TIP. Subsequently, “after” travel time data will be collected upon a few years after the project has been open to traffic.

Additionally, the Regional Operations Task Force, which includes ARC, GDOT, and GRTA collaborate to conduct before and after travel time surveys for roadways improved by synchronized traffic signal timing sequences. Not only is this data used to refine the signal timing plans, it also is used to document the overall effectiveness of the program at the corridor level, including estimated air quality benefits.

Currently, actual performance of projects and achievement of targets is not tracked. There are no penalties for not achieving targets or performance standards.

## Data Support Systems

Standard performance-measure related data needs used as part of plan/program development (i.e., project evaluation and selection exercises) are typically associated with travel model output, which varies greatly based on the travel model itself and resources of the agency to refine output to support project and system-level assessment. Standard output used in performance measurement at the ARC includes travel speeds and delays and travel volumes. A key issue for ARC and many MPOs is that travel models are calibrated to a regional level, while performance measurement often needs to be performed at a much smaller (e.g., project) level, hence model output may not always be appropriately applied at a smaller geography. In addition, travel models typically represent average weekday conditions for higher functionally

classified roads (arterial and above) so smaller scale, or more nontraditional impacts (e.g., on travel reliability, access to particular land uses, etc.) can be very difficult to assess.

As part of the case study interview, the ARC noted that MPOs, state DOTs, and local jurisdictions need more support for comprehensive data collection so that a robust inventory of data can be used to monitor existing conditions as well as performance due to transportation investments. ARC also cited the need for Federal emphasis, along with dedicated funding or other resources, to support performance-based management. Travel demand models have shortcomings when it comes to performance measurement, especially as it relates to corridor-performance, system operations, and measuring non-recurring delay.

The availability of data affects the development of performance measures at the ARC, largely. Performance measures are not developed and adopted into the planning and technical process, unless there are data systems to support analysis. More and better data would improve calculation of performance measures and broaden the measures that could be considered as well as the types of projects that could be evaluated.

The ARC performance-based project evaluation process is strongly enhanced by access to the other planning functions and technical resources housed within the agency. Dialogue between the Transportation, Research, and Land Use staff within the Department of Comprehensive Planning on data needs to support transportation plan and project evaluation is a key contributor to the robustness of the performance measurement process. However, while access to technical resources internal to the agency is significant, the agency currently does not have a strong overarching data governance process in place. The Transportation Planning Division within the Comprehensive Planning Department is responsible for transportation data management. The agency has not currently implemented asset management approaches for data, or data stewardship or governance models. There are no specific definitions for data standards, but efforts are underway to develop certain guidelines and standards for consistency as part of the CMP. The ARC also is placing an emphasis on developing an information system/clearinghouse as part of the CMP scope of work.

Much of the data used as part of the performance measurement process is gathered from outside sources. Traffic data is obtained from the GDOT and local jurisdictions for travel model development (calibration), safety and crash data is acquired from the GDOT. To support environmental impact assessment, multiple GIS layers are collected from environmental, historic, and other resource planning agencies.

There are currently no data enterprise models, data dictionaries or metadata in use at the agency, and no processes in place for tracking user requested or steward generated data. Cube and Esri ArcGIS are the primary software packages used to store and extract performance-related data. ArcGIS is the primary tool used for data storage (loaded travel demand model networks converted to shape files) and data integration.

The technical analysis used to support performance measurement exercises is run in-house at the ARC, by transportation planning and modeling staff. There are currently no easy mechanisms for executives to access project information, to run reports and obtain information. Scripts have been developed to automate as much of the performance measurement process as

possible, with several automated reports available that include summary statistics for the travel model network. These are typically only used by technical planning and modeling staff. All data is readily available to the public upon request, however.

There is currently no relationship between target setting and data systems beyond the extent of the travel demand model being used to prioritize projects and demonstrate compliance with the regional TTI mandate of 1.35.



# City of Coral Springs, Florida

## Background

Of the public sector Baldrige organizations, the City of Coral Springs represents the most complete example of how a public-sector agency used the Baldrige criteria and process to refine its Performance-based Resource Allocation process. As a city government, it has to provide a wide-range of services from roads, to law enforcement, to parks, to emergency services to code enforcement – thus it provides application to a broad array of functions. It also is a good example of an organization that used a Performance Management System to deliver intangible or non-capital services such as community relations, minority satisfaction with quality of life, and the responsiveness of city employees to customer enquiries. Being a public agency, its application includes more operational detail than do the applications of ARDEC or OMI, which are concerned with issues of competitiveness and national security.

The City of Coral Springs is a government that strives to follow a corporate management model. Since 1994, the city of 131,000 residents in Broward County has used the Baldrige criteria to provide a framework and management model for its decision-making. In 1997, it became the first Florida city to win the statewide Baldrige honor and was the first repeat winner in 2003. It was cited in former Vice President Albert Gore’s Commission on Government Best Practices, it has been cited in many management journals, and its officials are often asked to speak at national management conferences. In 2007, it was named a national Baldrige winner.

The city reports it has two overriding organizational characteristics. First, it has a “flat” organizational structure and its employees have a strong focus on the customer. It believes this leads to short-cycle times of decision-making and a strong emphasis upon how the decisions will affect the customer (i.e., citizens). Its mission is “to be the nation’s premier community in which to live, work, and raise a family.” Its four Core Values are:

- Customer Focus;
- Leadership;
- Empowered Employees; and
- Continuous Improvement.

## Strategic Planning Framework

These values and beliefs are put into action through the city’s formal Strategic Planning Process. The preamble to the city Strategic Plan summarizes the city’s approach to the strategic planning process:

*“The City of Coral Springs’ Strategic Planning process is the cornerstone of our business model. It is the foundation upon which the Business Plan and the Annual Budget are based. We believe that before we can allocate our available resources, we must first understand the needs and desires of the residents of Coral Springs and the environmental factors that will affect us in the future.*

*By looking ahead and asking our customers what they need, we establish a vision for what level of service we will provide, along with an understanding of what resources will be necessary to provide them. “*

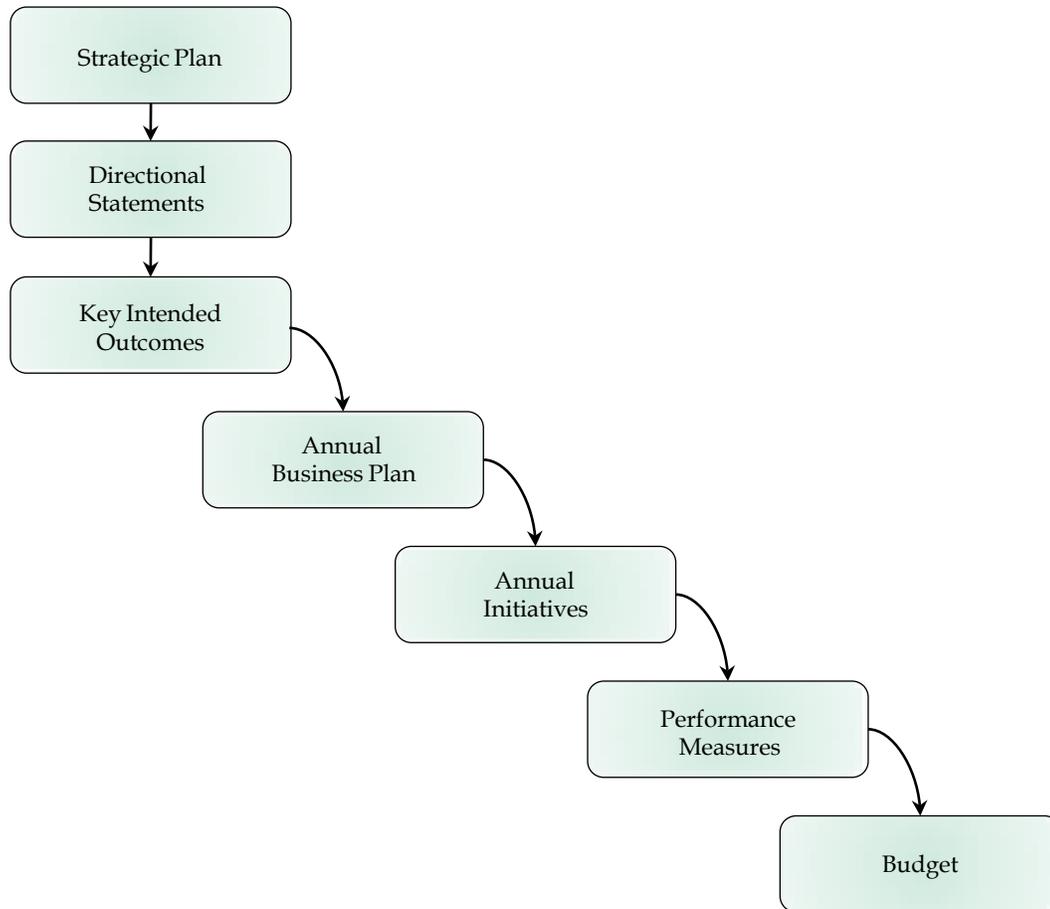
The first Strategic Plan was adopted in 1997 and has been updated annually since (Figure 5). The Strategic Priorities of the Plan include:

- Customer-Involved Government;
- Neighborhood and Environmental Vitality;
- Financial Health and Economic Development;
- Excellence in Education;
- Youth Development and Family Values;
- Strength in Diversity; and
- Traffic, Mobility and Connectivity.

For each priority, a set of directional statements are developed which define broad objectives. Then two to ten key intended outcomes are set for each strategic priority to ensure and measure its progress. From this strategic plan, directional statements and key outcomes, the city staff then develops an annual business plan. This business plan translates the strategic priorities into daily operational objectives.

The city reports that the benefits of the business plan approach are that daily city workforce activities are tied directly to the strategic goals of the city, that performance measures relate directly to key desired outcomes and that variance from the achievement of Strategic goals can be measured. The city budget is tied to the business plan and so resources are allocated commensurate to key city priorities.

**Figure 5. Coral Springs Strategic Planning Cycle**



The Strategic Planning Process begins in March of odd-numbered years when staff collects data for an Environmental Scan. This scan includes customer and public feedback from the sources shown in Table 1. A strategic plan retreat is held in April where workbooks are developed to assess issues regarding finances, the environmental scan, customer requirements analysis, performance analysis, benchmarking and an update of current initiatives. In-depth presentations are made about key topics such as changes in customer requirements, changes in the regulatory environment or shifts in technology. The various forms of customer feedback responses are reviewed for trends and priorities. In addition, any changes in emergency preparedness plans are considered. The City Commission staff then evaluates the information and directs city staff of the direction the strategic plan should take as a product of the two-day workshop.

**Table 1. Sources of Citizen Feedback**

Customer Feedback Opportunities

“Slice of Springs Meetings”	Biennial Citizen Survey
Visioning Exercises	Resident Advisory Committees
Focus Groups	Service Requests
Internal Surveys	Work Orders
Complaint Tracking System	Neighborhood Partnerships
Staff Retreats	Operational Data
Trend Analysis	Employee Surveys
Web site Use Statistics	Public Hearings

The city staff then develops key intended outcomes, a new business plan, new annual initiatives, and new performance measures. The city says it tries to emphasize leading indicators in its performance measures so that progress on new initiatives can be gauged during the course of the year.

This retreat and workshop with the city commission is then followed in May of each year with a staff workshop in which the city staff develops more detail for implementation of the strategic plan. Performance measures are refined and budgets are estimated to implement the initiatives. Following the retreat, the city manager meets with department heads to develop performance agreements and resource needs to complete the initiatives for the year.

The following month, June, a business-planning workshop is held again with the city commission in which staff present the draft business plan. This includes capital projects, new business plan initiatives, and new programs. A second workshop is held in July to receive additional feedback, and both sessions are televised. Once approved, the business plan is used as the city staff’s action plan for the following year. Individual employees’ work plans are tied to the performance measures. Performance for merit raises are based upon performance measure achievement.

## **Performance Measures**

An extensive series of performance measures are developed addressing all seven key areas of strategic priorities. The measures are so numerous they are summarized into 10 key composite measures which give at-a-glance summation of city performance (Table 2). These composite measures are often referred to as the city’s stock index because of the role they play in assessing the overall health and performance of the city. These composite measures provide, in effect, a Balanced Scorecard that includes hard quantifiable performance such as property values, the crime rate and auto crashes but also measures of intangible quality of life such as the degree of voluntarism and the participation in city athletic leagues.

**Table 2. Coral Springs Key Composite Measures**

<b>Composite Measures</b>
School Overcrowding
Volunteers in Government
Nonresidential property values
Residential Property Values
Employee Productivity
Customer Satisfaction
Athletic League Participation
Crime Rate
Employee Satisfaction
Major Intersection Accidents

The Financial Trend System Measures in Table 3 track the city’s financial health, and are part of one of several monitoring systems. Each major operational area tracks such key measures and reports on their success as part of the ongoing monthly and quarterly reporting process throughout the year.

**Tables 3. Coral Springs Financial Trend Monitoring System Measures**

<b>Financial Trend Monitoring System Measures</b>
Net Operation Revenue Per Capita (in constant dollars)
Restricted Operation Revenues as a Percent of Total Net Operating Revenues
Intergovernmental Revenues as Percent of Total Gross Operating Revenues
Elastic Tax Revenues
User Fee Coverage
Net Operating Expenditures per Capita (in constant dollars)
Employees per 1,000 Population
Undesignated Fund Balance as Percent of Net Revenues
Net Bonded Long-Term Debt As Percentage of Total Assessed Value
Population
Total Assessed Property Value (Constant Dollars)
Percent of Industrial and Commercial Assessed Property
Labor Force Employment in Coral Springs

## **Customer Input**

A factor, which clearly differentiates Coral Springs from many other U.S. cities, is the extensive, formal, iterative and continuous process of receiving customer input. The process of customer input cascades throughout all levels of government in a complementary, self-reinforcing manner. The input process begins each year with formal annual telephone surveys of 1,000 residents and 250 businesses. The independent research company, the Center for Research and Public Policy, conducts the survey. The in-depth research seeks feedback on city performance, emerging issues and actionable items for improvement. The questions focus upon the city's performance on its key intended outcomes which derived from its strategic plan and which form the basis for the annual business plan. The results of the survey form the basis of the Strengths Weakness Opportunities and Threat analysis, which precede each biennial Strategic Plan update and each annual Business Plan update. They also can be used to amend or update the annual Action Plans for city divisions, managers and employees.

Individual operating departments also conduct a variety of surveys and customer-input processes:

- Residents who are transported by the emergencies services are sent follow-up postcard surveys;

- Parks and Recreation surveys park users;
- Six “Slice of the Springs” meetings are held annually in each major city neighborhood for face-to-face discussions with residents;
- Advisory committees are formed for each of the city’s seven Strategic Priorities and those committees receive formal feedback from hearings and workshops with residents;
- Focus groups are periodically convened to focus upon new or emerging issues;
- An annual meeting with businesses is held to gather information on how the city can assist them;
- Every business which leaves the city is sought for an exit interview to determine its reasons for departure;
- The city has a Customer/Complaint/Request information service which records, tracks and responds to citizen complaints and enquiries;
- The police department is decentralized into four Community Policing substations to put the officers closer to the neighborhoods and citizenry;
- The city web site and blog solicit comments;
- The city relies on emerging social media to podcast and e-mail residents on topics of interest; and
- In addition, as with every unit of government, public hearings are commonly used.
- The Coral Springs public input process provides rich data sets of customer satisfaction data going back well over a decade. In addition, the city has helped form a collaborative of 34 other Florida cities which also collect customer-satisfaction and city performance data. It uses this data to benchmark its customer satisfaction performance with its peers across Florida. In addition, it participates in the International City/County Managers’ Association Center for Performance Measurement (CPM.) This provides benchmarking for customer satisfaction on a national level.
- Such data provides granularity of customer satisfaction and customer expectations in a wide array of city services. This data then helps identify and define the 86 performance measures, which permeate the city, its divisions, and office.
- A recent example of how customer input directly affected the city’s Performance-based Resource Allocation process was in the area of traffic congestion. In recent years, the annual customer surveys and other sources of customer input revealed growing concern about congestion, excessive speeds on residential streets and crashes, particularly at intersections. As a direct result, the six Strategic Priorities were amended to add a seventh,

Traffic, Mobility, and Connectivity. Several key priorities and measures were developed for this initiative, including:

- A 10 percent speed reduction on traffic-calmed streets;
- Reducing intersection crashes to no more than 165; and
- Increase city transit ridership to 125,000 annual trips.

## **Data and Knowledge Management**

The city treats data as a critical asset. An active data and knowledge management process links the performance data and the customer-satisfaction data for the city. Performance agreements are established from the City Manager down to front-line management levels. These agreements enumerate performance expectations for the key intended outcomes and their associated performance measures. City data systems then provide continuous information about progress toward meeting these goals and performance agreements.

The data systems support departmental performance reviews which can occur daily or weekly, and which formally occur quarterly. Analysis of performance trends, outliers, root cause and variance from standard are routinely performed. Quarterly standard reports track progress on Key Intended Outcomes, the annual budget and other key performance measures.

Highly integrated business information systems are the primary source of internal data used in tracking performance. In 1992, the city adopted a strategy for best-integrated suite of business information systems. The city reports that when it captures data, the data is populated into related systems for cross-jurisdictional use and efficiency. The process of paying a water bill results in the update of the city's utility bill, cash receipts and general ledger applications. GIS integration allowed common data to be shared for property tax appraisal, the location of residents for emergency response and for public works maintenance.

Some of the key examples of the city's Data Knowledge Management process include:

- Police and fire response times are measured within the city and compared to national benchmarks;
- Uniform Crime Reporting statistics are used to benchmark local performance to national and regional peers;
- Financial comparisons are made to similarly AAA-rated cities;
- Data on Key Intended Outcomes is refreshed continually and shared openly;
- The city makes performance data widely available to employees and citizens through a variety of electronic and printed media;

- The city’s Information Services Management Department uses a technology services management model to keep hardware and software resources current;
- Service agreements are negotiated with IT users;
- IT performance measures for reliability and access are tracked;
- Security is formalized at the network and application level;
- Emergency data backup facilities and protocols are in place; and
- An Information Technology Game Plan is developed to ensure that IT resources link to and complement the Strategic Plan and Business Plan.

## **Outcomes and Performance**

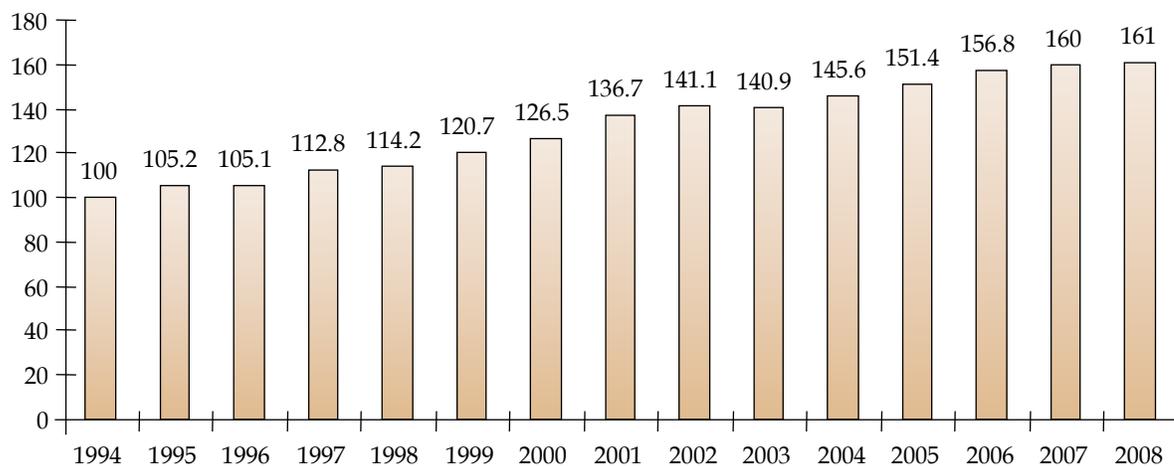
The city’s Data and Knowledge Management Systems document a wide array of performance data. The city’s annual Business Plan notes that of 82 key performance measures, 70 percent met their target, 15 percent were within five percent of their target, and 15 percent did not meet their target. Table 4 captures the values selected key intended outcomes that track major, qualitative measures.

Figure 6 through Figure 9 illustrate a fraction of the performance data reported by the city. In these examples the composite index consolidates various performance indices, quality of life and safety statistics are closely tracked, rising property values are tracked, and productivity is measured by the number of city employees compared to city revenue. The overall wealth of data provides a comprehensive means to track the results of the city’s performance-based resource allocation process. Such documentation tends to be common among the successful Baldrige organizations.

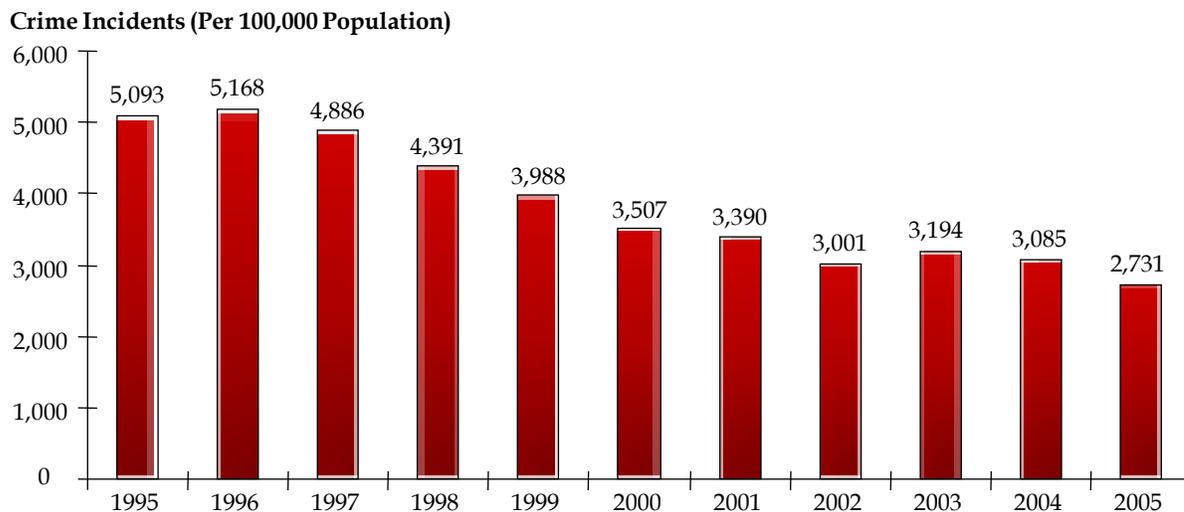
**Table 4. Coral Springs Key Intended Outcomes**

Goal	2007	2008	2009
Number of citizen volunteer hours	31,000	31,000	31,000
Percent voter turnout	40%	N/A	50%
Overall rating of city in terms of communicating with residents	93%	93%	93%
Overall rating of city in terms of communicating with businesses	78%	79%	79%
Customer service rating by residents	93%	93%	93%
Number of mentors trained	50	50	50
Overall quality rating for city services and programs (residents survey)	93%	93%	94%
Overall quality rating for city services and programs (business survey)	91%	92%	93%
Employee satisfaction rating	93%	93%	93%

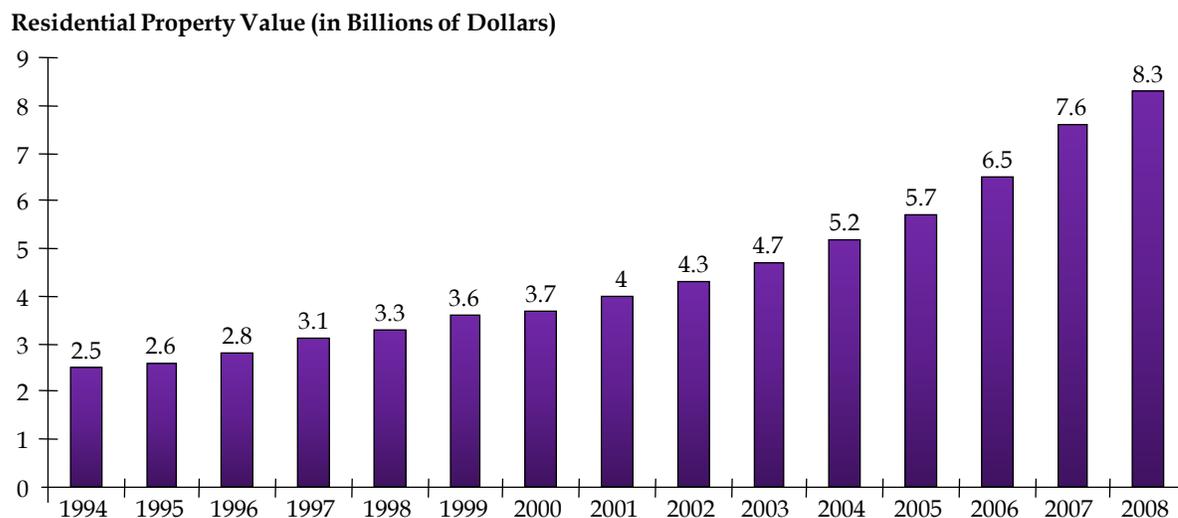
**Figure 6. Coral Springs City Composite Index**



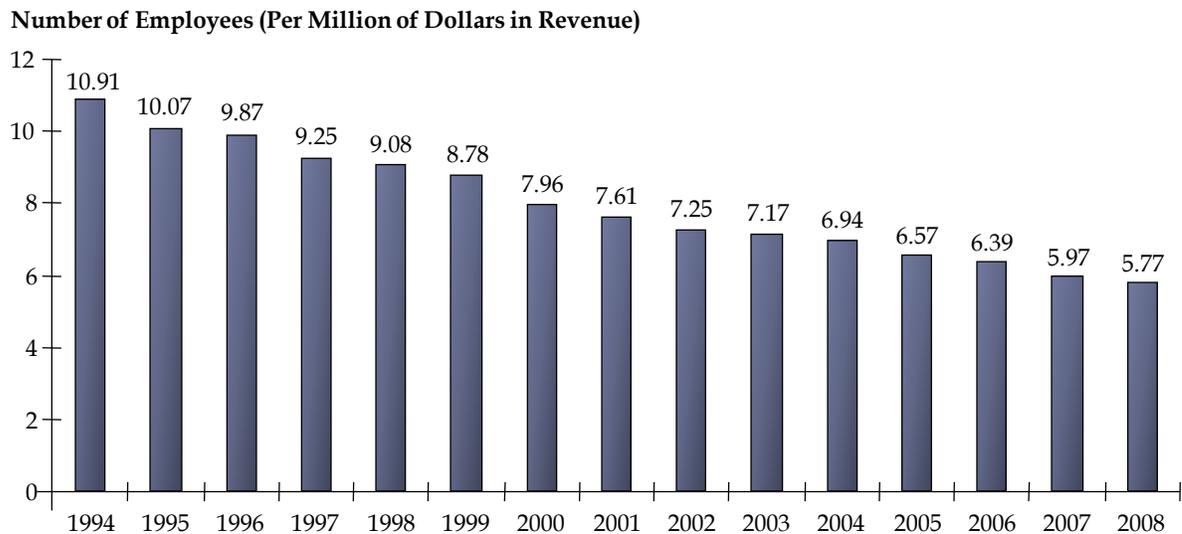
**Figure 7. Coral Springs Crime Incidents**



**Figure 8. Coral Springs Residential Property Value**



**Figure 9. Coral Springs Productivity**



The flow chart in Figure 10 summarizes the cyclic and interrelated decision and information processes which underlie the city’s process.

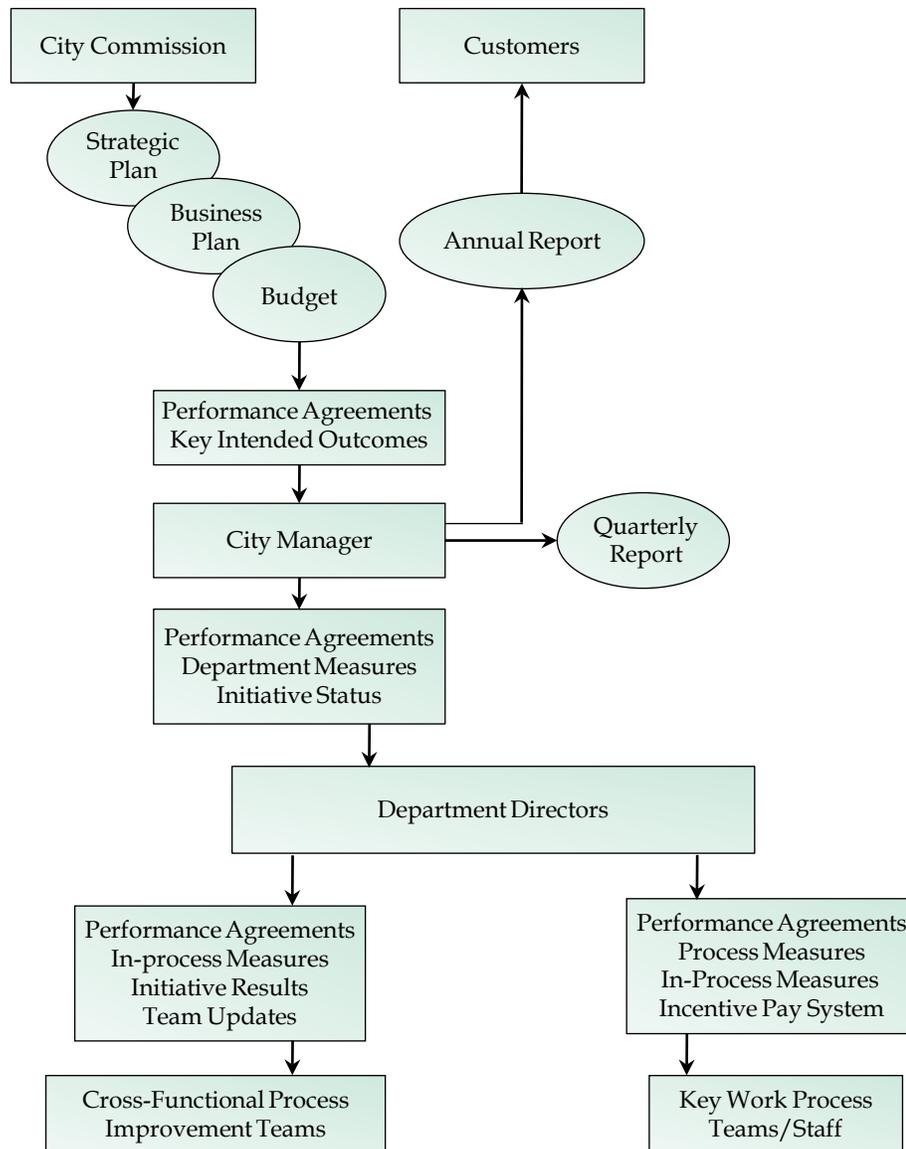
## Data Support Systems

### General Relationships

The city’s mission is “to be the nation’s premier community in which to live, work, and raise a family.” Beginning in 1997, the city commission began a process of strategic planning designed to identify the issues that must be addressed to achieve the city’s mission. These strategic priorities emphasize the values of the community and include:

- Customer-Involved Government;
- Neighborhood and Environmental Vitality;
- Financial Health and Economic Development;
- Excellence in Education;
- Youth Development and Family Values;
- Strength in Diversity; and
- Traffic, Mobility and Connectivity.

**Figure 10. Coral Springs Performance Management and Information Process**



For each strategic priority, a set of specific-performance measures called key intended outcomes (KIOs) were developed to define and measure progress towards achieving the city’s objectives. KIOs are measurable outcomes at the strategic level. There are 33 intended outcomes (performance measures) identified in the city’s Baldrige application. Annual or cumulative performance targets are established based on trend analysis and modeling.

The city commission holds itself directly accountable to Coral Springs residents for performance in each of the seven strategic priorities. Every department has a set of performance measures and priorities, and they are accountable to the City Manager for their

measures. Performance results are regularly reported to residents in *Coral Springs* magazine and are presented in detail at the annual State of the City event. This has added more emphasis and importance to the process.

The city has a set of data for each pertinent issue/strategic priority. This data is used to determine the effectiveness of specific activities and programs in meeting the city's objectives. For example, the city might have a fire department response time target of six minutes. The city will track the time it takes for the fire department to respond to a call, and they will use the data to identify potential enhancements such as: Does the fire department need better trucks? Are they getting sufficient information to respond to the call? What do the call takers need to improve their jobs?

Data to support the city's performance measures program is collected through various internal and external surveys, as well as other customer feedback sources. Surveys of local businesses are conducted every other year, while surveys of residents are conducted every other alternating year. Internal departmental and employee surveys also are conducted. Some departments such as the Fire department fill out an internal survey after every incident they respond to. The city also has a Complaint Management System, which they use to track the resolution time on complaints. Specific survey instruments/data sources are listed in Table 2.1-1 of the city's Baldrige application.

There is a feedback loop whereby the annual surveys provide input on additional city services and activities that citizens want, as well as provide data to support measurement of customer satisfaction with particular services and activities. New strategic priorities may be added based on the survey results. For example, Traffic, Mobility and Connectivity was added as a strategic priority in 2007 after traffic and speeding were identified from surveys as key resident concerns for multiple years. The city uses traffic data to identify related improvements such as how police officers write tickets, and then they track accidents as a measure of the effectiveness of the initiative.

The strategic planning process is done with the overarching goal of making the community a better place (e.g., work, quality of life, education, etc.). For example, the city did an annual survey on how people gain access to city information. As a result of the survey, they opened "City Hall in the Mall," to improve their visibility and access to citizens. On IT related issues, citizens expressed a desire to have access to agendas on-line, as well as easier access to commission meetings. As a result, the city started podcasting city council meetings and providing meeting agendas on-line.

## **Organization and Governance**

### ***Data Governance Framework***

The city does not have a formal data governance program, although they do have designated people responsible for ownership and input of data. Data owners look for outliers within their datasets. If they identify an outlier or other data quality issue, they will investigate it further by comparing the data to neighboring cities.

The city's IT group maintains and houses the data, but they do not have the expertise to judge the usefulness and quality of a particular dataset. Each department within the city has a set of measures they are responsible for. Because data is both qualitative and quantitative in format, it does take a lot of legwork and effort to clean up and process the data.

## **Data Sharing**

### *Institutional Arrangements/Policies to Support Data Sharing*

Data is shared internally among city departments. Internal exchange of information is done through the City Manager's quarterly employee communication meetings, weekly senior staff meetings, weekly department staff meetings, quarterly Supervisory Forum, and through the Knowledge Network and Active Strategy systems.

The city also participates in several cooperatives to share comparative and competitive data from within the municipal government industry. The first is through their participation in the International City Manager's Association Center for Performance Measurement (CPM), which is a group of 100 cities nationally that share data for benchmarking purposes and to improve their own performance. The city also helped found the Florida Benchmarking Consortium in collaboration with 10 other local Florida governments to encourage benchmarking and to develop standard definitions for performance measures. They also are a member of the Florida League of Cities. The city provides information to these consortiums based on certain agreed upon criteria (benchmarks). Participation involves the completion of questionnaires covering performance measures in various functional areas of local government.

When performing benchmarking through these consortiums, the city reconciles differences in city size by comparing themselves to cities of similar size according to mileage and/or population. Sometimes they compare themselves to larger cities. The city generally compares themselves to 20 select cities known for excellence that are the same size as Coral Springs. When performance gaps against competitors are identified, cross-functional task teams are created to research and implement best practices to improve performance.

### *Internal/External Data Access*

Florida public records law requires that the city make their data available publicly. They publish quarterly reports on their web site, although the data is generally presented in processed form (i.e., crime rates, tax rates, etc.) Raw data is not necessarily available, although interested parties can generally obtain it through the International City Manager's Association Center for Performance Measurement (CPM).

## **Documentation and Reporting**

### *Enterprise Data Model*

Active Strategy is the city's software for tracking, mapping, and managing performance data. It is a web-based, off-the-shelf software for data entry and processing. Knowledge Network is

the city’s intranet that serves as a portal to the Active Strategy system, on-line training, and cross-functional task team histories.

The city is able to input performance measures into their system, and then produce charts and graphs for relevant key measures. The benefit of a single software system is that all the data is interconnected. About 40 people have access to the system. This includes all department heads, as well as people responsible for entering and processing the data.

## **Technology**

### ***Data Management Systems / Business Intelligence (BI) Tools***

GIS software is used by the city’s crime and fire dispatch services, and it is generally used as a tool to identify response needs for a particular service. The software helps to improve response time within these departments. For example, GIS can be used to identify whether hazardous wastes or chemicals exist at a particular site. If a fire or crime occurs at that location, it will take longer for appropriate departments to respond if they are not aware that the hazard exists. The key method for integrating data within GIS is location coordinates for infrastructure-related items (e.g., traffic, crime). For qualitative performance measures, the process is not as driven by GIS.

## **Success Factors**

The city identified the following success factors as guidance to other agencies in implementing a performance measurement program:

- Focus on continuous improvement – All of the city’s systems are reviewed on a periodic basis for improvement. They continually identify improvements by asking questions such as: Are the numbers accurate? Are they looking at the data from the right angle? Are there any outliers that might be key to improving service? Otherwise, the process gets stagnant and they would not be able to identify the underlying need to resolve an issue.
- Don’t be data rich, but information poor – It is important to collect appropriate data that is tied to specific-strategic objectives, rather than going overboard and collecting too much data.
- Data communication and access is key – Data needs to be shared with employees and other stakeholders.
- Make sure data is pertinent – Data needs to be leveraged in order to drive the strategic planning process.
- Data sharing and comparison with peer cities has been a critical success factor. This is actually a Baldrige requirement. The value of comparisons is in conducting trend analysis and benchmarking. If the city achieves an improvement in a certain area, they can identify what they did differently that year and share their success with other cities. Similarly, they can learn from other cities that did something different to achieve their own improvements.

The city's web site, <http://www.coralsprings.org/publications/> provides their budget and strategic plan documents, annual report, and the state of the city report.

## Other

The following list summarizes key points from the City of Coral Springs Case Study, which are applicable to other state DOTs, for the use of performance measures and targets and establishing Data Governance programs:

- Data to support the city's performance measures program is collected through various internal and external surveys, as well as other customer feedback sources. Surveys of local businesses are conducted every other year, while surveys of residents are conducted every other alternating year. Internal departmental and employee surveys also are conducted.
- There is a feedback loop whereby the annual surveys provide input on additional city services and activities that citizens want, as well as provide data to support measurement of customer satisfaction with particular services and activities. New strategic priorities may be added based on the survey results.
- The city participates in several cooperatives to share comparative and competitive data from within the municipal government industry. These include the International City Manager's Association Center for Performance Measurement (CPM), the Florida Benchmarking Consortium, and Florida League of Cities. The city provides information to these consortiums based on certain agreed upon criteria (benchmarks). Participation involves the completion of questionnaires covering performance measures in various functional areas of local government.
- Focus on continuous improvement – The city reviews their performance measure framework on a periodic basis for improvement. They continually identify improvements by asking questions such as: Are the numbers accurate? Are they looking at the data from the right angle? Are there any outliers that might be key to improving service? Otherwise, the process gets stagnant and they would not be able to identify the underlying need to resolve an issue.



# Corporation X

## Background

Corporation X is a multibillion dollar transportation services company serving a wide range of markets, including bulk, forest products, consumer goods, chemicals, intermodal, and automotive. In recent years, it has refocused after a period of multimodal diversification, but it still handles some multimodal services at its ramps through an affiliate.

It owns extensive assets and facilities nationwide, including about 150,000 vehicles and approximately 40 terminals. Its capital-intensive structure is reflected in its capital budgeting process. The Capital Committee meets regularly and allocates money for next year's capital budget. Capital expenditure requests need to pass two hurdle rates – one to get before the committee and another to be approved. Safety and regulation capital expense approvals are assigned a higher priority.

The company's core competency is transportation, and the company's transportation operations' role is to drive cost efficiency by redesigning processes and to deploy technology that helps allocate resources in a way that creates over hundreds of dollars of productivity gains in the next two years. Transportation is ultimately responsible for some of the company's key objectives, namely 1) safety; 2) service orientation/service design; and 3) reliable execution of the plan through teamwork and execution.

Most supply chain activities are handled in-house due to their specialized nature. A small proportion of activities are outsourced where union crafts do not restrict outsourcing and costs are lower outside the company. These activities include maintenance for certain brands of equipment, some equipment repair, contract work at the ramps for certain equipment, and operations at a few terminals. The company also outsources some technical activities, including network modeling efforts (if the model is specialized and the company lacks the resources or time to do it in-house), and engineering design and construction services (if not constrained by union agreements).

Transportation comprises about 95-percent of the company's operating costs, according to estimates made by the interviewees. The company's dry and liquid bulk logistics and warehousing subsidiaries represent a small fraction of the company's revenue, as does a technology subsidiary that serves Corporation X's needs and also sells to outside customers. A very small proportion of the company's total expenditures go toward real estate and service management for diversified activities.

## Performance Feedback and Management

The performance management system was established by Human Resources. Biannual reviews need to be processed by prescribed due dates or else an alert triggers action. A performance measurement group was originally housed in Operations and subsequently moved to Finance to ensure objectivity.

There are many incentives to meet performance objectives. Quantitative objectives are embedded in professional employees' annual objectives. Sixty percent of individual bonuses depend on performance relative to revenue and profit targets; 40 percent depends on individual performance, so if the company meets its financial goal, everybody wins. At lower levels in the organization, rewards are based mostly on proficiency in technical skills, while at management and executive levels, competencies like leadership are more heavily weighted.

Aside from individual performance incentives, internal competition and ego boosting plays a large role in motivating staff. "It's not just about having the information available – managers compete with one another to improve on each other's performance," explains an interviewee. The company announces winners every quarter for goals such as terminal performance and curfew management, as well as for more subjective performance such as "being proactive."

The company's performance management process contains all five elements, but to varying degrees of intensity. Metrics, monitoring, and prioritization of goals are prominent, while targets and resource allocation processes are less visible.

- Corporation X uses many performance metrics. It has defined key financial metrics such as Operating Ratio (OR) and compound annual growth rate (CAGR) or Earnings per Share (EPS). It also measures a wide range of operating metrics, including:
  - System velocity – average vehicle speed in miles per hour;
  - Terminal dwell – the time (in hours) spent in terminals;
  - Vehicles active – a count of all vehicles;
  - On-Time Originations – percent of scheduled departures on-time or early;
  - On-Time Arrivals – percent of scheduled arrivals on-time to two hours late;
  - Safety, as measured by a Personal Injuries Index and an Accident Rate; and
  - Labor utilization.
- The company clearly sets goals and objectives based on fundamental linkages between top-level financial performance and midlevel operating performance. "If schedules adherence is good, then asset performance goes up," explains an interviewee, and "if operating efficiency goes up, then profit goes up." Therefore, the goals are aligned throughout the hierarchy: from the CEO to the COO to Operations Planning to Service Design, and on to day-to-day Operations. Individual goals are entered into the Performance Management System at the beginning of the year through the Management by Objective (MBO) process. Corporation X says that it sets specific-quantitative targets, but they are confidential even in

anonymous form, so the existence of operating targets and the linkage between targets at various levels is not transparent and could not be verified. Interviews and secondary research elicited two financial targets (Operating Ratio in the low 70s by 2010, and CAGR Earnings per Share of 13 percent–15 percent), but no operating targets.

- The company says that it allocates resources – including budget, staff, systems, and equipment – where they deliver the greatest impact toward the goal. However, given the many operating goals and metrics, and the multitude of capital expenditure decisions, it was not possible during the interview process to determine how tightly resource allocation is tied to performance.
- Corporation X devotes extensive resources to monitoring internal results. An Internal measurements group comprised of six to seven people resides in the Finance department. It is deliberately separate from Operations to ensure objectivity. It keeps track of corporate and operating goals, and breaks them down by division and region. The group posts daily, weekly, and quarterly scorecards to the company’s intranet.
- The company has a clear prioritization of goals. Safety comes first (hence a focus on the Federal Rail Administration’s accident and injury index). Financial goals come next, then Operating goals.

Targets are set for both short-term and long-term horizons. The company aims for 18–21 percent compound annual growth rate (CAGR) of Earnings per Share and 13–15 percent CAGR of revenue. Operating Ratio (the ratio of operating expenses to operating revenue) is the most publicized target. Senior executive management set a company-wide goal to reduce this to 68 percent. The goals then get cascaded down to operational management. This goal in particular was very aggressive, and the company will not meet it.

If a goal is not achieved in the period specified (some goals have time phased implementation plans), the target is maintained for the next period, which is usually a year. However, the postponement does not replace new goals or targets – it adds to them. Failing to meet a target in one period may make it harder to achieve it in the next period since there will be multiple targets to achieve in that period. In addition to postponing the target due date, the team usually analyzes the root cause of why it missed the target.

The company uses scenarios to evaluate possible resource allocations in several ways. First, at an operational level, scheduling scenarios are constructed. Second, at a financial level, financial scenarios figure into the budgeting process. Third, public policy scenarios are considered when dealing with sharing its infrastructure.

In summary, performance-based management (PBM) has played a critical role increasing the competitive success of Corporation X. PBM has recently been enhanced by the addition of more detailed measurements and more precise expectations placed on those with access to that data.

## Data Support Systems

“Having the information available is critically important,” explains one interviewee. In tracking the performance indicators, Corporation X breaks down the results by division and time period, and to market segments within the division. “We have a nice drill-down tool,” he adds.

Yet the interviewee cautions against focusing too much attention on data quality. The investment in IT systems has to be justified by a benefit, and the benefit of better data quality is often not worth the incremental investment. Finance approves the cost/benefit analyses when they are needed. However, “data is not the end-all. Major, superordinate goals are more important than small ones because achieving the larger goals improves your success rates at the smaller goals, too.” Therefore, Corporation X focuses more on the competitive environment for goal attainment, and has parties when team members achieve their goals.

Due to regulatory reporting requirements, Corporation X is expert at sharing data with external partners using common data formats and ODBC protocols to connect to its data warehouse. This expertise in sharing carries through to its internal relationships between users and policy-makers.

Data and reports are highly accessible to users. “Everybody is linked, and everybody knows some basic IT tools. The days of IT being on an island are over,” explains an interviewee. A data warehouse is maintained by IT in the enterprise resource planning (ERP) system. Data is posted daily and transferred at regular intervals to generate standard reports. Customers can access the system via the web to see the location and estimated time of arrival (ETA) of their shipments. Users can either manipulate a data warehouse tool to generate custom reports, or ask IT to do it, with the incumbent delay. Ten years ago, anybody who wanted to generate a report needed to find someone who was good with computers to do it, but now people generally have enough facility with the system to generate their own reports and write their own queries. The combination of ease of access and computer savvy has enabled people to more readily attain their goals.

Its Performance Measurement group sets data standards and standard operating definitions. Data protocols are agreed upon by members of the Finance Department, the Capital Committee, and the Performance Measurement Group. No procedures are in place to monitor changes in data collection procedures or data revisions.

Corporation X uses a variety of hardware to feed raw data to the software delivery tools. Locomotives use condition-monitoring equipment to track engine conditions like throttle position, fuel consumption, and emergency brake condition. Global positioning systems (GPS) track the positioning and dwell time of vehicles. Global Information System (GIS) track crew movements. Radio frequency identification (RFID) monitors the position of cargo units at terminals.

In summary, advances in data management and data accessibility have played a key role in resource allocation by facilitating performance measurement systems that have empowered users to achieve their goals more quickly and efficiently.

# DIY Company

## Background

DIY Company is approximately a \$5 billion manufacturer and distributor of tools and equipment. Its largest share of sales is to “big box” retailers such as Wal-Mart and Target. It is seeking to reduce this by diversifying into other market segments to avoid dependence on a small and decreasing number of large customers with extraordinary purchasing leverage and a propensity to create their own private label brands that compete against DIY. Its diversification strategy has led it into a variety of services businesses, including security services. Its core competency is evolving from manufacturing to channel management, as manufacturers are increasingly commoditized and disintermediated from the end consumer in the modern global retail supply chain.

DIY makes product primarily for stock, as most of its customers place orders for immediate shipment. Some larger promotional products are made to order. The raw materials are procured globally. Manufacturing is done in the U.S. or overseas, whichever is less expensive.

Inbound, the company uses all modes of transportation, including ocean, road (truckload and LTL), parcel, and air freight. From plants to the distribution centers, it ships full container load and full truck loads. From the distribution centers to customers, it uses mostly parcel, a result of the increased sales direct to end users. For the U.S., inbound transportation represents 15 percent of the budget and outbound represents 85 percent.

All transportation is purchased, and DIY owns no transportation assets besides some yard jockeys, except for a specialty division that uses distributors who become truck owner operators that buy or lease their vehicles from the company. DIY uses a third-party logistics provider for carrier negotiations, day-to-day management and freight payment. It does 70 percent of the warehousing itself and outsources 30 percent. Customer service is all done internally. The North American Transportation Manager participates in the company’s continuous operational improvement process, and one of his primary responsibilities is negotiating freight rates with transport carriers.

The core competency for the current phase of this company’s growth is managing mergers and acquisitions, particularly in branded products and security solutions. Net sales have increased 80 percent from 2003 to 2007 reflecting execution of the company’s diversification strategy. Transportation was, but is no longer, a core competency at DIY. As the company diversifies into service businesses, supply chain management has become less critical to the company’s success.

## Performance Feedback and Management

Performance-based resource management has not been well developed at the company, according to the interviewee. Successful performance management depends on the individual manager.

The compensation of all managers, including the CEO, is tied to a new continuous operational improvement process system, which is based on individual goals and objectives. Every employee fills out a performance scorecard which defines short and long-term personal goals and objectives. Targets are set yearly, and it usually takes two to three months to finalize. This has been challenging in a period of rapid acquisitions, where individual performance may become subordinate to the need to integrate or shed resources.

The company exhibits the five characteristics of performance-based management:

- The CEO and CFO set annual goals. Their direct reports tie goals and objectives to meet corporate goals, and the goals-objectives correspondence flows down to individuals throughout the organization. Reduction of overall expenditures figures prominently in the goals.
- The key metric used by the North American Transportation Manager has been transportation costs as a percent of gross trade sales. Other important metrics include: Return on Capital Invested (ROCE), Working Capital Turns, Operating Margin, Productivity, Sales Growth, and Fill Rate. Individual managers measure “process” metrics that help to realize the overall financial objectives. For example, the North American Transportation Manager measures inventory turns and carrier productivity because both higher inventory turns and higher carrier productivity decrease cost, and cost as a percent of gross trade sales is the key performance metric for this manager.
- Targets are set for reducing gross trade sales. Managers adjust individuals’ annual compensation according to achievement of the target. The target is increased annually.
- The main mechanism for allocating resources is individual compensation. Compensation is tied to achievement of the goal, so individuals rise or fall in the organization according to their contribution to the goal.
- DIY monitor results through a quarterly achievement scorecard.

The performance management system has evolved over time, but such evolution is deliberately incremental. For example, the company is considering measuring transportation on a more pertinent measure – transportation cost as a percent of net sales. Although this would make sense, history plays an important role in the use of the goals and targets. Transportation as a percent of gross trade sales has been used for eight years and the organization understands how to interpret performance-based on myriad previous experiences with the metric. Even if imperfect, it is well understood and there are previous reference points for it.

Individual performance is marked with grades of A+ to C-. A bell curve is used to ensure competitive comparisons within the peer group. “A” performance results in accelerated career

progression. A “C” grade is a warning that management expects a higher level of performance. The individual score factors into compensation. Over time, the organization becomes stacked with “A” performers, and the “C” performers self-select out.

Long-term goals are set, but do not flow through to individuals’ objectives. For example, a long-term distribution center goal may be 10 inventory turns per year, but individual objectives are only set on the basis on 1-year improvements.

The priority of various goals has shifted as the company has migrated from a manufacturing and logistics competency to a financial management model. Over time, the company has used various tools to achieve its objectives, including Lean Manufacturing and Six Sigma. Now that the objectives go beyond manufacturing and sourcing, the company views its transportation performance in the context of supply chain management across its divisions.

Targets are established according to the best performance among the business units. This ensures that the targets are both relevant and current. The company acknowledges inconsistencies in the measurement between business units – for example make-to-order business will have better fill rates than make-to-stock businesses – but does not accept this as an excuse for non-performance. Instead, it applies additional subjective evaluation to arrive at a normalized performance rating. Targets apply on an annual basis. The company does not run scenarios. There are no public policy considerations that require the targets to be adjusted or tweaked due to exogenous public policy factors.

Failure to achieve the goal may result in a performance improvement plan. Conversely, winning performers benefit from larger than average compensation awards, and hence high-performing projects end up being staffed with the best talent. The performance scorecard and the continuous operational improvement process work synergistically through this Darwinian process to assure that resources are optimally allocated.

Simplicity and historical consistency of metrics have worked very well in supporting the overall performance measurement and management process. For North American Transportation, there is one metric and one goal, and current performance can easily be obtained at any time from the Finance department. In addition, the Darwinian principle of “survival of the fittest” has helped to ensure natural evolution and adaptation of the company’s systems, people, and processes to changes in the competitive environment.

## **Data Support Systems**

DIY uses a transportation management system (TMS) provided by its third-party logistics partner to choose carrier and routings.

## **Data Organization and Governance**

DIY does not have an established data stewardship/governance model, although they do have data owners within each business area responsible for data quality. Data owners spend a lot of

time cleaning data, and at the end of each month, they send out specific data based on renewable authorizations.

DIY previously had a data integrity group responsible for data quality (e.g., spelling of names, freight class codes, etc.) within the organization, but the group was disbanded because it was perceived that they did not add value to the organization. Data quality and cleaning of data is performed on an ad hoc basis. The problem is exacerbated as DIY acquires additional businesses and must perform customer matching and merging of data across databases.

## **Data Sharing**

DIY relies on publications and people in the field to do benchmarking. They use a freight third-party logistics provider (3PL) to produce standard benchmark measures such as distribution costs as a percentage of gross trade sales as compared to other companies. The 3PL produces standard benchmark information and provides DIY with industry data on an as needed basis. The 3PL contract costs DIY \$100,000 per year.

DIY shares data internally through formal requests for data across business areas. For example, one group might have data on total freight expense, but they must request data from other business areas in order to complete their performance measures (e.g., data on volume, accruals to freight charges, inflation for 2009, etc.).

DIY shares shipping data with customers by sending them an automated shipping notification. They have the ability to mail out shipping notices, but they do not do so because of the associated expense.

In terms of data availability, the greatest challenge is that data is not always readily available. More and better data would improve the availability of performance measures and targets and hence the ability for DIY to make better decisions. For example, the freight division within DIY can calculate sales data by division, but not by location. As a result, they manage the metric on a micro level, but with macro data. The ability to distinguish between customers or location would make a tremendous difference in their ability to measure progress in meeting their performance targets.

## **Technology for Data Management**

DIY uses a transportation management system (TMS) provided by its third party logistics partner to choose carriers and routings, while individual distribution centers use a warehouse management system (WMS). They purchased XMark in Canada for RFID tracking, but do not use the system unless they are shipping expensive products. DIY also buys 50 to 100 licenses to use Minitab to conduct statistical analyses. It was once a desktop application, but is now accessible over the Internet.

# Florida Department of Transportation

## Background

The Florida Department of Transportation (FDOT) is a decentralized agency employing nearly 7,500 people in seven districts, a central office, and Florida's Turnpike Enterprise. The Secretary of FDOT is the chief administrative officer. The agency has direct responsibility for the state highway system of over 41,000 lane miles and 6,000 bridges. FDOT's primary focus is the Strategic Intermodal System (SIS), corridors, facilities, and services of statewide and interregional significance which include interstate and other major limited access and controlled access highways; major rail lines and waterways; major airports, seaports, spaceport, freight and passenger terminals; and city and county roads when they are connectors to the primary system. The SIS program allows for resource allocation by FDOT across transportation modes in order to make strategic investments for the state and its regions.

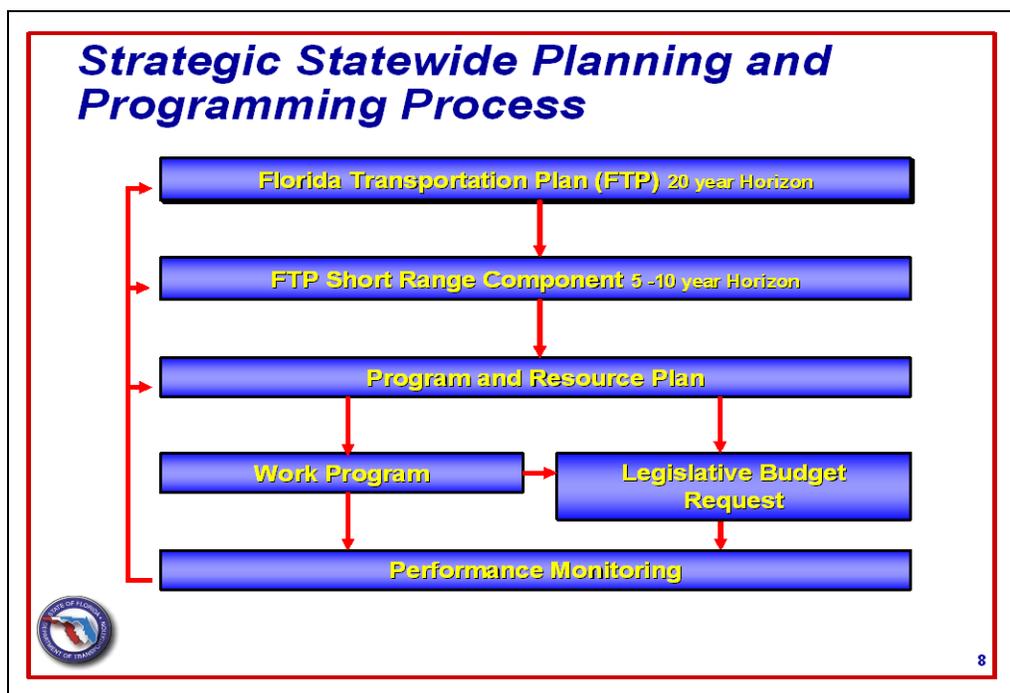
Decentralization means that FDOT's district offices are essentially DOTs themselves, each with its own secretary, and planning, environment, right-of-way, design, construction, maintenance, and legal offices. The various offices within the districts report to the district secretary and not to their counterparts in the central office. The district secretaries report to the Secretary, and also sit on the FDOT Executive Board. Although the Executive Board makes high-level policy regarding overall finding priorities and equitable distribution of resources, the agency's decentralized structure means that many detailed funding allocation decisions are made at the district level. This structure requires a strong but flexible performance management system to ensure consistency across districts in terms of achieving statewide goals. FDOT's overall Business Plan seeks to maintain accountability and transparency for processes that may not be standardized across the department.

FDOT utilizes an extensive performance measurement process that aims to link planning, programming, and budgeting activities to provide performance accountability and to guide future resource allocation policy. This process evaluates the progress made in achieving the long-range goals and objectives stated in the Florida Transportation Plan through the Short-Range Component of the Florida Transportation Plan, as well as, through the continuing identification of objectives and measures in implementing the Business Model through the five-tiers of Business Plans. Accountability for the Department's project production also is monitored through monthly production management reviews by executive management. State law establishes a budgetary performance monitoring process by the Governor and Legislature through a document titled the Long-Range Program Plan and provides for an objective assessment of the department's performance accountability on an annual basis by the Florida Transportation Commission.

As part of its Business Plan, FDOT conducts a planning and programming process that contains long, intermediate and short-range elements that are linked together to provide a continuum of guidance from policies to resource allocation decisions. The Florida Transportation Plan, the Short-Range Component, the Program and Resource Plan, and the Five-Year Work Program are all part of the statewide planning and programming process. The Florida Transportation Plan provides 20-year policy direction through long-range goals and objectives to guide transportation decisions in Florida. The Department establishes quantifiable short-term (up to 10 years) objectives, or targets, for meeting its responsibilities for implementing the Florida Transportation Plan in the *Short-Range Component of the Florida Transportation Plan*, updated annually.

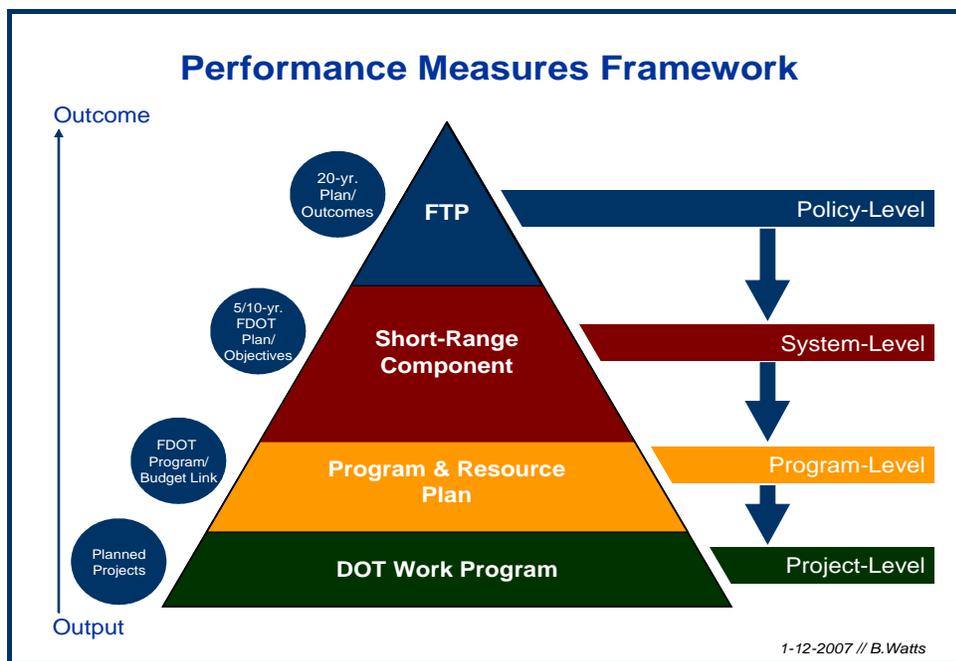
Each year FDOT also develops a 10-year Program and Resource Plan to establish financial and production targets for state transportation programs. It guides program and funding decisions to carry out the goals and objectives of both the Florida Transportation Plan and the Short-Range Component. This plan essentially links the FDOT long-range transportation planning process to the annual budget and Work Program. The Work Program is a 5-year listing of all transportation projects planned for each fiscal year, adjusted for the legislatively approved budget for the first year.

As required by law, FDOT’s Five-Year Work Program is developed through a two-way planning and input process between the Metropolitan Planning Organizations (MPOs), districts, and central office. The Florida Legislature provides top-down statutory direction, and the Florida Transportation Commission (FTC) provides policy and performance standards to guide the process. The agency has an annual budget of nearly \$8 billion. The current Five-Year Work Program is \$41.1B, of which 44 percent is dedicated to capacity expansion projects for all modes except transit; and four percent is dedicated to transit.



Performance monitoring compares how well FDOT is performing in light of how FDOT measures itself and how others measure FDOT. Key Performance Measures are monitored on a monthly basis by the FDOT Executive Board and annually by the FTC, legislature, and governor. The current key performance measures fall into five categories: Transportation System Safety, Customer and Market Focus, Production Performance, Transportation System Performance, and Organizational Performance. Additionally, each office/program within FDOT has developed performance measures and monitors performance on an ongoing and continuous basis using *pbviews* Performance Measurement System, a performance measurement database. From raw data for each input item, to trend charts and graphs showing actual versus target measures or year-to-year comparisons, *pbviews* can show the smallest detail or the “big picture” about any selected measure. The goal is to provide information and basic analysis for management at all levels to use in monitoring and tracking the key performance measures.

The following graphic illustrates the Performance Measures Framework in which FDOT operates, measures its performance, and measures performance of the transportation system, as well as the reporting framework employed.

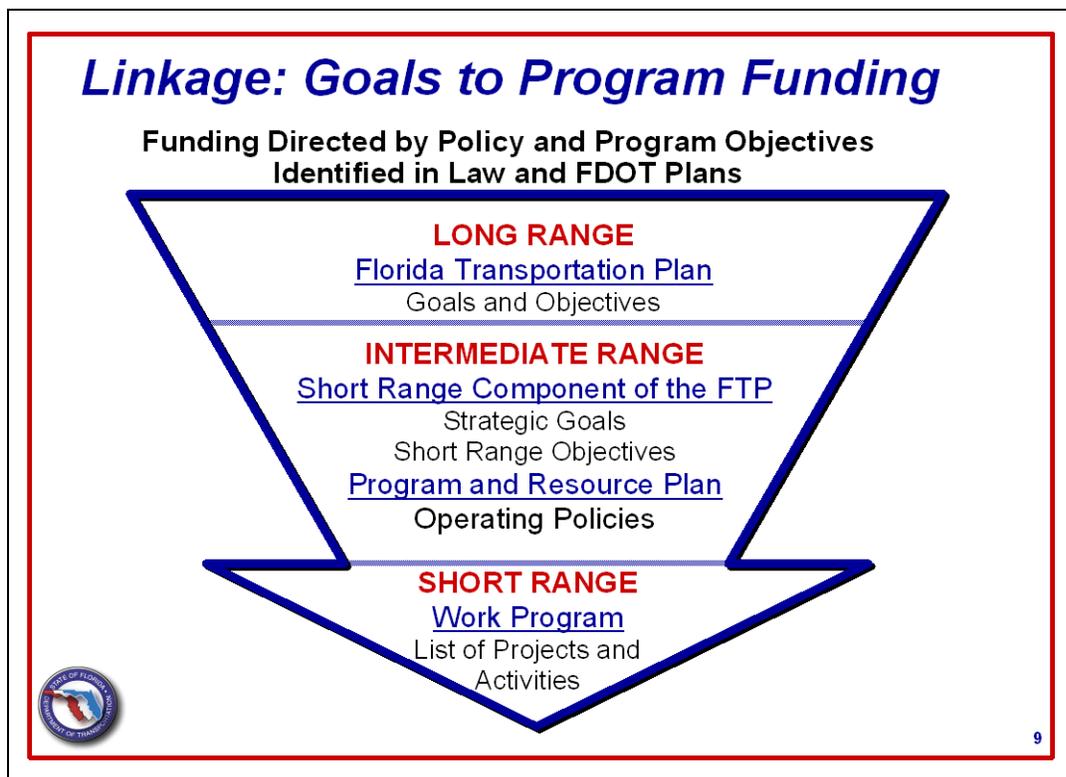


FDOT’s approach thus provides for continuous evaluation and reporting on the condition of assets, programs, and systems against established performance measures.

## Resource Allocation

### Resource Allocation Framework

The Florida Department of Transportation’s resource allocation framework follows the same relationships as the State’s planning framework. It begins with the Florida Transportation Plan (FTP), composed of a 20-year policy plan and a detailed Short-Range Component with a 5-to 10-year planning horizon.



The long-range component of the FTP contains five broad goals:

- A safer and more secure transportation system;
- Enriched quality of life and responsible environmental stewardship;
- Adequate and cost-efficient maintenance and preservation of transportation assets;
- A stronger economy through enhanced mobility for people and freight; and
- Sustainable transportation investments for Florida’s future.

These five goals are supported by 29 long-range objectives. However, the FTP does not identify targets or performance measures. Quantitative targets are defined in the Short-Range Component, which augments the 29 long-range objectives with 13 short-range objectives tied to quantifiable performance measures. These short-range objectives span four of the five goal areas (i.e., there are no measures for the goal of “enriched quality of life and responsible

environmental stewardship”). All of the measures are outcome-oriented with the exception of one output measure related to the SIS, which has its own performance-based funding allocation process.

Next in the top-down progression of Florida’s planning framework are the 10-year Program and Resource Plan and the Five-Year DOT Work Program. These two documents are created in tandem, and the central office lead in this process is the Program and Resource Allocation Office, within the Office of Financial Development.

The annual cycle of updating the Program and Resource Plan and the FDOT Work Program is the main point of feedback into the resource allocation process. The plan update process kicks off in July of each year, and includes adding a new 5<sup>th</sup> year to the Work Program, adding a new 10<sup>th</sup> year to the Program and Resource Plan, and making other necessary revisions to existing years in the plan horizons, particularly in the areas of pavement and bridge maintenance.

In preparation for Executive Board planning meetings, the Program and Resource Allocation Office assembles available transportation system performance data and summarizes the data in information packets. The data in the packets are supplied by the measure owners by way of the *pbviews* measurement and analysis system. The Program and Resource Allocation Office supplements performance data extracted from *pbviews* with more in-depth quantitative analysis, tables, and figures.

## **Priority Setting/Tradeoffs**

Resource allocation decisions are made by the FDOT’s Executive Board, which is comprised of the department secretary, three assistant secretaries, the district secretaries, and numerous program heads.

Florida statutorily requires that preservation of the existing highway system comes first, and so maintenance is funded off the top. Allocations for preservation and maintenance are determined statewide by forecasting the number of lane miles of resurfacing, bridge replacements, and so forth, necessary to maintain minimum standards, and applying those values to cost factors to determine necessary funding levels. Other capital expenditures are determined primarily by the district offices, in consultation with local governments and MPOs.

By statute, as well as department policy, the majority of discretionary capacity funds are allocated to the SIS, including highways, rail lines, ports, terminals, and intermodal facilities. SIS project funding allocations are determined by the FDOT Central Office in consultation with the districts.

Discretionary capacity funds not allocated to the SIS (about one-fourth) are distributed to districts according to a statutory formula that applies equal weight to population and fuel tax revenues. FDOT also ensures equitable allocation of funding. For example, southeast Florida has the most significant capacity issues and the greatest population growth, but the State checks to ensure that there is an equitable share for other areas of the State. The Program and Resource Plan dictates the distribution of funds to different program areas, but beyond that, it is primarily the responsibility of highly autonomous district offices to manage those funds.

The districts work with the MPOs and counties to develop regional priorities. FDOT and MPO projects have to be consistent with local comprehensive plans and this increasingly impacts decision-making. One issue is becoming more important – priorities for investment in metro areas come from MPOs but there is sometimes a disconnect between priorities of the MPOs and the land use decisions of the local governments. Florida has a highly prescriptive law regarding how projects advance through the Work Program that was originally enacted in the 1980s to bring more stability and certainty to the program.<sup>6</sup> The law requires coordination and consistency with MPO’s Transportation Improvement Plans (TIP) to the “maximum extent feasible” which provides some leeway to help ensure that the State Transportation Improvement Plan (STIP) is developed on time each year.

Since the SIS is FDOT’s top priority, the portions of the State Highway System not included in the SIS receive a lower priority in terms of funding for capacity projects. These roads are maintained to department standards, and FDOT has targeted programs for assistance to rural areas and small counties. Florida counties and municipalities are responsible for local roads and streets, and there is coordination at all levels.

## Target Setting

Resource allocation decisions are driven by a number of output- and outcome-oriented performance targets in the areas of highway maintenance, Strategic Intermodal System (SIS) funding, and transit funding, as required by Florida statute. These include the following:

- Eighty percent of pavement on the State Highway System meets department standards;
- Ninety percent of FDOT-maintained bridges meet department standards;
- One-hundred percent of the State Highway System meets acceptable maintenance standards;
- Fifteen percent of discretionary capacity funding must be used for transit projects;
- Fifty percent of discretionary capacity funding must be applied to the Strategic Intermodal System (the department’s own performance target for this is 75 percent.)

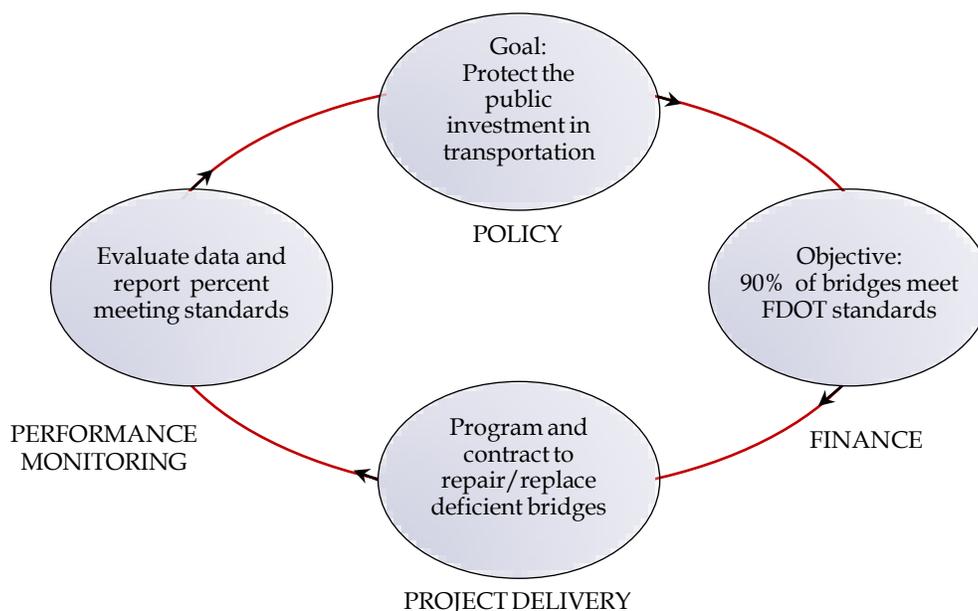
The remaining primary targets are set by the Executive Board, and secondary measure targets are set by the program offices and the districts (i.e., the “measure owners”). As the above targets are mandated by state law, meeting them is the department’s first priority. Determining the standards against which these measures are applied is the Executive Board’s responsibility, and so the standards are reviewed as one of the first steps in the Program and Resource Plan and Work Plan update process.

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<sup>6</sup> Section 339.135, F.S.

Figure 11 illustrates the relationship between goal and target setting and performance measures in FDOT’s bridge program:

**Figure 11. FDOT Bridge Program Relationship Between Goals and Targets**



There are additional secondary targets for Preliminary Engineering Consultant levels. When FDOT is building their new Work Program, there is an opportunity to bring forward new specialty projects. However, there is political pressure to add highway capacity expansion projects with any available resources left over. Consultant targets are set so that the level of engineering activity is maintained, and the production pipeline keeps going.

FDOT is currently postponing, reducing the size/cost or removing projects due to revenue reductions. The first area likely to be cut is capacity expansion projects, because maintenance targets are “sacred.” One would logically expect that consultant levels would also go down, but FDOT is struggling with how to set the target to determine the appropriate level of reduction. FDOT previously used right-of-way (ROW) acquisition targets as a measure to keep production going, but the Executive Board chose to do away with them because ROW land resources are decreasing. Historically, FDOT reset engineering consultant targets to whatever level is projected in the Work Program for four common years. They perform a trend comparison to construction levels and project what levels of preliminary engineering are needed. The Department is considering alternative methods for setting targets.

With recent budget cut-backs, target setting is more inconsistent now. The Federal stimulus package presents new challenges in determining which projects will be moved forward (e.g., projects inside the STIP only). Resource allocation procedures will be critical in building up the Work Program in case of stimulus, or pulling back in case of reduced revenue. One concept is to set net capacity additions based on the existing revenue stream, and then bring forward special needs projects (e.g., bridges, planning, etc.). Additional needs would be vetted with the

Executive Board, and any additional revenue would then be allocated to capacity projects based on statutory formula. They could increase allocation cost per lane mile, or the funds could be given as discretionary funding for districts to decide how it will be used (e.g., additional capacity, or enhance repaving projects).

No analysis has been done to determine the impacts of funding reductions on mobility around the state, although FDOT might consider resetting or lowering some standards (e.g., the maintenance standard is 80 percent, but FDOT is performing much higher at 95 percent). This would free up funding for additional capacity projects. Evaluations such as this one are done during times when revenue is down. Districts need some flexibility to determine which projects are best for their district. Some analysis has been done on the maintenance and pavement side to evaluate the impacts of lowering targets.

Alternatively, FDOT could consider revising its level of service (LOS) standards, currently codified in Rule 14-94, Florida Administrative Code. Until the early 1990s, LOS standards were planning guidelines designed to help prioritize capacity needs based on geographic area types – urban, transitioning, rural, etc. With the decennial census of 2010, these area types will be updated based upon population gains, and LOS standards applicable to some highways will change as a result. However, beyond that change, the LOS standards could be reworked in terms of how they are measured, for instance using a different model hour. Any changes to the standards would need to take into account impacts on land use and development, although it should be noted that the Florida Legislature is currently debating making most Florida cities LOS exception areas, so reworking the LOS standards may have little impact beyond FDOT.

FDOT needs to develop mobility performance measures that allow comparisons between different project types. For example, funding for the Road Rangers program was reduced by 50 percent last fiscal year, with about \$5.3 million in the maintenance budget available for the program. Districts made different decisions on how to supplement their Road Rangers program with their flexible funding. Some Districts ended up cutting their program by 50 percent, while others were able to maintain their program using flexible funds. If funds are given off the top, districts are able to decide how to allocate their flexible funds. If they are mandated to use it for capacity, districts lose their flexibility in determining which projects to fund.

## **FDOT's Tiered Business Plans**

FDOT has long promoted a highly decentralized management structure that gives considerable independence to district secretaries. This results in wide variations in funding priorities and decision-making processes among different districts, and can pose a challenge to implementing a centralized performance management structure. FDOT's five-tiered Business Plan seeks to maintain accountability and transparency for processes that may not be standardized across the department. Developed as a system for implementing the department's Business Model the Business Plan attempts to link together all of the department's statewide objectives, statewide business functions, organizational units, district functional units, local offices, and individual employees under a single set of criteria and toward a unified goal of advancing the department's strategic goals. The Seven Criteria of the FDOT Business Model are based on the

Florida Sterling Council’s Criteria for Excellence and the National Baldrige Criteria for Excellence, and were adopted by the department in 1998:

- **Leadership** – The department’s senior leaders set direction, communicate direction, monitor results, improve the system, and address its responsibilities to the public and practice good citizenship.
- **Strategic Planning** – The four parts – Florida Transportation Plan, Short-Range Component, Annual Strategic Objectives, and Executive Board Initiatives – are built and updated separately during their normal cycles and brought together in the DOT Business Plan to allow the agency to align its efforts and resources.
- **Customer and Market Focus** – Customer satisfaction and dissatisfaction results provide valuable information that helps FDOT understand both its customers and the marketplace.
- **Measurement, Analysis, and Knowledge Management** – Data and information to be collected and measured are determined by a variety of sources, including the need to satisfy legal mandates and to respond to internal and external customer requirements.
- **Workforce Focus** – The department’s work and jobs are designed, organized and managed to promote alignment among organizational needs, employee capabilities, and career development. The department provides training and educational opportunities to meet organizational needs and employee career progression.
- **Process Management** – The objective is to “Implement a Results-based Management System,” through “Core Processes” – Plan, Produce, Deliver, Maintain and Operate – and the six “Key Support Processes” – Managing Human Resources, Managing the Workplace Environment, Procuring Goods and Services, Managing Information, Managing Finances, and Executive Support Services.
- **Organizational Results** – The department uses indicators and systems to track performance, including customer focus and customer satisfaction results, financial and market results, human resources results, and organizational effectiveness results.

Tier One (the “FDOT Plan”) is built by the Executive Board and is designed to fully integrate the DOT Business Model statewide through the functional deployment of the Florida Transportation Plan, Short-Range Component, annual Strategic Objectives, and Executive Board Initiatives, creating five tiers of business plans. The FDOT Plan contains sections for each of the seven Business Model criteria, and each of these criteria has its own subsection of objectives, activities, performance measures, targets, status (used for reporting), and person responsible. The “objectives” are drawn from the Strategic Objectives, which are:

- 2003-01 Improve External Customer Satisfaction
- 2003-02 Improve Response to External Customer Issues
- 2003-03 Improve Project Delivery
- 2003-04 Implement the FDOT Strategic Highway Safety Plan
- 2003-05 Implement the DOT Business Model Statewide
- 2003-06 Improve Leadership System Effectiveness

- 2003-07 Address Workforce Development Issues
- 2003-08 Improve Communication Effectiveness

Tier Two through Four plans also are constructed around the Business Model criteria and their subsections, and use the same format as Tier One to encourage consistency and linkages between plans. Lower tiers modify objectives to meet functional responsibilities.

Tier Two is made up of the Statewide Function Plans (i.e., Construction, Maintenance, Human Resources, etc.) created between Central Office and the Districts to define the key business objectives of the function and the linkages to the Tier One plans. Tier Two also may include Organization Plans (i.e., District or Division) providing added direction to more than one function. To date, only one Tier Two Functional Plan has been completed (Design), although there are 36 Tier Two Organizational Plans.

Tier Three Plans isolate functions at the regional level (District Four Construction, District Six Materials, etc.). Tier Four consists of Office Business Plans for each individual office, maintenance facility, etc., while Tier Five consists of individual plans for every department employee. As of 2007, all business plan tiers were phased in.

Each subordinate tier must be reported to and approved by the appropriate manager on a quarterly or biannual basis, with the exception of Tier Five employee plans, which are evaluated as part of the annual employee review cycle. According to instructions published by the FDOT Performance Management Office, “Sources of Existing Measures may be laws, rules, regulations, procedures, process maps, the Key Performance Measures established by the Executive Board, etc.” Offices are not obligated to conform to department-wide standards for all performance measures, but they are required to demonstrate accountability for all of their functions.

Tier Five of the FDOT Business Plan describes the department’s expectations of each individual employee, and how those expectations relate to the higher tiers of the Business Plan. This linkage is the connection between Tiers three and Four and the Employee Performance Accountability and Bonus System (EPABS), the agency’s on line employee performance review program. One section of the EPABS program, titled “work activities expectations,” forms the basis for Tier Five. The Tier Five document is supposed to take those expectations and articulate how they relate to the objectives in Tiers Three and Four. Specifically, employees are required to know the Tiers Three and Four objectives, the performance measures and targets used to advance those objectives, and their role (and associated performance measures) in meeting those objectives.

## **Improving the Process**

Performance-based resource allocation is an evolving practice at FDOT. FDOT has long been recognized as a leader in performance measurement across many of its business functions and is developing and strengthening the link between performance measures and decision-making.

Conversations with several FDOT staff and others familiar with department processes have highlighted a number of challenges that the agency is working to overcome as it seeks to improve the link between performance measurement and funding allocation decisions.

- **FDOT Is Improving Performance-Based Accountability in a Decentralized Environment –** FDOT is decentralized to the point that different districts do not necessarily follow the same management structures or contain all of the same program offices as one another. This promotes innovation among district secretaries and senior managers, and allows for district-specific solutions to regional issues, but it also poses an inherent challenge to maintaining a consistent, performance-based management and resource allocation system. FDOT has worked hard to mitigate these challenges.
- **The tiered Business Plan is a key contributor to the unification and alignment of agency goals.** The five tiers were created with the idea that, “Information and requirements flow from Tier One to Tier Five... while feedback, supported by measures (facts), flows upwards.” Implementation of pbviews as a centralized clearinghouse for performance measures also has played an important role. With these tools and strong leadership from the central office and the districts, FDOT has introduced clear accountability linkages that connect the agency-wide business model to each and every employee, even in the reality of differing district priorities and management styles.
- **FDOT Is Still Dealing with Uneven Performance Measure Quality and Targets –** Statutorily mandated performance targets for roadway and bridge maintenance have resulted in great stability in the way that those programs are funded, with future funding decisions clearly linked to past performance. Funding decisions for other program areas are less clearly linked to performance. This is most apparent when examining the Short-Range Component of the Florida Transportation Plan, which lays out the quantifiable targets by which all programming decisions are to abide. For example, the goal of “A Safer and More Secure Transportation System” presents safety data across all modes, including rail (and highway-rail grade crossings), seaports, and airports, but offers performance targets only for highway, pedestrian, and bicycle safety. Similarly, the goal of “Enriched Quality of Life and Responsible Environmental Stewardship” does not include any performance targets in the Short-Range Component, but rather presents a number of “Strategies.” One such strategy is use of the Efficient Transportation Decision-Making (ETDM) process, the State’s GIS-based collaborative environmental review process. ETDM is not a tool for making resource allocation decisions per se, so the connection between project selection and specific agency goals remains unclear.
- **There are many more measures available than those described in the Short-Range Component, including a number of measures that are associated with the agency’s Key Performance Measures and that have stated targets articulated in the pbviews system.** However, it is not clear how these measures and targets relate to the Florida Transportation Plan, which is the statewide guiding document for transportation decision-making. This may also be partly a function of performance targets being set by program managers at the district level, rather than statewide.

- FDOT’s Performance Measure Framework Is Still Incomplete – In some cases, performance targets have not been created because associated performance measures are not yet available. In the mobility area, for example, several interviewees identified the lack of well-defined and data-supported travel-time reliability measures and targets. This is an area that FDOT is actively working to develop.
- Performance Measure Ownership Is Sometimes Poorly Defined – One challenge identified by a number of interviewees was the lack of well-defined ownership of the performance measurement and reporting infrastructure at FDOT. For example, the Program and Resource Allocation Office is responsible for preparing information packets to be used in the plan development cycle, but that office is not responsible for reporting performance data (this is the responsibility of the program offices) nor for maintaining performance measure databases. This latter role is performed by the Performance Management Office, which manages pbviews. pbviews also is not fully implemented yet, and some measures are not yet reported through that system. Additionally, other performance measure-related activities do not utilize pbviews, including the Florida Transportation Commission’s annual Production and Performance Report (an independent oversight report prepared using data primarily supplied by FDOT).
- This challenge might be characterized as a side effect of attempting to transition to a more robust performance reporting system in pbviews, and of Florida’s highly decentralized business model. As pbviews is more fully deployed, it may become more efficient and could achieve greater recognition as a clearinghouse for performance data across all districts and programs. Full implementation of FDOT’s five-tiered business plan system plays an important role as well, as it requires districts and program offices to identify performance measures and targets for all goals and objectives, regardless of how that performance data is collected and where it is stored.
- FDOT’s intent is to move the Emerging SIS to the enterprise level across all program areas. FDOT has established data governance and stewardship roles for the Emerging SIS, but there is still a need for connection at the technology level. Data formatting and data cataloguing activities also are still ongoing.

Interviewees also highlighted a number of success factors in developing FDOT’s performance measure and resource allocation framework:

- FDOT has prioritized maintenance and preservation. Statutory requirements for quality pavement, bridge, and overall state highway system conditions have fostered an environment where expectations are known in advance and are consistent from year to year. These statutory requirements and off-the-top funding for maintenance have cemented FDOT’s commitment to putting preservation first. Given the consistency of this commitment, the Program and Resource Office has developed a highly successful process for projecting future output requirements and cost assumptions based on past performance. Accurate projection of funding requirements for these off-the-top programs sets the tone for overall success in the budgeting process.

- There is a strong link between system performance, agency performance, and individual performance. FDOT’s Five-Tier Business Plans include all of these components.
- The ability to handle flexibility and fluctuation in revenue is another success factor.
- Another success is the ability to handle multimodal and intermodal facilities through the Strategic Intermodal System.

## Data Support Systems

### General Relationships

Data Management at the Florida Department of Transportation (FDOT) has been of interest to the FDOT Information Technology (IT) office for several years. Following are all policies and procedures that are in place. The date the policy was established is listed along with a short description of the policy.

*Custodian and Owner Responsibilities – Data and Software – 1995* – Defines custodians and owners for data and data systems, including roles and responsibilities. The emphasis is on data security, access, and audits; however, definitions also are included for data, data management and others. According to the procedure data, management entails the identification of types of data, development, and enforcement of data dictionary terms, control of data redundancy, maintenance of a data dictionary, and physical design of databases. The procedure clearly delineates the responsibilities of the IT office versus the data owners. Custodians and owners are responsible for ensuring that sufficient controls are established within their area of responsibility to ensure the accuracy and completeness of data and that data comes from the appropriate source for the intended use. While these terms are defined and well known within the data community, there is not a clear link to performance measures and decision-making.

*Information Systems Roles and Responsibilities – 1997* – Generally defines IT and other business office responsibilities with respect to data systems. It specifically states that FDOT offices shall ensure the integrity of data systems.

*Information Resource Management Council – 2005* – Establishes process for making major IT and data project selection decisions.

*Electronic Data Management and Geographic Information Systems – 2007* – Intent is to establish automated systems to improve the quality and accessibility of department information and support graphical analysis of geographic data.

*Electronic Data Management Requirements – 2007* – Establishes controls for electronic records.

These policies are currently in place and owners of data sets clearly defined. For example, the manager of the statistics office owns the data contained in the Roadway Characteristics Inventory database and the IT office is responsible for the database itself. As such, the statistics office must maintain the quality and integrity of the roadway data. The statistics office has

developed and maintained a data business plan for the roadway and traffic data under their jurisdiction. The plan assigns quality standards and instructions for the district offices to follow related to data collection. The plan also addresses integration and standardization issues. Any new databases or software applications must be approved by the Information Resource Management Council which is comprised of senior management.

The FDOT structure appears to serve the development of large scale database applications very well. For example, FDOT established a Strategic Intermodal System per legislative requirements. The system is a multimodal interstate system of transportation corridor and facilities designed to serve the State and maximize the economic vitality of the State. The selection, prioritization, and maintenance of the segments require a vast amount of data. The FDOT Planning Office worked in conjunction with the IT office to design and deploy sophisticated, integrated SIS databases to house geographic, inventory and characteristic data.

The department also is very performance measures oriented as indicated in the previous section of the case study. FDOT has strong data and IT capabilities in the bridge, pavement, and maintenance areas. Beyond these programs, statewide data collection focuses more on the presence of assets rather than their condition.

FDOT is working on reliable performance measures and the data required to calculate reliability. Right now FDOT tracks person hours of delay, but they are trying to expand into more reliability issues. This measure is of particular interest to the SIS and for travel across modes. Overall, FDOT feels they have a good foundation, and can tap into many other data sources/choices if needed for a particular issue or study.

## **Organization and Governance**

### ***Data as an Asset***

There is no indication that FDOT treats data as an asset. A recent Asset Management assessment within the department made recommendations related to enterprise GIS as a method of more consistently integrating and referencing data related to management of assets.

### ***Data Governance Framework***

The policies outlined above define the data governance structure. However, there does not appear to be an enforcement strategy in place.

### ***Roles and Responsibilities***

These are defined in the Custodian and Owner Responsibilities policy described above. The policy was written in 1995 and should be updated.

### ***Data Standards***

General standards related to access, security, etc. also are outlined in one of the policies above.

### ***Institutional Arrangements/Policies to Support Data Management***

The Information Resource Management Council reviews and approves all requests for IT projects. This does not necessarily include data management projects.

### ***Relationship to Target Setting/Decision-making***

In 2006, FDOT’s Executive Board adopted a resolution requiring all performance measures to be stored in a single location. PBviews is the software package that the Florida DOT utilizes to manage and present the agency’s numerous performance measures. Deployment of new performance measures and the transition to centralized storage of all measures in PBviews is still ongoing. The system stores measures in a hierarchical system, and also distinguishes between statewide measures and several geographic strata, such as districts and individual office/facility locations. Atop the performance measurement hierarchy are FDOT’s five key performance measures (KPMs):

Transportation system safety;

Customer and market focus;

Production performance;

Transportation system performance; and

Organizational performance.

The KPMs are aggregate measures that organize primary and secondary tiers of measures. For example, the Production Performance KPM consists of three primary measures (construction, production management, and cost estimate measures) and 12 secondary measures. Each primary and secondary measure is assigned a relative weight as the measure data are entered into PBviews. The system allows viewers to examine each primary measure, secondary measure, and KPM by individual locations or statewide.

## **Data Sharing**

### ***Institutional Arrangements/Policies to Support Data Sharing***

There are no specific policies to promote data sharing within FDOT.

### ***Integration with Outside Data Sources***

The University of Florida has a coordinated database of environmental data. It is a massive effort, covering a lot of data. They also maintain the official state demographic forecasts, although this is a separate effort from the environmental data. FDOT maintains a database of transportation data, and the SIS pulls together a multimodal database covering all the SIS modes. FDOT is working to link the University of Florida databases into that.

### *Internal/External Data Access*

There is nothing unique about internal and external data access.

## **Documentation and Reporting**

### *Enterprise Data Model*

FDOT has realized the importance of establishing relationships between spatial data and business processes, and integrating various localized information systems. Almost every major business process at FDOT requires the use of GIS data. The department has invested significantly in GIS technologies through the creation and maintenance of geospatial data. The Central Office maintains enterprise data which is mostly spatial and used with many applications within FDOT for spatial display and analysis. However, district-level responsibilities require more regional and local analysis and consequently, the districts have developed GIS data and applications to address more localized needs. The result is a somewhat fractured GIS, where data sharing, data creation, application development, and techniques are not shared across functional groups, which in turn creates redundant data storage and ineffective workflow. A GIS Enterprise Plan was recently completed to formally analyze the requirement for such an enterprise system at FDOT. As a result, an enterprise GIS policy/procedure was recently proposed by the GIS Coordinator.

### *Data Dictionaries and Metadata*

Other than the policies referenced above, there are no specific-data dictionary or metadata requirements.

## **Technology**

### *Data Management Systems / Business Intelligence (BI) Tools*

The Strategic Investment Tool (SIT) was developed as a method for prioritizing SIS highway and connector projects. Managed by the Systems Planning Office, the SIT uses 25 weighted prioritization criteria that fall within five main categories: 1) safety and security; 2) system preservation; 3) mobility; 4) economics; and 5) quality of life. The SIT is applied to both statewide projects and district-level funding decisions. These performance measures also are reported in PBviews, combining and expanding upon the primary and secondary measures that constitute the five KPMs.

The districts also maintain a variety of additional databases using various types of GIS tools. The GIS Enterprise initiative provides an opportunity for FDOT to achieve economies of scale in terms of the districts' GIS work and to support the management of other assets that fall between the maintenance and capital programs (e.g., signs, guardrail, and drainage systems). Needs on these assets are not tracked systematically on a statewide basis.

## **Success Factors**

Establish, update, and enforce policies and procedures to govern data management.



# Hennepin County Public Works

## Background

### General

Hennepin County is the largest local government in Minnesota and according to its 2009 budget it has been rated among the best managed large counties by studies from Syracuse University and *Governing Magazine*. The county, whose 2009 annual budget totals over \$1.7 billion, received high marks for governmental structure, integration of social services, superior debt management, technology training, and innovative partnerships. Additionally, the county is one of approximately 22 counties nationwide to receive a triple-A credit rating, the highest possible, from all three national rating agencies. Hennepin has maintained this rating since 1977.

The county is located within the Twin Cities Metropolitan Area. The upper Mississippi River flows through Minneapolis and defines the northwestern boundary of the county. Minneapolis, the most populous city, is one of 46 municipalities within the county. Hennepin County is the largest county in Minnesota, encompassing 611 square miles with an estimated population of 1.1 million people. The county has added new residents over the last 15 years and population projections forecast more growth. One-third of the county's population (377,392) lives in Minneapolis with the remaining 759,207 residing in suburban Hennepin County.

### History

Each year since 1994 Hennepin County has produced a Community Indicators report that provides a view of the current community conditions and trends based on selected quantitative data. The report is a reflection of the health of the county as a whole. Over time indicators have been adjusted and updated to reflect the county's changing interests and priorities. However, many of the original indicators have been retained in order to establish a trend line.

In 2002, Hennepin County government introduced a strategic management framework that focuses on results and customers. Consistent with the framework, the indicators in each annual report have been grouped to align with the county's current overarching goals. Each report also updates indicator data from previous reports to track changes in Hennepin County residents' quality of life.

Hennepin County's annual Indicator Report is based primarily on performance measures that are monitored by individual county departments within the overall strategic management framework. This framework is oriented towards lines of business. Departments with like services that serve common customers work together to chart strategic direction. This case study focuses on the Public Works line of business that has developed a plan establishing

strategic direction for the following functional areas: 1) emergency preparedness, 2) environmental, 3) energy, 4) housing and community works, 5) transportation, and 6) administrative services.

Each functional area has an overarching goal that is linked to the Public Works mission and vision, as well as the countywide strategic management framework. The goals also are aligned to specific objectives, community indicators, and program measures. Community indicators reflect trends of importance to achieving the Public Works goals but are beyond the singular control of the Public Works business line. Program measures, however, focus largely on those areas directly under control of the business line. Together the indicators and measures establish a baseline to illustrate past and future direction. The strategic plan documents the story behind the baseline, identifies partners needed to address community-wide issues, and describes what it will take to “turn the curve.”

## **Planning and Programming Resource Allocation**

The Public Works Strategic Plan is policy driven and performance-based. As illustrated in the figure below, the plan provides a Strategic Decision-Making Framework which links the department’s vision and mission to performance-based goals and objectives. The performance measures provide the foundation for monitoring progress toward desired outcomes such as the impacts of system investments, the condition of infrastructure features, and the quality of services. These assessments are summarized in a balanced scorecard.

The Balanced Scorecard, described in detail in Figure 12, is a management and measurement tool used to support ongoing results-based decision-making, planning, and budgeting at all levels of the county. The scorecard allows each business line to:

- Align daily work with strategic goals and objectives;
- Judge the impact of decisions;
- Gauge the need for change; and
- Facilitate the countywide communications.

**Figure 12. Strategic Decision-Making Framework**



Hennepin County uses the Balanced Scorecard (BSC) method as a management and measurement tool to support ongoing results-based decision-making, planning and budgeting at all levels of the organization. Performance measurement, in the Balanced Scorecard, or any other system, is like a warning light on the dashboard of a car. The light tells you that something is going on, but it doesn't tell you why it's happening. To learn why the warning light is on and fix the problem, you need to look further. The Balanced Scorecard identifies the "warning lights" for county managers, directors, and administrators in order to highlight the programs needing attention.

The Balanced Scorecard helps the county to align daily work with the county vision and strategic goals. The vision for the county is as follows:

*We envision a future where residents are healthy and successful and where our communities are safe and vibrant. We will strive to meet and exceed expectations by engaging people and communities in developing innovative solutions to challenges. We will be a diverse learning organization. We will partner with others to enhance the quality of life in Hennepin County and the region.*

The Balanced Scorecard translates an organization's mission, vision, and strategies into a comprehensive set of performance measures and an effective measurement and management system. It is a tool for decision-making that builds on cross-functional cause and effect relationships.

The BSC in Hennepin County is viewed from four perspectives:

- Customer – What results do we need to produce for our customers to fulfill our mission and achieve our vision?
- Finance – What financial objectives must we meet in order to produce the desired results for our customers?
- Internal Process – What processes must we excel at in order to attain the financial objectives and desired results for the customer?
- Learning and Growth – How do we develop our internal resources to refine the necessary processes that will allow us to attain our financial objectives and desired results for the customer?

## **BSC Application to Public Works**

The specific application of the BSC perspectives to the Public Works Business Line is illustrated in the Public Works Business Line Strategy Map (Figure 13). The map connects the department’s goals to the four perspectives of the scorecard. The goals are aligned with the following vision and mission statements in the Business Line’s 2007 Strategic Plan:

- Public Works Vision: “We envision a workplace where the natural and human environments support and sustain one another in the present; and are preserved for the future, where safe, affordable housing and accessible transportation choices endure that everyone may live, work, and enjoy life.”
- Public Works Mission: “To strengthen our economic vitality and quality of life through environmental stewardship; support of strong, healthy, and safe communities; wise investments in economic development; and affordable housing and provision of accessible transportation choices.”

## **Target Setting**

As stated previously, the Hennepin County Public Works Line of Business has five functional areas, including 1) emergency services, 2) environmental, 3) energy, 4) housing and public works, 5) transportation and 6) administrative services. These functions, described in the 2007 Strategic Plan, are at varying stages in setting performance measure targets. For purposes of illustration, the transportation function is highlighted by providing its goal, objectives, selected performance measures, and targets. For some measures targets have not yet been set. However, the Business Line is on a track to develop a complete menu of measures and targets for all functions in the near future.

The overarching goal for transportation for the County is “Hennepin County has the best transportation network to move people and goods to sustain our communities and environment.” This is supported by the following objectives:

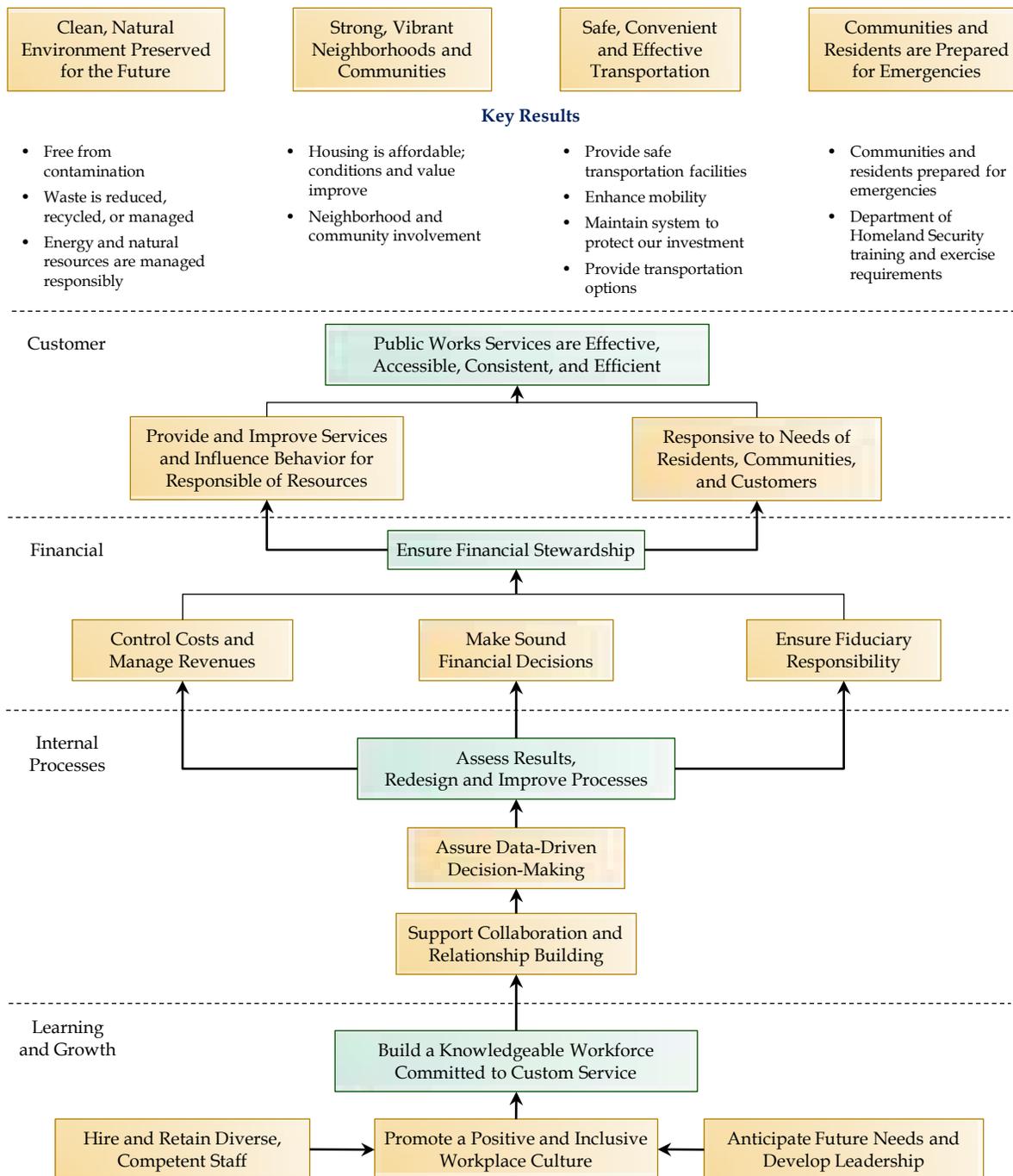
- Objective 1: Provide Safe Transportation Facilities
  - Assure less than 10 percent of county bridges have a sufficiency rating less than 50
  - Reduce crash rates below the 2004-2005 targets of 3.53 crashes per million vehicle miles
- Objective 2: Enhance Mobility
  - Travel Time Index (no target)
  - Twin Cities Transit Ridership (no county target)
  - Utilization of Acquired Railroad Corridors (no specific target but rights-of-way will continue to be purchased for future transit opportunities.
  - Completion of the Bicycle System Plan (target 100 percent)
  - Walking as a Percent of Trips (developmental area)
- Objective 3: Maintain System to Protect Investment
  - Assure 67 percent of Lane Miles are Rated “Good” or “Better” on the Present Serviceability Rating (PSR)
- Objective 4: Deliver System Improvements
  - Assure that 80 percent of Projects are Bid on Schedule
  - Maintain Engineering Costs at 18 percent of Actual Capital Project Costs

In future updates of its Strategic Plan, the Public Works Business Line intends to establish additional targets not only for transportation but for all functional area performance measures. The target setting process takes into account the objectives to be achieved and the four dimensions of the Balanced Scorecard with the following questions in mind:

- What do our customers value and expect?
- What are the financial implications of meeting the measure targets?
- What data is required to manage the measures?
- Is staff adequately trained and committed to achieve the targets?

With these questions in mind, each functional area develops its targets which are vetted with its customers and with staff from other functional areas. The targets are approved by the Director of Public Works who reviews them with the County Board.

**Figure 13. Public Works Business Line Strategy Map**



## Data Support Systems

### General Relationships

In general, a great emphasis is placed on ensuring that relevant data is available to support performance-management and decision-making at the county administration level. While several departments have a majority of the data that is needed for decision-making within their area, the county still lacks good performance indicators on a countywide basis, especially for the financial systems. Data needs related to timeliness and accessibility, for use as performance indicators, has been identified as the most important data needs at this time.

The county also wants to establish a robust information system, in the future, to track expenditures and investments as they relate to the overall goals of the county. The Public Works Department is well ahead of the other departments in developing such a process, especially for the Environmental Services program, which has established a link between goals, targets, and budgets using the Balanced Scorecard method.

Even though legacy systems currently provide the majority of information to decision-makers, Hennepin County is in the process of developing new integrated data systems to support agency functions. Data also is incorporated, to some extent, from external sources, including Mn/DOT, the Department of Public Safety (DPS), local school districts, police departments, and other criminal justice agencies.

The performance targets at Hennepin County are basically established by the top-level managers who coordinate with each other in setting the targets. Information is readily shared among the managers in order to establish the best performance measures for each functional area.

The Research, Planning, and Development (RPD) department of the county is responsible for determining what data and information systems are needed for each department, in coordination with those departments and the Information Technology department. The individual departments provide significant input into the development of the information systems for their business units. The county also has three committees that are responsible for reviewing and approving/rejecting investments in programs. These committees include:

- Information Technology managers from each department;
- Business leaders from each department; and
- IT Governance Board comprised of Department Directors, the Deputy County Administrator, and the County Administrator.

More information follows regarding the organization and role of Data Governance at the county.

## Organization and Governance

### *Data as an Asset*

Hennepin County considers its data programs to be important assets to the county. They continue to invest heavily in their data management programs to protect those assets. New applications are being developed and implemented to manage the human resources, financial programs, and tax collection functions, as well. The security and protection of the data assets is of primary importance as evidenced by the county's use of "redundant" systems for the disaster/recovery processes and also is providing training to its employees on what is considered public data versus private data. The Information Technology (IT) department, additionally, has responsibility to provide cost/benefit information to management regarding the development of any new information system for the county.

### *Data Governance Framework*

The Data Governance and Data Stewardship functions are a shared responsibility at Hennepin County. The Research, Planning, and Development department works with the staff from other departments to ensure that the plans for development of new information systems comply with established organizational policies and procedures. The IT department's role is to ensure that any new systems developed comply with the county IT standards and policies for information systems. The individual departments are responsible for defining who has access to data for their department(s) and submits their requests for development of new systems to the Business Intelligence Center (BIC) for consideration.

The top level of oversight of the data systems resides with the *IT Governance Board* and is comprised of department Directors, the Deputy County Administrator, and the County Administrator. The IT Governance Board was established by an official charter (see Appendix C). The *IT Steering Committee* provides advice on how proposed information systems will fit into the current IT architecture at Hennepin County.

### *Roles and Responsibilities*

The county has a well-defined list of roles and responsibilities for managing its Business Intelligence (BI) program through the use of the COGNOS system. See Appendix C for the chart of Roles and Responsibilities.

### *COGNOS 8 Query Studio Standards*

Hennepin County has a well-defined set of standards for use of the COGNOS 8 Business Intelligence system. Excerpts from the Hennepin County manual entitled, "COGNOS 8 Query Studio Technical Standards, 04/04/2007," are included in Appendix C. The manual specifies that the "standards that are to be used by C8 developers both in the Business Intelligence team and within the business units" and includes standard naming conventions for projects and reports which are stored/retrieved from the Query Studio.

### ***Institutional Arrangements/Policies to Support Data Management***

The responsibility for the management of data systems is shared throughout Hennepin County as indicated below. Each department listed below also is responsible for the quality of data in their area.

- Information Technology – Responsible for the enterprise network;
- Human Resources – Responsible for the enterprise Human Resources/Payroll data;
- Office of Budget and Finance – Responsible for the enterprise Budget and Finance data;
- Human Services and Public Health – Responsible for client data; and
- Public Works is an example of a department – Responsible for their systems data.

### ***Relationship to Target Setting/Decision-Making***

The use of a data governance structure and data standards at the county helps to ensure that information is readily available from the information systems with reliable and good quality data to support decision-making throughout the county. As discussed previously, the county is actively pursuing replacement of legacy data systems with newer applications to support funding and investment decision-making processes. This will, in turn, support the programs in the future which provide critical services to the citizens of Hennepin County.

## **Data Sharing**

### ***Institutional Arrangements/Policies to Support Data Sharing***

Hennepin County Public Works uses the COGNOS system to facilitate data sharing among the various staff within the agency. Most of the staff involved in performance measures has access to COGNOS, via the web. The level of access for data and reports is based upon the position level of the staff, i.e., supervisory or not. The executives at the organization are expected to use COGNOS for their needed reports and information.

### ***Integration with Outside Data Sources***

While a majority of the data that is used for performance management comes from internal sources, some of the data such as transportation data and crash data is provided from Mn/DOT and the DPS, respectively, as discussed previously. The county also utilizes data from the schools, police departments and other criminal justice agencies. While some of this external data is still entered manually into the Balanced Scorecard component of the Business Intelligence system, plans are to automate this process in the future.

### ***Internal/External Data Access***

The county not only integrates data from external sources, but also shares its data with other public organizations, like the schools for instance, to better understand how the programs at the county impact the children and educational programs throughout the county.

Internal sharing of data is primarily using the COGNOS system. Additionally, the Hennepin County Public Works department also is initiating discussions regarding what data may be made available to the public in the future. However, this will not include performance measures and targets.

## **Documentation and Reporting**

The COGNOS system is the tool used for managing Business Intelligence functions, including reporting and queries as needed by decision-makers. The County Administrator is a strong advocate for the use of COGNOS as the primary documentation/reporting repository.

### ***Enterprise Data Model***

The County has created models which depict the allocation of resources as part of an extensive budgeting process. The departments also have identified performance-based metrics for their departments and the County is now working on metrics which are important on a Countywide basis. These performance-based metrics will be incorporated into future enterprise models.

### ***Data Dictionaries and Metadata***

The county also has developed a business glossary which defines business terms used for various programs. Appendix C has an example of the Business Terms Glossary for the *Payroll Employee Turnover Reports*.

### ***Change Data Tracking Methods***

Tracking system changes for the various data programs became a priority with the integration of data systems. Changes in one program would cause problems in another data program and the county recognized the importance of creating a mechanism to track system changes. The County is continuing to make improvements to their “change tracking” methods. With the plan to implement a large human resource/financial tracking system at the county in the near future, there are no plans to add additional applications to the “project queue” at this time.

## **Technology**

### ***Data Management Systems / Business Intelligence (BI) Tools***

The county currently uses MS SQL server as its database platform and the COGNOS Metric Studio tool for managing Balanced Scorecard information. The county plans to implement Oracle as the database platform for the new human resource/financial application system.

ESRI’s ArcGIS system is used to support the Geographic Information System needs for the county. Many of the staff is receiving training in ArcGIS to learn more about how this GIS software can help support them in their daily jobs.

The county also uses Informatica products for data integration purposes.

## **Data Systems’ Relationship to Target Setting/Resource Allocation**

The data systems in the county provide information for target setting and resource allocation decision-making. The Balanced Scorecard tool requires the departments to define targets rather than just using the data as a metric like tracking the number of customers. The data systems in place and in development will eventually allow the county departments to spend less time gathering data and more time defining the outcomes and targets that are needed for each county program.

### **Success Factors**

The strong executive level support for performance-based management in the data programs at Hennepin County ensures that the county will continue to design and implement information systems which are aligned with strategic county goals and missions.

There is strong executive level support for the use of Business Intelligence tools, like COGNOS and ArcGIS to facilitate the management and integration of important data systems, which are used to provide accurate information to decision-makers in a timely manner.

A well-defined Data Governance framework which includes participants from the Business departments and Information Technology department helps to build strong information systems which support performance-based management at the county.

Use of the Balanced Scorecard helps the county to identify how well they are performing in order to build on current successes and address issues as needed to improve performance.

### **Other**

The following list summarizes key points from the Hennepin County Public Works Case Study, which are applicable to state DOTs planning to implement Performance-based measures, targets, resource allocation, and Data Management initiatives at their agency:

- Top-level support from Administration officials is critical to supporting performance-based management within any organization.
- A Balanced Scorecard is a very efficient way to develop, monitor, and display performance measures and targets in an organization in order to align work tasks with agency goals.
- Use of data integration and Business Intelligence (BI) tools such as GIS and COGNOS, to facilitate integration of data systems and access to critical progress reports (Balanced Scorecard) for review by management.



# Japan Road Bureau, Ministry of Land, Infrastructure and Transport

## Background

The Road Bureau of Japan’s Ministry of Land, Infrastructure, and Transport (MLIT) are responsible for the development and management of national roads under its direct jurisdiction (currently totaling approximately 22,000 km). The bureau also subsidizes national roads that are under the direct jurisdiction of the prefectures, as well as some prefecture roads and municipal roads (Table 5). As of Fiscal Year 2008, the bureau’s annual budget was about 7.8 trillion Yen (approximately \$80.8 billion).

**Table 5. Japan’s Road Ownership, Management, and Funding Authority**

Category of Road	Developer	Capital Funds	Manager	Management Funds
Highway <sup>a</sup>	Express Company Ltd (National Government)	Express Company Ltd (National, prefecture Government)	Express Company Ltd (National Government)	Express Company Ltd (National, prefecture Government)
National Roads Under Direct Jurisdiction	National Government	National Government and prefecture Government	National Government	National Government and prefecture Government
Subsidized National Roads	Prefecture Government	National Government and prefecture Government	Prefecture Government	Prefecture Government
Prefecture Roads	Prefecture Government	Prefecture Government	Prefecture Government	Prefecture Government
Municipal Roads	Municipal Government	Municipal Government	Municipal Government	Municipal Government

<sup>a</sup> Strictly speaking, completed highway is owned (with debt for construction) by the Japan Expressway Holding and Debt Repayment Agency, an independent administrative agency. The Express Company Limited rents and manages the highway from the holding agency.

## Resource Allocation

Japan only recently introduced the concept of performance measurement into the transportation planning process, but already has institutionalized a performance-based resource allocation process. The passage of the Government Agencies Policy Evaluation Law in 2002 was the first formalized requirement for a true performance-based process.<sup>7</sup>

In FY 2003 the MLIT Road Bureau introduced an outcome-based management framework, and starting in FY 2004, the Bureau began shifting from allocating budget based on roadway ownership and functional classification (e.g., national highways or prefecture highways) to allocating budget based on performance in various policy areas (such as congestion relief or regional connectivity). Within each policy area are outcome-oriented performance measures and performance targets. The exact program areas, evaluation methodologies, and measures and targets have changed occasionally since FY 2004.

The management framework incorporates four key steps:

- Set numerical targets;
- Implement policies and projects;
- Evaluate achievement levels (review); and
- Modify next year’s management and resource allocation.

Through this process, the Road Bureau uses performance measures to prioritize roadway projects within program areas (Figure 14). Those roadway segments with the worst performance and for which a project (e.g., safety or congestion-specific improvements) is expected to achieve large performance improvements are given a high priority. The Road Bureau does not have a systematic performance-based process in place to change funding, staff, or organization based on performance achievement or progress towards targets, nor does it prioritize programs or projects between programs. The Bureau submits a required report, which compares performance to funding, to the Ministry of Finance when the MLIT requests funding, but funding to the Bureau is not tied to the reported performance. As performance is evaluated over time, data-driven executive decisions are sometimes made to address areas of concern. Reconsideration and improvement of policies and programs is discussed when goals and targets are not met.

For example, by measuring traffic safety through the newly created “reducing traffic accidents” policy theme, MLIT realized that the roadway network was experiencing a high rate of injuries and fatalities, and the rate was increasing. As a result, in FY 2005 this policy area received a budget increase of 34 percent.

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<sup>7</sup> Nishio, Tsukada, Oba, and Ohno. Outcome-Oriented Performance Management of Road Administration in Japan. TRB 85th Annual Meeting, 2006.

**Figure 14. Road Bureau Performance Measures and Targets, FY 2006 and 2007**

Policy Theme	Indicators		FY2002 (Base Value)	FY2006		FY2007		
				Actual Result	Target	Estimate	Planned Target	
Strengthening of international competitiveness	①	Ratio of hub airports and ports accessible within 10 minutes from an IC of expressway	59%	67%	67%	68%	68%	
	②	Time loss due to traffic congestion	3.81 billion people-hr/yr	3.31 billion people-hr/yr	Approx. 10% decrease (Approx. 3.43 billion people-hr/yr)	Approx. 3.24 billion people-hr/yr	Approx. 10% decrease	
	③	Hours of roadwork	201 hr/km·yr	123 hr/km·yr	16% reduction from FY2002 level	114 hr/km·yr	Approx. 20% reduction from FY2002 (161 hr/km·yr)	
Regional self-reliance and strengthening of competitiveness	④	Ratio of main cities in neighboring regions that are connected to each other by an upgraded national road	72%	75%	76%	77%	77%	
	⑤	Percentage of people who are able to have a safe and pleasant drive into the city (center of daily life) in under 30 minutes	63%	66%	67%	68%	68%	
	⑥	Percentage of intersections with information signs having route numbers and route names	—	71%	78%	80%	90%	
	⑦	Percentage of cities that have rescue routes covering a wide area in the event of disaster	66%	76%	74%	80%	76%	
Securing safety, assurance	⑧	Percentage of “urban areas having disaster prevention issues”	37.0%	33.9%	33.0%	33.2%	32.0%	
	⑨	Road traffic accident casualty rate	118.4 accidents/100 million vehicles/km	115.3 accidents/100 million vehicles/km (provisional)	Approx. 110 accidents /100 million vehicles/km	Approx. 10% reduction (108 accidents/100 million vehicles/km)	Approx. 10% reduction (108 accidents/100 million vehicles/km)	
	⑩	Percentage of perpetually closed crossings at which prompt measures have been taken	—	21%	32%	40%	100% (target for FY 2010)	
	⑪	Time loss due to closed railroad crossings	1,366 million people-hr/day (actual result for FY2004)	—	—	—	1.3 million people-hr/day (target for FY2009)	
Creation of affluent living environment	⑫	Reduction of CO <sub>2</sub> emission from motor vehicles	—	Approx. 1.1 million tons of CO <sub>2</sub> /yr	—	Reduction to approx. 8 million tons of CO <sub>2</sub> /yr in FY2010		
	⑬	Percentage of barrier-free main roads in the vicinity of passenger facilities with an average daily user volume of more than 5,000	Approx. 17%	Approx. 44%	Approx. 42%	Approx. 50%	Approx. 50%	
	⑭	Percentage of trunk roads in urban areas without telephone poles	7%	Approx. 12% (quick report value)	Approx. 13%	Approx. 15%	Approx. 15%	
	⑮	Achievement rate of required limits on nighttime noise	61%	73%	72%	Approx. 80%	72%	
	⑯	Rate of NO <sub>2</sub> environmental goal achievement	—	73%	85%	Approx. 90%	Approx. 90%	
	⑰	Rate of SPM environmental goal achievement	—	91%	100%	100%	100%	
Service life extension of existing stock	⑱	Ratio of bridges receiving preventative maintenance	—	95%	96%	Approx. 100%	Approx. 100%	
	⑲	Road structure maintenance ratio	Bridge	86%	80%	91%	83%	93%
			Pavement	91%	95%	91% (Unchanged from FY2002 level)	93%	91% (Unchanged from FY2002 level)
Effective utilization and functional augmentation of High-way network	⑲	Ratio of high-standard roads usage (targeted traffic volume for conversion to high-standard roads)	13.1%	14.4%	14.5%	15.0%	15.0%	
	⑳	ETC usage ratio	Nationwide	5%	72% (Spring 2007)※	75% (Spring 2007)	Approx. 80% (Spring 2008)	Approx. 80% (Spring 2008)
			Metropolitan Expressway	6%	78% (Spring 2007)※	90% (Spring 2007)	—	85% (Spring 2008)
			Hanshin Expressway	3%	72% (Spring 2007)※	90% (Spring 2007)	—	85% (Spring 2008)
Execution of road measure	㉑	Ratio of comprehensive cost reduction of road projects	—	12% decrease (quick report value) from FY2002 costs	Approx. 12% decrease from FY2002 costs	Approx. 15% decrease from FY2002 costs	Approx. 15% decrease from FY2002 costs	
	㉒	Level of road user satisfaction	2.6 points	2.9 points	2.9 points	3.0 points	3.0 points	
	㉓	Number of website hits	15.46 million hits/yr	69.39 million hits/yr	Approx. 81 million hits/yr	Approx. 90 million hits/yr	Approx. 100 million hits/yr	

Source: Road Bureau, MLIT, “Outcome-Based Road Administration Management in Japan.”

All of MLIT’s bureaus (including road, river, railway, seaport, and airport) set their 5-year goals based on performance measures and evaluate progress annually within the MLIT’s performance-based policy framework. However, the Road Bureau manages performance in greater detail and utilizes more of its own measures.

Though total funding distributions among Japan's 47 prefectures were not affected by the ongoing changes, the MLIT also worked with the prefectures to develop regional performance plans and targets so that these regional governments also could better allocate resources. Part of these efforts included the development of a national road administration guidebook aimed at standardizing the use of performance data in project selection. This guidebook also outlined what kinds of plans and projects should be undertaken to achieve the target outcomes; the approaches to be used as standard procedures for sharing awareness of problems between the headquarters and field offices; and for identifying locations with serious problems and recognizing the effectiveness of projects.

Input from the public also is an important part of the decision-making process at MLIT, when considering investments in programs for the future. The agency solicits input from the general public and subject matter experts as part of its decision-making process. The Road Bureau also conducts an annual Survey of Road Users' Satisfaction, and has increased the use of performance-based employee reviews internally. These efforts have led to an agency wide culture of performance and greater accountability to the public.

## Target Setting

Setting goals and performance targets is primarily done either at the central MLIT office, or at the division, regional, or local offices. The targets are derived in part from the latest major subjects of policy, planning, and programming to emerge from the funding reports from the MLIT and Road Bureau, the Road Bureau's Midterm Visioning Report, and the national government's Five-Year Major Infrastructure Development Plan. Longer term targets (referred to by the Road Bureau as "goals") match this with a 5-year span.

The Road Bureau utilizes the funding reports to estimate future funds, assuming that approximately the same amount of money will be available annually for the next five years. This information is used when determining feasible 5-year goals for the bureau.

The Road Bureau sets and annually updates shorter-term annual targets when it prepares its annual Performance Measures Report/Planning Report. At this time, the measures themselves also are reviewed and subsequently modified, or new measures are added. This adjustment in the measures themselves may then require an adjustment in the relationship between the targets and the measures. Targets for the next fiscal year are based on the possibility of achievement and similar to the 5-year goals consider financial constraints.

The annual Performance Measures Report/Planning Report monitors the bureau's progress towards its annual and 5-year targets. If targets are not met for a program, for instance, then a closer review is performed to determine how the processes for that program may need to be revised, or if a new program may need to be developed to address those performance needs. Conversely, if targets are consistently met earlier than anticipated, target deadlines or measures are reset to reflect more accurate expectations.

Overall, in the target-setting process, it has been difficult for the Road Bureau to decide whether to choose more feasible goals or higher, more challenging goals. A philosophy of using more challenging goals would require a change from using past budgets as a financial constraint for future years to using past budgets as a baseline from which to estimate additional funding necessary to achieve the higher targets.

## Data Support Systems

### General Relationships

The Japanese MLIT is responsible for the development and maintenance of about 22,000km of the Japanese road system comprised of subsidized national roads, prefecture roads, and municipal roads.

In support of a performance-management based process, the Road Bureau began operating under an outcome-based management cycle starting in 2003. This management cycle includes the following components:

- Quantitative goal setting in advance;
- Outcome evaluation; and
- Review of the evaluation.

The MLIT uses goals and performance measures as part of its routine operation, with goals categorized as “long-term” (5-year timeframe) and “short-term” to determine what can be accomplished *given available resources*. There is no priority ranking for the goals/measures, except in the areas of traffic safety and congestion management which are identified as high priority.

The agency sets and updates performance targets when they publish the annual Performance Measures Report/Planning Report. This report is carefully reviewed by managers and employees to determine the success rate in meeting targets. There is no adverse consequence to employees when targets are not met; instead, an evaluation of the situation is performed to determine where/how adjustments may need to be made. The performance management concept has become a part of the cultural environment at MLIT and everyone shares in the responsibility and success of achieving targets.

The performance measures defined by the agency are based largely on the availability of existing data systems, or the probability of data acquisition for the various programs. Measures which cannot be evaluated based on data are not used. The collection of the necessary data and setting of related targets is an important function of each division in charge of policy and programs in each area.

The MLIT uses the following categories of data to support the traffic safety and congestion management programs:

- Traffic volume;
- Travel speed;
- Number of traffic accidents;
- Road inventory length (after development); and
- Digital Road Map.

Any improvements and enhancements recommended for these systems are considered as independent needs and are not prioritized relative to one another. The importance of each data system is based on its ability to support the planning and policy functions of the agency.

## **Organization and Governance**

### *Data as an Asset*

The MLIT recognizes the importance of having data to support its various programs and invests in the collection and acquisition of data sets to sustain these programs. The responsibility for the collection of the data is divided between the central office and divisions of the MLIT and the ministries in charge of each data program. If the ministries collect the data, it is then reported back to the central MLIT office. The types of data collected by the ministries include the number of traffic accidents, CO2 emissions, and others. The type of data collected by the divisions and central office of MLIT includes survey and road inventory data for the roads in the MLIT jurisdictions, and includes roads in the area of the local offices of MLIT and prefectures.

### *Data Governance Framework*

The MLIT does not use a formal data governance structure to manage its data programs. There are various offices that share in the responsibility for oversight of the quality and management of the data systems as discussed in the following section.

### *Roles and Responsibilities*

The Performance Management Office is responsible for developing the Manual for Survey Data and for calculating the measures used for performance, with input provided by the regional and local offices. The divisions in charge of policy and programs throughout MLIT are responsible for data quality related to each program.

### *Data Standards*

The data standards used at MLIT are primarily related to survey standards for data collection activities. There is no standard set of data definitions or metadata specified for the various programs.

### ***Institutional Arrangements/Policies to Support Data Management***

The institutional arrangements and policies to support data management come from the Performance Management office and the divisions in charge of policy and programs for the distinct program areas. There is no one central office, board, or council with authority over all data programs within the Road Bureau MLIT.

### ***Relationship to Target Setting/Decision-Making***

While setting goals and performance targets is primarily done either at the central MLIT office, or at the divisions and regional and local offices, decisions are not made based solely on achievement of targets. As discussed previously, the ability to achieve targets is monitored through the evaluation of the Performance Measures Report/Planning Report, which is published annually. If targets are not met for a program, for instance, then a closer review is done to determine how the processes for that program may need to be revised, or if a new program may need to be developed to address those performance needs. Conversely, if targets are consistently met earlier than anticipated, target deadlines/measures are reset to reflect a more accurate performance measure.

Input from the public also is an important part of the decision-making process at MLIT, when considering investments in programs for the future. The agency solicits input from the general public and subject matter experts as part of its decision-making process.

## **Data Sharing**

### ***Institutional Arrangements/Policies to Support Data Sharing***

The Performance Measures Report/Planning Report is the primary mechanism for sharing of data and information. It is published annually and is available on the Road Bureau and Prefecture web sites for each prefecture.

### ***Integration with Outside Data Sources***

The MLIT also integrates data from various outside sources as noted below:

- Electric Toll Collection (ETC) usage ratio data from Nippon Expressway Company Limited (NEXCO);
- Number of traffic accidents for road traffic accident casualty ratio from the National Police agency; and
- Number of projects on upgrading railroads to avoid crossings from the Urban and Regional Development Bureau (separate division of MLIT).

### ***Internal/External Data Access***

The MLIT does not have an integrated database or enterprise data warehouse for providing internal/external access to data systems. The data is made available for the various programs

on each prefecture’s web site so that everyone has access to the data and information, including the agency executives.

## **Documentation and Reporting**

MLIT primarily uses MS Excel for creating reports. The Performance Measures Report/Planning Report also is made available on the MLIT and Prefecture web sites for use in monitoring progress in meeting agency goals and targets.

### *Enterprise Data Model*

There is no integrated database or enterprise database at this time for the data used at the MLIT. The data resides in independent databases for the various programs, whether the data is collected by the agency or if it is integrated from outside sources.

### *Data Dictionaries and Metadata*

The data definitions are primarily related to the collection of survey data and there is no metadata currently defined for this type of data.

### *Change Data Tracking Methods*

There is no formal process in place for tracking changes to the data systems at MLIT.

## **Technology**

### *Data Management Systems / Business Intelligence (BI) Tools*

The agency uses its intranet web sites to facilitate the management of business intelligence in the absence of data warehouses and data marts. MLIT also uses 3D Map technology to meet Geographic Information System (GIS) needs, such as identifying areas of congestion or concentrations of traffic accidents.

## **Data Systems’ Relationship to Target Setting/Resource Allocation**

The MLIT considers its data programs to be extremely valuable in calculating and measuring performance outcomes. Additionally, the agency uses the Performance Measures Report/Planning Report to monitor the success in achieving targets so that adjustments can be made to targets and programs when needed. The allocation of resources, as discussed previously, is not based on the data systems, but, is instead a function of the needs identified by the long-term and short-term goals of the agency.

## **Success Factors**

- Use of an annual Performance Measures Report/Planning Report helps agency managers to identify areas where adjustments need to be made to meet targets and goals.

- Distribution of the Performance Measures Report/Planning Report via the agency and prefecture web sites is instrumental in managing business intelligence at the agency.
- Use of external data sources facilitates the management of congestion and traffic safety programs, at a lower cost to the agency.

### **Other**

The development of an integrated database would greatly improve the operations of the MLIT regarding the management of the road system in Japan. The agency expressed a need for this type of environment instead of the independent data systems and programs which now exist in each prefecture. An integrated database would also facilitate allowing the public to have more access to information in a timely manner.



# Kansas State Department of Education

## Background

The Kansas State department of Education (KSDE) promotes the mission of the Kansas State Board of Education through leadership and support for student learning in Kansas. Within the Fiscal and Administrative Services Division of KSDE, the Information Technology (IT) group provides technical support to KSDE staff, as well as data analysis to support performance reporting in compliance with Federally funded programs. They support student education directly in terms of integrating technology into the classroom in order to provide an innovative, 21<sup>st</sup> century learning environment.

Key customers and activities of the IT group include the following:

- The most immediate customer is agency program staff within KSDE, for which the IT group provides technical, network, Internet, and computer support.
- The next level of customer is individual schools and districts. KSDE is responsible for allocating and distributing Federal funds to schools and districts. The IT group collects data from schools, districts, and programs, and then translates that data into a format required for Federal/state reporting.
- Another level of customers are parents and taxpayers. KSDE maintains a “Report Card” section on its web site to help parents and taxpayers understand how schools are performing.
- The State Legislature is another major customer. The legislature determines the funding formula that regulates how state money is to be spent on education. The IT group also provides customized reporting requested on an ad hoc basis by individual legislators.
- The final key customer is the Federal government, for which the IT group supplies performance data to support Federally funded programs such as No Child Left Behind (NCLB).

## Resource Allocation

### Resource Allocation Framework

KSDE’s resource allocation framework was developed based on Federal No Child Left Behind (NCLB) legislation, which requires each state to define and publish annual performance targets

for schools and districts. States can establish their own state level requirements for accreditation; however, NCLB performance requirements must be submitted to the Federal government for approval. The information published on the KSDE Report Card is part of these Federal requirements.

There are two primary performance measures used by KSDE. The first is Adequate Yearly Progress (AYP), which is defined as the percentage of students meeting or exceeding the standards for academic proficiency. AYP is a required performance measure as defined by NCLB legislation. The second measure is Quality Performance Accreditation (QPA), which is defined as the percentage of students meeting or exceeding the standard on reading, mathematics, science, social studies, and writing state assessments. QPA is required as part of state level accreditation requirements.

Allocation of funds is based on a statewide funding formula that includes some performance-based criteria, but school funding is primarily based on need (e.g., the number of special needs students, at-risk students, free and reduced lunch counts, English as second language students, income status, etc.). In general, the performance-based criteria are tied to state level accreditation requirements. If schools do not maintain their accreditation status, they will lose their state funding.

## **Priority Setting/Tradeoffs**

Prioritization of agency goals is accomplished at a high level by the Kansas State Board of Education and the Executive Leadership Team (which consists of the Commissioner and Deputy Commissioner). Every year, the Executive Leadership Team looks at the goals established by the Board, and establishes which activities will be accomplished that year. They are required to report back to the Board of Education on progress in meeting those goals.

## **Target Setting**

At the state level, KSDE's executive leadership monitors progress on a frequent basis and then redefines, reprioritizes, or resets targets as needed, so there is very little chance that targets will not be met. At the Federal level, there are NCLB requirements and targets that must be met, or the state will not receive Federal funding.

The primary incentive for schools to achieve their targets is to maintain their accreditation. There also are a number of awards that schools and districts can receive based on their performance, such as Standards of Excellence, Governors Rewards, and Blue Ribbon Awards.

KSDE also has an ongoing data warehouse project that is state funded. There are specific targets and goals associated with this project and if they do not meet them, they will lose their funding for the project.

## Improving the Process

KSDE's biggest reporting efforts are for the Education Data Exchange Network (EDEN), which is the on-line portal for individual schools and districts to submit data files for the ED Facts initiative. ED Facts is a U.S. Department of Education initiative to put performance data at the center of policy, management, and budget decisions for all K-12 educational programs. ED Facts centralizes performance data supplied by K-12 state education agencies with other data assets within the department, such as financial grant information, to enable better analysis for policy development, planning, and management.

KSDE's data governance framework was initially developed to meet EDEN requirements for Federal reporting. The idea was to collect data from schools one time and then forward it to the Federal government.

The Federal government gives specifications regarding which files must be submitted regularly, and they are moving towards a master data management system. KSDE put together a process for master data management and approached it from a project management perspective. They have continued to revise their process every year, and the Federal government has now adopted KSDE's processes and templates as their own model for master data management.

## Data Support Systems

### General Relationships

The following data are collected by KSDE to support performance measurement:

- Enrollment data. Schools are required to collect data on the number of minutes each student is in class on September 20, as well as other demographic data. Data is reported at the individual student level, which is then aggregated and used in the statewide funding formula to determine how much funding each district will receive for that school year.
- State assessment data. State standards require assessments in several different subject areas to be conducted from February through April. All students in grades third through eighth and high school are required to be assessed. KSDE collects data on students in order to take the assessments and get them on the roster.
- End of year data collection includes Days in Membership (enrollment) and Days of Attendance.
- Data also is collected for title programs (e.g., homeless student, migrant student, etc.).
- KSDE also tracks students who move around within the education system, recording when and why they left a particular school district. When a student enters the education system,

they are assigned an ID number that is used throughout their education in Kansas, even if they move out of state.

- Military data collection. Kansas started providing additional funds for districts with a large number of military students.
- KSDE conducted another collection on rural education grant programs and title funding dollars on December 1, 2008.

KSDE uses the Student Information System (SIS) as their core system for data collection. When implementing major system enhancements, KSDE meets with districts and internal program staff to assess whether changes in data collection standards are expected. They determine the new requirements for the SIS and develop a requirements document for these changes. They coordinate with SIS vendors on a cycle where vendors can accommodate the required changes before the start of the new school year.

## Data Governance Framework

KSDE's data governance framework was initially developed to meet EDEN requirements for Federal reporting. They developed their framework internally based on their own research on the Internet. They looked outside of education to other industries for best practices in developing their model, and they also joined the Data Warehouse Institute, which is non-vendor specific. They sent a representative to attend a one week course on establishing a data stewardship program that was sponsored by the Institute. Since its initial inception, KSDE has taken their data governance model and expanded it to all other data initiatives they have.

KSDE developed their data governance framework through the following steps:

**Step 1: Get executive leadership buy-in.** A key success factor in developing KSDE's data governance program was to have strong executive leadership and support for the program. The IT group achieved this by presenting the data governance model to executive leaders and inviting their feedback. The program was presented in terms of how data governance is tied to issues they care about (e.g., KSDE's standing with the Federal government, how they are meeting schools' needs, accuracy of calculations for accreditation and funding, etc.), and how improvements in this area could meet their needs. Executives then sent e-mails to the heads of all program levels to explain the new data governance initiative. KSDE attributes their success to the ability to sell the concept at a high-level, but implement it at the detailed level.

**Step 2: Establish a data stewardship program.** There were several programs within KSDE that did not have a defined data program and/or did not work with data in an organized, predefined way. Therefore, with the help of executive leadership, KSDE first identified individuals within each program area who would be Data Owners. Data Owners are defined as the director of the program area that requires that particular data. Data Owners are responsible for ensuring protection of, and authorizing access to, applications and their associated data. Data Stewards, who are identified and assigned by Data Owners, are defined as individuals that have day-to-day responsibility for data within his/her area of responsibility. Data Stewards also are responsible for data quality. A Data Owner and Data Steward were

identified for each program area within KSDE, and there is a strong partnership between them. The establishment of custodianship and ownership of data was done in concert with a similar effort for an agency data security program, for which the IT group is the caretaker. The data security program was a policy mandated by the State.

**Step 3: Establish a Data Governance Board.** The Data Governance Board is made up of all Data Owners as well as others at KSDE with a high-level of responsibility regarding data. The Data Governance Board establishes and enforces policies related to data management.

**Step 4: Establish a Data Request Review Board.** KSDE receives many data requests from researchers, the Federal government, and policy-makers. Previously, this was not an organized process. Therefore, a Data Request Review Board was formed to establish policies and procedures for responding to data and information requests while protecting personally identifiable student information. The Data Request Review Board is a subgroup of the Data Governance Board.

**Step 5: Prepare a Data Governance Handbook.** KSDE developed a Data Governance Handbook to document critical roles and responsibilities within their Data Governance Program. The document serves as a reference guide for KSDE employees to become familiar with the program. Initially, the handbook was based loosely on the agency's security document, which identified the specific responsibilities of data owners, identified who can have access to what data, and established policies for how securely data should be treated. It was the product of a six to eight-month effort to compile the work of several other initiatives that were going on. The handbook has evolved over time and now includes roles and responsibilities for Data Governance Board Members (their responsibilities and roles), Data Stewards, and the Data Request Review Board. The Data Governance Handbook addresses all areas of responsibility and establishes an escalation process (i.e., if there is an issue at the data steward level, how should the problem be escalated?). A copy of KSDE's Data Governance Handbook is provided in Appendix C.

Meaningful and frequent communication is critical to the continued success of KSDE's Data Governance Program. The Data Stewards meet monthly as part of a work group, and two representatives from IT also attend. The work group serves to provide professional development and to address any data stewardship issues. The Data Governance Board also meets monthly. There is a set agenda for each meeting, which ensures that important subjects are covered and that the right people to make decisions are present. The IT group also meets with executive leadership on a regular basis.

## **Data Sharing**

### ***Institutional Arrangements/Policies to Support Data Sharing***

The public has access to the KSDE Report Card, which lists how school districts are performing. The notion of public reporting has become a powerful motivator for schools and districts, and they are very interested in the performance results that are published on KSDE's web site. KSDE reports the exact data that was submitted by schools/districts, so there is a strong

motivation for them to report accurate data the first time. Most reporting is done on an annual basis, with some data collected at the beginning of the school year and some at the end.

With regards to data sharing, KSDE’s biggest challenge is in addressing the multiple data requests received from researchers, the Federal government, state legislators, and other state agencies. The Federal Education Records Privacy Act (FERPA) dictates what student-level data can be shared. It is the Data Request Review Board’s responsibility to establish policies with regards to which requests can be met and which data must be masked (e.g., social security number, which students receive special and rehabilitative services, etc.).

### ***Internal/External Data Access***

Schools and districts submit student-level data via an SIS called Kansas Individual Data on Students (KIDS) ([www.ksde.org/kids](http://www.ksde.org/kids)). There are several vendors of SIS software available, and schools and districts can select which software they want to use.

KSDE uses a secure FTP site to secure other methods of electronic file transfer. KSDE has some web based forms for schools/districts to submit data. For these web-based applications, they use a common authentication portal which limits access to certain applications to individuals who are authorized to use them. There are different access levels that restrict access to data within applications (e.g., access levels include district read only, district write, school read only, school write, etc.). Requests for data access are submitted to Data Owners, who are then responsible for granting approval.

## **Documentation and Reporting**

KSDE is currently undergoing a state-funded data warehouse initiative, and they are in the third year of its development. The objective of the data warehouse is to pull source data into the enterprise data system, and then create custom reports. The data warehouse project will implement data marts to create custom formats for data reporting. A huge component is the metadata system, which reflects data in the data warehouse.

Developers of the data warehouse, metadata systems, and business intelligence systems are all in-house. They chose to train their IT staff on data warehousing rather than bringing in data warehousing consultants. By investing in their staff and providing them an opportunity to learn new technology, they obtained buy-in for the project at the staff level. This has been a major success factor for them.

## **Technology**

### ***Data Management Systems/Business Intelligence (BI) Tools***

KSDE uses Microsoft products exclusively, although they have some internally developed applications as well. This offers the added benefit of being able to integrate different applications. Independent data can be integrated through master data management. KSDE also uses web services (i.e., service-oriented architecture). They have a defined master data management concept dictating that data be collected/modified in one place and then replicated

as needed. KSDE is an a NET development shop, and they try to keep no more than a level or two behind as software versions are updated.

The IT group does not use GIS software, although fiscal auditors who audit the distances between schools and student addresses use it. The auditors use a GIS program called StreetSmarts to map the distance between schools and student addresses. The auditors actually drive the routes. This is important because KSDE funding is based on distances greater than 2.5 miles as part of state funding formula.

## Success Factors

KSDE cited the following success factors in implementing their data governance program:

- KSDE’s transparency in terms of business rules, policies, etc., governing the collection of student-level data.
- Having strong executive leadership and support for their data governance program. This was achieved by presenting data governance in terms of how it will meet executive leadership’s needs.
- Professional development at all levels is critical. A success factor in this area is KSDE’s Data Quality Certification Program, which is a professional development program that was formed in response to schools and districts requesting KSDE’s help in reporting better data to the State. Participation in the program is voluntary, and schools and districts participate on their own time and expense. However, most of the training is done over the Internet. The program initially started with data entry-level staff so they could understand the importance of their jobs (e.g., how the data is used, FERPA requirements, why they should care about the quality of data, business rules behind entering the data, etc.). The program expanded to include district program staff focused on assessments, enrollment duties, etc., as well as school superintendents and administrators who are responsible for signing off on the data. KSDE is piloting that track this year.
- The program recognizes the importance of people who take on these roles. For example, data entry is generally done at the lowest staff levels within a school (typically the school secretary). KSDE implemented a recognition program, in which participants in the program receive a framed certificate and pen, and they are recognized on the agency web site. The recognition program has had a major impact on data quality. The motto of the program is, “The data pays you and grades you.”
- Another success factor has been asking for feedback from participants in the Data Quality Certification Program. The program started as a grass roots program based on suggestions received from districts. KSDE hosts a weekly conference call on data quality, and all education staff in the State is invited to call in and ask questions. For the past four years, KSDE has people at the agency level available on the call to answer any questions.

## Other

The following list summarizes key points from the KSDE Case Study, which are applicable to other state DOTs, for the use of performance measures and targets and establishing Data Governance programs:

- At the state level, KSDE’s executive leadership monitors progress on a frequent basis and then redefines, reprioritizes, or resets targets as needed, so there is very little chance that targets will not be met.

KSDE developed their data governance framework through the following steps:

**Step 1: Get executive leadership buy-in.** A key success factor in developing KSDE’s data governance program was to have strong executive leadership and support for the program. The IT group achieved this by presenting the data governance model to executive leaders and inviting their feedback. The program was presented in terms of how data governance is tied to issues they care about (e.g., KSDE’s standing with the Federal government, how they are meeting schools’ needs, accuracy of calculations for accreditation and funding, etc.), and how improvements in this area could meet their needs. Executives then sent e-mails to the heads of all program levels to explain the new data governance initiative. KSDE attributes their success to the ability to sell the concept at a high level, but implement it at the detailed level.

**Step 2: Establish a data stewardship program.** There were several programs within KSDE that did not have a defined data program and/or did not work with data in an organized, predefined way. Therefore, with the help of executive leadership, KSDE first identified individuals within each program area who would be data owners. Data owners are defined as the director of the program area that requires that particular data. Data owners are responsible for ensuring protection of, and authorizing access to, applications and their associated data. Data stewards, who are identified and assigned by data owners, are defined as individuals that have day-to-day responsibility for data within his/her area of responsibility. Data stewards also are responsible for data quality. A data owner and data steward were identified for each program area within KSDE, and there is a strong partnership between them. The establishment of custodianship and ownership of data was arranged in concert with a similar effort for an agency data security program, for which the IT group is the caretaker. The data security program was a policy mandated by the State.

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- Meaningful and frequent communication is critical to the continued success of a Data Governance Program. KSDE’s Data Stewards and Data Governance Board each meet on a monthly basis. There is a set agenda for each meeting, which ensures that important subjects are covered and that the right people to make decisions are present. The IT group also meets with executive leadership on a regular basis.
- The notion of public reporting is a powerful motivator for schools and districts, as the public has access to the KSDE Report Card, which reports how school districts are performing. KSDE reports the exact data that was submitted by schools/districts, so there is a strong motivation for them to report accurate data the first time.
- Developers of the data warehouse, metadata systems, and business intelligence systems are all in-house. They chose to train their IT staff on data warehousing rather than bringing in data warehousing consultants. By investing in their staff and providing them an opportunity to learn new technology, they obtained buy-in for the project at the staff level.

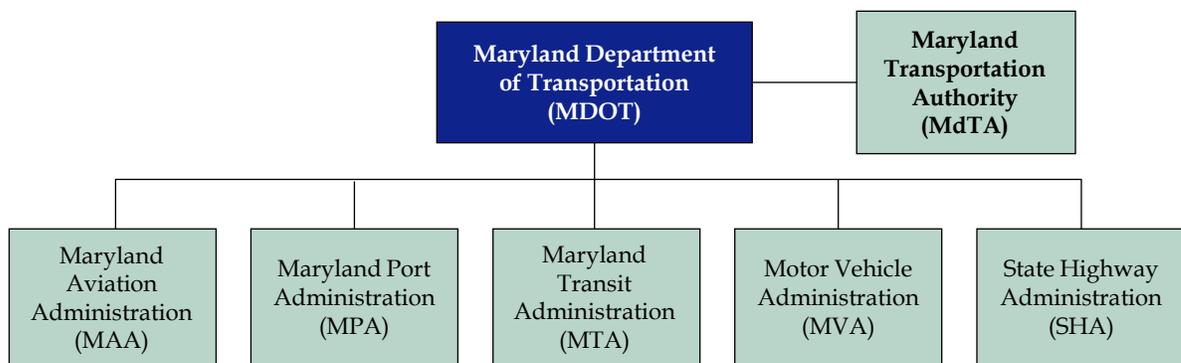


# Maryland Department of Transportation

## Background and Overview

The Maryland Department of Transportation (MDOT) is one of Maryland’s largest agencies, with more than 9,000 employees. MDOT is responsible for coordinating statewide transportation planning activities across all modes of transportation, including highways, tunnels, bridges, railways, rail transit, buses, ports, airports, bike paths, sidewalks, trails, as well as driver services. MDOT provides oversight to and coordination with five Administrations that have unique functional responsibilities for the transportation facilities and services in Maryland: the Maryland Aviation Administration (MAA), the Maryland Port Administration (MPA), the Maryland Transit Administration (MTA), the Motor Vehicle Administration (MVA), and the State Highway Administration (SHA). The Secretary’s Office (TSO) establishes the department’s transportation policy and oversees the Modal Administrations. The Secretary of Transportation also serves as Chairman of the Maryland Transportation Authority (MDTA), an independent agency responsible for Maryland’s seven toll facilities and for financing new revenue producing projects for MDOT. MDOT’s organizational framework is illustrated below in Figure 15.

**Figure 15. MDOT’s Organizational Framework**



The State of Maryland is a leader in performance-based management. All state agencies participate in performance reporting and are encouraged to practice target setting and performance monitoring to identify and implement management and operational strategies that achieve strategic goals, promote transparency, and support decision-making that maximizes return on the State’s investments.

## **Managing for Results**

MDOT and its Modal Administrations first formally adopted performance-based management after the passage of Maryland’s Managing for Results (MFR) statute in 1996. MFR in Maryland requires that state agencies report performance data with their annual budget request. The focus is on organizational outcomes that are important to customers and external stakeholders. A core set of performance measures (such as highway fatality and injury rates, pavement condition, wetland replacement quantities, and overall customer satisfaction) have been compiled for each modal administration and reported annually since that time.

## **Maryland Transportation Plan**

The Maryland Transportation Plan (MTP) establishes a 20-year vision for transportation in the State and helps to guide statewide investments in all modes of transportation. The MTP sets goals and objectives that provide a framework for MDOT’s decisions about which projects and programs to fund. Every five years the MTP is updated to address current and future transportation challenges, needs, and conditions. The most recent update to the MTP was completed in 2009. Presented to the governor and the general assembly as a package, the MTP is one piece of the State Report on Transportation, which also includes the annual Attainment Report on Transportation System Performance (AR), and the Consolidated Transportation Program (CTP) – MDOT’s 6-year capital programming document.

## **Attainment Report on Transportation System Performance**

The Transportation Performance Act (SB 731), passed in 2000, mandates that MDOT annually develop the AR to establish performance measures and targets that quantify the goals and objectives in the MTP. The Attainment Report is intended to track MDOT’s progress towards specific-performance targets and the goals and objectives of the MTP using outcome-oriented performance measures. These outcome measures provide an indication of the impact a product, service, project or action has on performance and help to determine whether desired results have been achieved. The Attainment Report also includes a number of background (input and output) measures that detail the extent and use of the transportation system (e.g., miles of highways, number of passengers, etc.).

As part of every MTP update, a governor-appointed advisory committee is assembled to provide guidance to MDOT in the development of the AR. The key functions of the advisory committee are to:

- Advise on the selection of performance measure and targets;
- Review the selected performance measures and supporting data;
  - Evaluate the clarity of the measures and targets; and
  - Identify gaps.

- Recommend strategies to increase the effectiveness of the report for MDOT, citizens, and legislators.

As part of the review process, the advisory committee makes a number of recommendations for consideration and develops a final report. These recommendations are guided by the following criteria for selecting performance measures: 1) clear linkage to the MTP; 2) relevance to policy-makers and the public; 3) easy to understand; 4) outcome influenced by MDOT program and policy decisions; 5) reliable data available; and 6) manageable number of measures. The advisory committee report details new measures and changes that have been incorporated into the AR as well as measures the advisory committee suggests the modal administrations and MDTA begin investigating for future tracking (i.e., begin to collect data, set a baseline and appropriate targets). This list is reviewed by the advisory committee appointed for the next update to the AR.

## **StateStat**

With the election of Governor Martin O’Malley in 2006, Maryland’s performance measure programs were elevated to StateStat, based on the CitiStat approaches used in Baltimore and New York<sup>8</sup>. StateStat is a performance measurement and management tool to enable the Maryland State government to be more accountable and efficient. StateStat focuses on operational performance measures that point to specific products and services that need attention to achieve quick improvements.

The goal of the StateStat program is to allow state administrators to continually evaluate and improve state performance at the highest levels – not just during annual budget reviews. State managers meet with the Governor and his executive staff at biweekly meetings to report and answer questions on agency performance and priority initiatives. Each week a comprehensive executive briefing based on key performance indicators is prepared for each agency that highlights areas of concern.

A small number of key public safety, health care, and social services agencies were selected to form the initial foundation of the StateStat review process. The program has since expanded to include MDOT and is incorporating an increasing number of key performance measures maintained by MDTA and the Modal Administrations.

## **Internal Performance Reporting**

In addition to mandated external performance reporting, MDTA and the Modal Administrations have also adopted internal performance management processes and reports. MDTA and two modal administrations, SHA and MVA, are profiled in detail in this case study

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<sup>8</sup> The CityStat program has received the “Innovations in Government” Award by Harvard University’s Kennedy School of Government, and has been studied and emulated by several jurisdictions around the globe.

to illustrate the agencies' varying approaches to target-setting and data management for legislatively mandated external and agency-developed internal performance reporting. These three agencies were selected based on the length and breadth of their internal performance management programs, as well as their approaches to target setting and data management.

SHA has practiced internal performance management for nearly 20 years and tracks a larger number of performance measures than any other modal administration. MVA, on the other hand, is now completing its first business plan that uses targeted performance measures to track progress towards strategic agency goals and objectives. MDTA's Division of Strategic Development facilitates and supports performance-based management throughout the agency and serves as a resource for performance data analysis and management, research, benchmarking, and training.

## Maryland State Highway Administration

### Agency/Organization Background

Maryland's State Highway Administration (SHA) serves customers throughout the State via seven district offices. The agency is responsible for over 16,000 lane miles of highways and 2,500 bridges<sup>9</sup>. SHA maintains 17 percent of road mileage in Maryland; however, SHA roads carry 67 percent of total traffic in the State. In fiscal year 2009, SHA had a total operating budget of \$222.0 million and capital budget of \$1.1 billion.

SHA has been engaged in performance-based management for nearly 20 years and agency leadership has internally supported the practice. SHA's history with performance management took them through Total Quality Management, Continuous Process Improvement, and, now, Performance Excellence. SHA's internal performance management approach, Performance Excellence, is based on a modified version of the Baldrige Criteria for Performance Excellence. SHA combines the seven Baldrige criteria into five Vision Areas:

- Leadership;
- Workforce Planning;
- Business Planning;
- Process Improvement; and
- Customer Satisfaction.

SHA has twice won the Governor's Excellence Award, which is awarded based on the Baldrige Criteria.

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<sup>9</sup> SHA FY 2008 Annual Report.

Like most MDOT administrations, SHA first formally adopted performance-based management after the passage of the MFR statute in 1996. Because of their involvement with MFR, SHA decided to create a short-internal business plan in 2000 that included several dozen performance objectives, with approximately three measurable objectives in the areas of pavement condition, bridge condition, and customer satisfaction rating. In 2003, Neil Pederson was named Administrator of SHA and the Performance Excellence Division was created. This division is now a part of the Administrator's office and has three to four staff.

In 2005, SHA developed a second, more elaborate business plan for internal and external use with a larger number of measurable objectives and targets. This plan was created in the context of senior management meetings over a six-month period. Managers determined all of the objectives that they wanted to include, and they also incorporated the use of targets at that time. Some targets were set by the Administrator and others were set by managers, but all had a four-year timeframe. The Business Plan is now updated every four years – associated with changes in Governor – and tracks approximately 450 performance measures.

Since the election of Governor Martin O'Malley in 2006, SHA has been asked to report multiple performance measures as part of the StateStat government management program. SHA was well-positioned to meet the Governor's expectations due to their internal efforts over the previous years. Over 100 SHA performance measures are currently being reported during monthly StateStat meetings.

The Maryland SHA Business Plan is based on six Key Performance Areas (KPA's). Each KPA is managed by a KPA council. The six KPA's are:

- Safety;
- Mobility;
- System Preservation and Maintenance;
- Environmental Stewardship;
- Organizational Effectiveness; and
- Customer Communication, Satisfaction, and Service.

KPA Councils are composed of a "vertical slice" of SHA staff. Objectives and targets for the most recent 2008 Business Plan were developed by the KPA Councils using a facilitated strategic planning framework. The KPA Councils review performance data quarterly and are involved in all performance reporting at the agency. SHA's current performance reporting cycle includes:

- Business Plan update – every four years;
- Internal (Baldrige-based) Assessment – every three years;
- External customer survey – every two years;
- SHA Annual Report, MFR, Attainment Report, Budget changes – annually;
- KPA Performance Report – quarterly; and

- StateStat – monthly.

SHA also has local business plans for each of its 23 offices. SHA hopes to increase the use of these business plan across all levels of the agency so that each employee can see how performance measures are used as a management tool and identify how their work supports the larger goals of the organization.

## Resource Allocation

### *Resource Allocation Framework*

Performance data are strongly linked to resource allocation throughout SHA, including capital and operating programs. Quarterly performance data is reviewed by the Administrator and Deputy Administrators and used to guide senior managers, allocate resources, and make budget decisions. SHA links their performance measures program to resource allocation in the following ways:

- **Budgeting and Programming** – Performance measures are used to demonstrate the need for state system preservation capital and operating funds to the Maryland Legislature, especially for pavement, bridge, and roadway maintenance. SHA requests funding enhancements in specific areas where performance results indicate that additional funding is needed to sustain or improve performance. In particular, performance affects resource allocation for Safety and Maintenance. For example, in FY 2007 SHA’s Routine Maintenance Operating budget received an increase of \$5.8 million as a direct result of demonstrating the relationship between the enhancement proposal and the performance goals and objectives in the Business Plan. In FY 2007, \$13.3 million (\$5.8 million enhancement plus 10 percent of FY 2006) of the Routine Maintenance Budget was distributed based on condition ratings. In FY 2008 and 2009, although the Routine Budgets were slightly reduced, \$16.3 million (25 percent) was distributed based on condition ratings. Other distribution factors include lane miles, roadside miles, and average vehicle miles traveled per shop. Performance also determines the emphasis areas for maintenance and system preservation projects in the capital program. Furthermore, when substantial increases in funding are secured, the performance data demonstrates how the money was used. Elements apply to both capital programs and operating program.
- **Operations** – SHA’s District Offices have established a common set of outcome measures that are set to appropriate targets for each district. This sets the stage for operational decisions across the districts. The most successful application has been in managing maintenance activities. SHA has a robust data repository for maintenance activities that track outputs and efficiency through each district maintenance shop, which can then be used to adjust work activity priorities.
- **Monitoring Results, Feedback, and Communication** – SHA’s leadership monitors agency-wide performance results on a quarterly basis. Feedback is provided to Key Performance Area leaders about performance that is outstanding, on track, and needs improvement. SHA is leading a pilot on behalf of MDOT to base managers’ performance appraisals on performance plans that link to office/district business plans as well as individual

performance targets. SHA has completely changed its assessment forms to incorporate performance management in these personnel reviews. The assessment now consists of two parts: Leadership competencies (40 percent) and an annually updated Performance Plan (60 percent). Performance is now linked to personnel reviews for staff down to the midmanagement level. For these staff, the focus is on output measures as opposed to outcome (longer-term strategic) measures.

## **Priority Setting/Tradeoffs**

SHA goals are not formally prioritized, but are informally prioritized as appropriate in different settings. For example, Safety is generally considered to be the agency and state's number one priority. Identifying funding for safety initiatives is usually not a problematic issue in Maryland. However, when SHA is supporting budget requests for state operating funds to the Legislature, the priority is placed on funding to support system preservation performance.

The amount of time required to obtain or make progress towards a particular goal also impacts which performance measures are prioritized. Input measures provide a profile of current demand and available resources. Output, efficiency, and quality measures are used to assess production, products and services, and for middle manager performance plans. Outcome measures change slowly over several years and are used to track long-term strategic and publicly viewed items

## **Improving the Process**

SHA has gradually evolved its performance management programs over the last 15 years to meet changing agency needs and provide increasingly detailed feedback on program performance. Going forward, SHA will continue to refine its performance management measures, update targets, and incorporate performance into additional resource allocation processes. For example, performance plans could be incorporated into evaluations of staff at all levels. In addition, SHA eventually hopes to have robust reporting on local business plans for each of its 23 offices. This will allow the agency to prioritize performance measures that are most important to each of its diverse district locations, develop accurate local targets, and focus the SHA Business Plan on a smaller number of measures of statewide importance with refined strategies.

## **Target Setting**

Target setting methods at SHA vary greatly depending on the measure. Each measure is assigned a “measure lead” who is the staff person responsible for maintaining and reporting data for a particular measure and ensuring data accuracy. Targets are generally set by the measure lead with input from the appropriate KPA Council, managers, data owners, and the Administrator. Maintenance targets in particular are set based on historic data and current leadership vision. SHA uses outside data, trends, and best practices to assist in the target setting process whenever possible. For example, some targets are benchmarked against data

from other Northeastern states for which AASHTO data is available. Most safety measures were developed at the same time as the Federal Strategic Highway Safety Plan, and thus mirror the measures and targets in that plan.

Different time horizons are used to set measure targets, depending on the particular SHA planning document. The Maryland Transportation Plan (MTP) sets the long-range vision for the agency and contains performance measures with five to 10-year targets. The Strategic and Business Plans take a midrange view and set four-year targets for all measures. The MFR sets annual targets, and Operations uses real-time data. StateStat uses mostly historic data and, as a result, no targets need to be set.

Targets are updated as necessary using the same variety of processes used to set new targets. Targets are most frequently reset if they are consistently exceeded or if there is any other logical reason or need to do so. For example, the target for “cost savings for delay” was reset due to economic changes that affected the measure and caused the target to be exceeded for two years in a row.

Since the needs, priorities, and performance of districts vary so much in different areas of the State, SHA is debating developing separate targets for each district. The districts currently track progress on 22 common measures.

## **Data Support Systems**

### *General Relationships*

Data availability does not have a significant effect on development of performance measures at SHA. If a measure is identified that the KPA Council agrees should be developed in the future (i.e., reduction in recurring congestion due to a specific project), it is included in the Business Plan and a preliminary target is developed for it based on current data available and managers’ knowledge. The target is reset if necessary after data and a methodology are developed.

Given the large number of performance measures tracked by SHA, it is not surprising that the agency receives data from a large number of sources and databases. As a result, SHA currently has a relatively decentralized data management approach. Data owners make their own decisions about system improvements. Measure leads are the final party responsible for ensuring the accuracy of performance data.

The Business Plan Information System (BPIS) is SHA’s central Oracle database used for quarterly reporting. Data from other databases is fed manually into BPIS each quarter, which is a time consuming task. The System Preservation and Maintenance KPA use its own database system and reports, but enter their data into BPIS for archiving. SHA is exploring options to adopt software that would automatically import data from outside databases to BPIS and provide additional functionality to document measure-specific data definitions.

Going forward, SHA is interested in developing several data support systems that will provide a centralized database for performance data in different areas or that will pull performance data from multiple source databases in real-time. These systems, in order of priority are:

- Maintenance Management System;
- Asset Management System; and
- Financial Management System.

SHA is currently testing new performance dashboard software that pulls from multiple outside databases for live or real-time reporting. The transition to this software is led by Performance Excellence Division staff, with some involvement from the IT Steering Committee.

## Organization and Governance

SHA does not have a single organizational structure or committee that is responsible for developing policies and guidelines to support data management. However, data is viewed as an asset within the agency, and data stewardship is addressed at multiple levels within the Performance Excellence Division. A “measure lead” and “objective lead” staff person is identified for each measure and objective used in SHA performance management documents. These leads act as data custodians for their measures and objectives, ensure data quality, and are responsible for all metadata such as defining and recording data definitions. The “measure lead” also works with the KPA councils and managers to adjust measure targets if needed. The Administrator and Deputy Administrators review performance data biweekly and the KPA councils review data quarterly.

SHA is actively involved in exploring new data support systems, governance models, and methods of improving data management. For example, SHA led a Transportation Research Board (TRB) peer exchange about data governance models. Several data management issues have been identified for improvement in the future, including the need to develop shared data and performance terminology between program managers and all SHA departments (i.e., “funds committed”).

## Data Sharing

The majority of SHA’s goals, performance measures, data, and strategies are made accessible to the public through SHA’s web site, Business Plan, and the Annual Attainment Report on Transportation Performance published annually by MDOT. The largest data sharing challenge for SHA is coordinating with outside agencies that provide performance data for key or legislatively required measures. This is a particular challenge in the area of Safety, where data such as incidents, fatalities, and injuries must be collected from police reports. Not only must these data be collected from many individual state and local police departments, but it must frequently be derived from handwritten and/or paper records. As a result of this process, regular and timely performance reporting on these measures is not possible. For example, annual figures often are not available until July of the next year.

## **Institutional Arrangements and Documentation**

### *Technology*

The Business Plan Information System (BPIS), SHA’s central performance management database used for quarterly reporting, is an Oracle database. The data that is fed into BPIS is stored in a variety of software environments, ranging from Excel spreadsheets to ODBC systems.

SHA is beginning to make some performance management data available through GIS-based applications, such as StateStat GIS and the MD iMap program. These programs are both based on an Adobe Flex user-interface and ESRI ArcServer background. GIS efforts at SHA are funded through a capital program.

## **Maryland Motor Vehicle Administration**

### **Agency/Organization Background**

Maryland’s Motor Vehicle Administration (MVA) serves customers throughout the State via 22 branch locations, multiple Vehicle Emissions Inspection Program (VEIP) facilities, and the eMVA web site. As a modal administration under the Maryland Department of Transportation, MVA serves as the “gateway to transportation infrastructure in Maryland” and is responsible for licensing of drivers and enforcing compliance of vehicles with registration, titling and International Registration Plan (IRP) services<sup>10</sup>. In fiscal year 2009, MVA’s total annual budget was \$188 million.

MVA first formally adopted performance-based management after the passage of Maryland’s Managing for Results (MFR) statute in 1996. A core set of MVA performance measures (such as number of transactions, VEIP compliance, customer wait time, and overall customer satisfaction) has been compiled and reported annually since that time.

### **Resource Allocation**

#### *Resource Allocation Framework*

The MFR was the first phase of linking performance to budget appropriations for MVA. This program has evolved throughout the years and has become integrated into all state of Maryland programs. Initially, the MFR program required MVA to annually report basic goals, objectives, and strategies to the Department of Budget and Management (DBM) and Legislature to assist in state level budget decisions. The performance-based concept in DBM budget

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<sup>10</sup> IRP services cater to motor carriers by allowing them to traverse Maryland, other states, the District of Columbia, and Canadian provinces.

submissions is twofold: 1) budget appropriations should be tied to performance measures, and 2) if there is not a direct correlation between a program or project and performance, the program or project should not be funded.

Until recently, MVA only tracked performance measures for external purposes (i.e., MFR), but over the last year they have been working on increasing performance management within the agency and developing internal performance measures. Motivation for this is both to become a key player in the Maryland Transportation Plan (the State's long-range plan), Attainment Report, MFR, and StateStat processes, and to reduce significant gaps between MVA's day-to-day work and external goals and performance measures.

The main component of MVA's recent performance management initiative is an effort to develop Strategic and Business Plans. The agency is currently undertaking strategic and business planning activities that will help to identify objectives, targets, and measures within each of MVA's functional areas that will directly support the agency's high-level goals. A Business Plan is being developed with the following components: mission, vision, performance measures, and strategies. MVA is identifying actions the agency will take to achieve each level of performance. The MVA Business Plan is expected to be finalized in July 2009. When completed, the Business Plan measures and strategies will be directly related to resource allocation in all of the MVA divisions, including the capital programs and operations.

Once completed, one of the primary goals of the Business Plan is for all employees to be able to identify MVA's mission and link their job to a Business Plan goal. MVA believes staff will respond when the agency's goals and objectives are clearer and the agency begins to operate as 'one MVA'. A large rollout and media support is anticipated for the plan, which is intended to increase communication, and ideally help employees feel inspired and/or challenged, thereby improving workforce development and retention. Lack of communication was highlighted as contributing to a perceived failure of MVA's first strategic plan, because it was only discussed once a year and was not linked to performance evaluations.

Internally, performance is currently linked to evaluations of Executive Service employees (usually serving in management capacities and above). Performance measures are not yet tied to career service employee evaluations; thus, it is up to management to creatively and effectively apply its resources to meet established objectives. Career service employees are classified union employees, and any changes to their review process must be negotiated into a new labor agreement. MVA and the union have a prescriptive guidance book for how managers should conduct reviews. This guidance may need to be completely rewritten to fit MVA's new Business Plan, which incorporates additional levels of performance management throughout MVA. The union is aware of the strategic planning process underway at MVA, but is not directly involved. To avoid potential conflict, MVA strives to build any performance-related recommendations within the existing union contract framework.

Another challenge of linking performance to personnel reviews is the agency's sensitivity that it does not create a penalty-based system. Due to the economic downturn and state budget shortages, there is no budget for bonuses that staff formerly received for exceptional performance (i.e., participating in mission critical efforts, performing 24-hour on call assignments, etc.). Management is trying to develop other creative incentives, including

agency level programs like Employee of the Month, which provides an extra day of administrative leave or a premium parking space, and division level events such as pizza parties and barbecues.

## **Priority Setting/Tradeoffs**

MVA performance goals are formally prioritized. Service, Safety, and Security are priority areas for the MVA in the MFR. Once the MVA Business Plan is finalized, the Plan will clearly identify strategic objectives that directly support the core goals of the agency. Objectives that support agency goals will be prioritized and will be weighted factors in the decision-making, resource allocation, and project prioritization approval process.

## **Improving the Process**

Having performance measures tied to budget appropriations has ensured that there is active participation and involvement in performance management, especially in regard to the specific performance-based activity that is measured. Until recently, however, performance measurement at MVA was almost entirely externally driven and developed from a “top-down” perspective. This approach did not motivate a sense of ownership over performance data and was perceived as an outside, bureaucratic activity that did not directly relate to or benefit the day-to-day operations of the agency. Targets were created “in a vacuum” without adequate agency input and, as a result, did not motivate staff to strive to achieve goals and did not promote efficient management. To address these past problems, MVA is currently embarking on a business planning process that involves all MVA management and seeks to link all MVA employees to at least one objective. The agency hopes that this process will prove successful in setting the stage for future successful performance management that engages and motivates staff.

## **Target Setting**

Target setting approaches at MVA have changed over the years and with changes in administration. Several years ago, a very top-down process was used to set targets. Meetings were held to inform managers of performance targets, but managers were not directly involved in setting or adjusting targets. Current upper leadership promotes a much more participatory process, wherein managers are integral to developing agency objectives and performance measures as well as performance targets. Manager input during the Business Plan development process resulted in the identification of over 150 objectives, which were then grouped by functional unit and developed into strategies. Over the past year, managers’ input has been gathered by the Executive Committee and used to inform targets. MVA is now beginning Phase II of the Business Plan development process and is determining how to involve other employees in the target setting process.

MVA adopts different target timeframes depending upon the nature of the measure and the purpose for which it is being reported. For example, the MFR is a 5-year forecasted process, of which prior year, current year, and three forecasted years of data is evaluated. As a result,

targets for MFR measures are generally set for three years in the future. Measures included in the first year of the Business Plan, on the other hand, will adopt 1-year targets to account for the fact the plan is in its development/planning year. The pending 2010 target will help familiarize managers with performance management and help MVA to ensure that appropriate data exists. Eventually, a 20-year Plan with a minimum 5-year target will be adopted.

The only measures that MVA develops targets for are those that are directly influenced by performance activities. Performance data should be available or easily obtainable if a target is to be used. The MVA strives to achieve long-term goals through short-term performance targets. This is accomplished by establishing realistic targets based on projected resources, the availability of funding, and accounting for future challenges and needs for services and products. Through business process efficiency measures, the MVA seeks to meet the challenges of the future. The MVA is receptive to legislative and customer recommendations regarding targets and receives direct input and guidance through the legislative and budget audit process as well as quarterly customer surveys.

If targets are consistently not met, performance activities are reviewed and evaluated for effectiveness. Additional resources (financial, personnel, assets) may be applied to meet the performance target or the target itself may be adjusted/eliminated if proven not feasible for the agency. If targets continue to go unmet, those controlling funding are made aware and actions are taken given budget constraints. Conversely, if a target is consistently met, it will also be reviewed and evaluated for its feasibility and appropriateness. It may be determined that the target was too low to begin with or, if the target is appropriate, resources may be redirected to other challenged areas.

## **Data Support Systems**

### *General Relationships*

MVA utilizes multiple data sources for performance management. The majority of MVA performance data reflects agency operations (i.e., transactions at MVA branches, web site activity, customer service survey responses) and is managed internally. Lack of appropriate data to evaluate program performance is not often a problem at MVA; however, in some cases, specific measures cannot be pursued because a baseline cannot be developed using existing data (i.e., percent reduction in fraud, percent reduction in error in all transactions). The Executive Committee is composed of Administrators and/or Deputy Administrators and has final approval for all performance measures. The Department of Information Technology (IT) attends all of the Executive Committee's meetings to support and monitor managers. If data for a requested performance measure is not available, the Executive Committee is made aware of data constraints and a plan to develop the required data is devised.

MVA's primary focus is to clean up their existing data (prevent and delete 'garbage' data) and to standardize inputs for reporting. By eliminating bad data and instituting quality assurance measures such as Vehicle Identification Number (VIN) verification, MVA hopes to reduce data entry errors, improve operations, and increase overall confidence in data to allow for quicker implementation of certain initiatives. Beyond data verification, MVA identifies data management system improvements and priorities based on funds available, priorities defined

by business units, and legislative obligations (i.e., legislative mandate to collect organ donor data and share with certain agencies).

## Organization and Governance

Internally, there are several MVA groups that are responsible for developing policies and guidelines to support data management. MVA's Quality Assurance Group is responsible for internal performance and IT management. The Office of Information Resources (OIR) develops data management policies and holds regular OIR customer meetings where IT staff is available to consult with managers about IT or data integrity issues. As previously mentioned, IT staff also attend all Executive Committee's meetings to support and monitor managers and to promote effective data management. Specific Database Groups (i.e., DB2, SQL Server, and Oracle) are responsible for overall data quality in databases based on their particular infrastructure. Finally, the Maximo Service Desk records data requests from business units, customers, and other resources to which MVA provides data. External groups that influence policies and guidelines to support data management include MDOT's Security Working Group, Information Technology Governance Board, and Information Technology Steering Committee.

Given the sensitive nature of much of the data MVA records, the agency has established well-developed privacy and security standards for data. A Memorandum of Understanding (MOU) exists between MVA and all external entities receiving data through regular automated means. Privacy Protection agreements also are required for all MOUs and contractual entities with access to MVA's data. MVA adheres to all data security standards outlined in MDOT's IT policies.

## Data Sharing

MVA obtains a variety of data from outside sources, including:

- Parking and other flagging data available from jurisdictions;
- Insurance data provided routinely from insurance industry for vehicle owner compliance enforcement;
- Social Security data;
- National Driver Register data; and
- Commercial Drivers Licenses.

MVA has established formal institutional arrangements, such as MOUs, with all organizations it receives data from and provides data to. A variety of MVA data is available to the public, including:

- Driving records available over-the-counter and via public web site;

- Vehicle data available during transaction processing on a public web site;
- Title records available upon request over-the-counter; and
- Statistical data available upon request via MVA’s Operations Research Unit.

## **Institutional Arrangements and Documentation**

MVA uses multiple formal data models to manage internally and externally generated data. Metadata about each performance measure is maintained by the measure lead or business unit responsible for the measure. IT staff and the Maximo Service Desk are responsible for tracking user requested data and information system changes.

## **Technology**

MVA receives data from a large number of sources which utilize a wide variety of database formats. Internally, DB2 is the platform for the agency’s primary, single-repository (this is the legally required platform). MVA maintains two primary systems based in DB2:

- Drivers Licensing System (DLS) – This system provides real-time information about drivers.
- Vehicles database – This system is older than DLS, requires batch updating, and is more difficult to validate.

Other technologies and databases used to store and extract data at MVA include: SQL Server, DB2, QMF, TransactSQL, DB2 Stored Procedure, and SSIS packages. MVA uses ODBC data architectures in certain cases. The agency also utilizes geographic information system (GIS) software for some applications.

# **Maryland Transportation Authority**

## **Agency/Organization Background**

The Maryland Transportation Authority (MDTA), or “The Authority,” is an independent agency responsible for managing, operating and improving the State’s toll facilities. The Authority serves customers using toll facilities in Cecil, Harford, Baltimore, Anne Arundel, Queen Anne’s, and Charles counties, as well as customers in Baltimore City. The Authority has statutory responsibility to supervise, finance, construct, operate, maintain, and repair certain revenue-producing transportation facilities projects. In addition, the MDTA has the legal authority to enter into partnership agreements on its own behalf, or on behalf of other agencies, and MDOT. This unique capability gives the Authority the opportunity to enhance the funding of the State’s transportation network by supplementing MDOT’s Transportation Trust Fund.

The Transportation Authority’s projects and services are funded through tolls paid by customers who use the agency’s facilities, other user revenues and the proceeds from toll revenue bonds issued by the Authority. The Authority has strong toll revenue bond ratings, of

Aa3 from Moody’s Investors Service, and AA- from Fitch Ratings and Standard and Poor’s. All three rating agencies view the rating outlook for Authority toll revenue bonds as stable. In FY 2009, MDTA’s annual operating budget was \$214.5 million.

MDTA first formally adopted performance-based management after the passage of Maryland’s Managing for Results (MFR) statute in 1996. A core set of MDTA performance measures (such as highway fatality and injury rates – jointly reported with the State Highway Administration – bridge condition, toll revenues, and throughput rates) have been compiled and reported annually since that time.

The Authority’s Division of Strategic Development facilitates and supports performance-based management. The Performance Management section serves as a resource to the Authority and assists each division through data analysis, research, benchmarking, and training. It also is responsible for facilitating each of the Authority’s formal performance measure reports, including:

- MDTA Strategic Plan;
- MDTA Business Plan (internal document);
- MDTA Division Work Plans (link each division’s work to the MDTA Business Plan);
- Managing for Results (MFR) submission;
- Authority’s contribution to the Maryland Transportation Plan (MTP).

All of these documents, with the exception of the MTP, are updated annually. The MTP provides a 20-year, long-range vision for Maryland’s multimodal transportation system and is updated every 4 to 5 years.

## **Resource Allocation**

### *Resource Allocation Framework*

MDTA links performance management to resource allocation in several ways. Initially, the MFR program required the Authority to annually report basic goals, objectives, and strategies to the Department of Budget and Management (DBM) to assist in state-level budget decisions. Since that time, the Authority has embraced performance-based management. Performance data is now used for internal resource allocation by the Performance Management Team at monthly Management meetings, and at Facility Administrator and Division Director’s budget meetings with the Executive Secretary and the Chief Financial Officer (CFO). Performance data is used externally for resource allocation through the MFR, Annual Attainment Report on Transportation System Performance, and status reports requested by the Legislature, MDOT, and the Governor’s Office.

Performance-based management was internally initiated with the creation of the Performance Management Team (PMT) in January 2006. The PMT has 10 members – one from each Division of MDTA – although additional staff acts as advisory members or play support roles. PMT membership rotates every 18 months. The group is now on its second cohort of members, but several from the first cohort still attend meetings. The goal of the PMT was to create more

regular internal performance reporting and management. The PMT meets monthly to monitor performance measures and targets within MDTA's Business Plan. Beginning in 2008, with the support of the Executive Secretary, the PMT began reporting during MDTA's Management Committee on a quarterly basis. The quarterly report contains 18 objectives and 20 to 22 performance measures.

One of the PMT's charges included changing the employee annual evaluation process and linking personnel reviews to performance. During the calendar year, every employee meets with his/her manager quarterly. Over the last year, MDTA piloted an evaluation process that assesses and evaluates each employee's contribution to the division work plan goal and/or performance measure that is most closely related to the employee's job description (i.e., invoice processing time). The goal is to link each employee to the division work plan, which illustrates their link to agency-wide goals/plans (i.e., MDTA Business Plan), statewide goals/plans (i.e., Annual Attainment Report), and eventually to the State long-range transportation plan goals.

In addition to developing a performance-based employee evaluation process, the PMT develops goals, objectives, and measures for both operational and capital budgets within MDTA. The Authority's current Business Plan contains three separate objectives related to resource allocation. MDTA's major performance-based resource allocation initiatives include:

- System Preservation (i.e., creating systems to track resource allocation, inspections, etc.);
- Implementing an Asset Management System; and
- Integrating MDTA's financial system with other systems.

Key performance metrics use to allocate the Authority's resources include:

- Financial Measures
  - Number of transactions,
  - Amount (in dollars) of tolls collected, and
  - Financial ratios.
- Safety Measures
  - Type, location, and contributing aspects of collisions (This measure is internally monitored by MDTA Police. Facility administrators and facility detachment personnel meet to discuss and determine if any collision contributing aspects are design/construction related and identify what can be done to mitigate the occurrences at the particular location.)
- Operational Measures
  - Facilities monitor the amount of money/resources utilized for snow removal to determine estimated budget needs for the following fiscal year.

## Priority Setting/Tradeoffs

The Authority's goals and performance measures are roughly prioritized. MDTA's Strategic Plan contains overarching goals that provide direction to the Authority. Each year, the Executive Secretary and staff determine the highest priority goals that will be the focus for the annual Business Plan. The goals that are selected and included in the annual Business Plan have priority for that fiscal period. In addition, the Strategic Development Division prioritizes measures based on minutes and feedback from quarterly meetings and reports. The Division also prioritizes certain performance measures based on staff requests to research, improve, or develop new measures focused on certain topics.

## Improving the Process

MDTA's performance management programs have evolved over the years and have had multiple successes and challenges. One of the most successful components of the Authority's performance management structure has been the implementation of the PMT as a monthly monitoring device. As a result of regular PMT meetings and involvement, MDTA has been able to more readily incorporate performance into daily operations, identify and address changes in performance, and pinpoint the causes of performance changes.

One area where the Authority hopes to improve is the process of developing new measures. There are several areas of the Authority's operations for which it would like to develop performance measures, but there are multiple measures and approaches that could be used to evaluate different aspects of performance. The process of deciding upon the most appropriate measure, developing a data source and methodology, setting targets and fine tuning the measure once it has been established has been difficult and time-consuming for MDTA.

## Target Setting

All MDTA performance measures that have been developed, or are being developed, have established targets. Targets for each measure are decided upon by the responsible Division's Management Team (the Executive Secretary, CFO, and Division Directors) with assistance from the PMT. Targets are generally established by evaluating past performance data, the current environment, and market conditions. MDTA uses as much historic data as is available, but some measures (i.e., vehicle miles traveled, or VMT) have data for a longer time than others (i.e., E-ZPass). Targets are sometimes benchmarked against other facilities. Other considerations that factor into target setting include funding availability, required resources, and tradeoffs. Once adopted, each objective must list required resources, name a lead sponsor, and name leads for each required resource. Individual divisions evaluate the tradeoffs and implications of different resource allocations internally based on their experiences and available environment information. Staff often requests the Strategic Development Division to research a new measure or ways to improve existing measures (i.e., new data sources, best practices). Based on this research, the division develops potential courses of action for the manager to bring to the monthly meeting. The largest portion of monthly meetings is spent reviewing each others' data and discussing next courses of action and additional needs.

All MDTA objectives are time-bound, and long- and short-term targets are set for the majority of measures. Progress towards targets is tracked internally at monthly meetings, which enables managers to identify unique events that may cause changes in the data (i.e., inauguration activities, major incidents). Targets are evaluated and adjusted as needed through this process and ongoing dialogue between staff, division management teams, and the PMT. Performance and targets also are evaluated annually for every measure in the annual Business Plan. After this evaluation, time horizons can be adjusted through the management committee if necessary.

MDTA has some targets that are set externally, including financial targets set through external financial agreements and crash-related targets set by the Federal Highway Administration (FHWA) and the Maryland Strategic Highway Safety Plan. If MDTA performance regularly exceeds these external targets (as it does for crashes), MDTA establishes separate internal targets. MDTA also coreports several performance measures it shares with the Maryland State Highway Administration (SHA). For these measures, MDTA sets its own targets and performance strategies, and SHA provides the data and methodology. MDTA collaborates with other agencies for several measures that it needs additional data for, or does not have the necessary equipment to monitor itself. For example, the Authority requests some information through their membership in the International Bridge Tunnel and Turnpike Association, and uses SHA equipment to assess pavement quality.

If MDTA performance consistently exceeds targets that are set internally, the PMT will persuade the division to adopt a new target or methodology. If the target is benchmarked from data on other facilities, MDTA will search for new data for facilities that are more similar to MDTA's. If the PMT proposes a new measure or methodology (i.e., queue length at toll facilities), staff will go to the field to see if standard data is available for the measure, report back to the PMT, and explore alternatives. Targets met or exceeded are used as lessons learned (examples of what the Authority has done correctly) and are used as a model for other performance measures.

If MDTA performance is below target (i.e., employee retention and invoice processing time), the PMT assigns a quality improvement team to work with the division and improve the process and increase performance. The Authority tries to avoid readjusting targets downwards. Targets not met also are used in lessons learned. The Authority evaluates what happened and why it did not reach the target. Questions asked include:

- Were there areas within the target that didn't work?
- Is the Authority attempting to set too high a target?
- Is the Authority measuring the wrong component?

Until recently, MDTA developed objectives regardless of data availability, and this practice may need to be reconsidered. There are several objectives for which the Authority is still researching and attempting to develop measures. MDTA formerly created measures/targets based on plan objectives, but over the last year has experimented with an alternative, bottom-up approach whereby the divisions develop measures they want to track and then create objectives from those measures. For example, interest in measuring queue length at toll

facilities led to research of data and methodologies, which led to the objective of minimizing the amount of time to get through the toll facilities.

## Data Support Systems

### *General Relationships*

MDTA's Performance Management Team (PMT) is composed of a wide-array of individuals throughout the Authority. In most cases, Divisions are represented by its Director or a senior manager. In other cases, the representative is a lead employee responsible for data collection. The PMT is involved in all aspects of performance management and data collection, including resource allocation for data programs. MDTA's Division of Strategic Development also is involved in decision-making regarding data support systems. The Division researches best practices in data management and makes recommendations to the Division of Information Technology (DoIT).

MDTA has extensive performance-related data needs, and performance data is currently collected in a variety of formats in a number of different legacy systems. For example, E-ZPass electronic toll collection data is managed by the Authority's vendor – Affiliated Computer Services (ACS); project information is stored in a Microsoft Project file; and human resources data is contained in an Access database. The biggest challenge to target setting and performance management is not having data centralized. To address this issue, an IT project manager is now overseeing a team responsible for the development of data management system improvements. Two current data management priorities are:

- **Project Management Initiative** – The Division of Information Technology is creating a hub for MDTA's finance, engineering, maintenance, and capital planning databases. Currently, this data is maintained in different systems that “don't talk” to one another. When completed, this will be a live operational database used on a daily basis.
- **Authority Trak** – This central database will store and archive all MDTA's performance measurement data. This database will be more static than the Project Management Initiative and allow MDTA staff to do data analysis without interfering with operational data. Authority Trak is currently set up as an Access database containing data for 17 key measures. Over the next year, the database will be improved to be more functional with automated reporting.

Future data needs at MDTA revolve around the topics of reliability and travel-time. For existing measures, MDTA feels improvements in data quality and quantity would allow for improved performance-based decision-making and management. The largest data-related need may be one of organizational culture change, however. As managers and directors gain more experience in performance-based management and gain greater confidence and familiarity with the data, the more likely they are to incorporate it into their daily processes.

## Organization and Governance

MDTA’s Division of Information Technology has implemented formal asset management approaches for data, including a process for the back-up and storage of data. The Division of Strategic Development is the organizational unit responsible for developing policies and guidelines to support data management. The Authority does not follow any established data governance model, but does establish data owners, sponsors/leads, and resources/staff for each objective. Each department is responsible for its own data; however, the Division of Strategic Development assists in areas where there are concerns for data quality or where assistance is needed to ensure that measures that are defined operationally and trends are reproducible using reliable data. Without this established structure and enforcement, MDTA feels they would likely have poorly constructed measures and associated data. While the Authority currently has several objectives without measures due to data limitations, staff has a high-level of confidence in the data that is available.

Developing audit quality data and improving communication about data and performance measurement are the Authority’s primary data-related goals. Future systems (currently in development) are clear illustrations of data being considered an asset. For example, the future open-road tolling mechanisms have redundant data storage, and automatic fail-over to ensure uninterrupted access to data.

## Data Sharing

MDTA is currently developing institutional arrangements and policies to promote efficient internal and external data sharing. The Authority is required by legislation to share its performance data with multiple stakeholders, and also must obtain data from several outside sources for various performance management tasks. For example, data from the Bureau of Transportation Statistics; the International Bridge, Tunnel, and Turnpike Association; and similar transportation organizations throughout the country are used for benchmarking. In addition, the Authority obtains some of its customer data from a vendor that manages the data for the agency.

MDTA data is made available to the public primarily through published reports created by the Authority and MDOT (i.e., Annual Attainment Report, MFR, and MTP). Data sharing primarily occurs internally between MDTA Divisions and other MDOT Modal Administrations. MDTA is currently working to develop an easy mechanism for executives to run simple reports and obtain performance information. This report function would operate similar to existing “on demand” reports used by MDTA staff, such as the “Finance at a Glance” report. MDTA hopes to have this system in place within the next year.

## Institutional Arrangements and Documentation

MDTA does not currently use an enterprise data model to depict performance-based resource allocation data. However, the Authority does maintain data profiles for each measure reported in the annual Managing for Results report. These profiles contain metadata such as operation definitions, the location of files, data formats, data owners, and other items. The Authority does not have a formal process in place for tracking user requested data or information system

changes, but the Division of Strategic Development is available to assist staff with research requests and other inquiries.

## **Technology**

MDTA's performance data is currently collected in a variety of formats in a number of different legacy systems. Technologies currently used to store and extract performance data include SQL, Access, and other software systems specifically designed for finance and engineering applications. DoIT staff is exploring opportunities to use data architectures such as Open Database Connectivity (ODBC) to make data more shareable between data systems as they are improved. Integrating data systems with target setting and resource allocation decisions is a major issue within MDTA at the moment. The Authority is working on solutions to integrate more of their data to improve target setting and resource allocation. Current legacy systems require duplicate entry of data into multiple systems. The Authority's goal as they continue to make progress in this area is to be able to improve resource allocation and target setting. The process to date has been useful in the continuing identification of internal customer requirements.

# Metropolitan Transportation Commission

## Background

The Metropolitan Transportation Commission (MTC) is the MPO for the San Francisco Bay Area, California. It is responsible for regularly updating the Regional Transportation Plan (RTP), which includes transit, highway, airport, seaport, railroad, bicycle, and pedestrian facilities. The most recently adopted RTP specifies how \$218 billion in anticipated Federal, state, and local transportation funds will be spent over the next 25 years. The Commission also screens requests from local agencies for state and Federal grants for transportation projects to determine their compatibility with the plan.

The Commission's work is guided by a 19-member policy board. Fourteen commissioners are appointed directly by local elected officials, two members represent the Association of Bay Area Governments and the Bay Conservation and Development Commission, and three nonvoting members are appointed to represent Federal and state transportation agencies and the Federal housing department. The MTC has a staff of about 130 persons.

## Resource Allocation

### Planning and Programming

As a regional planning agency, the MTC does not require the level of performance management that state DOTs or Federal agencies – with large spans of authority – might require. However, the MTC uses an extensive and comprehensive set of performance measures in development of its long-range RTP, and it has developed performance-based resource allocation tools such as the StreetSaver® pavement management system.

The RTP performance-based resource allocation framework has evolved over the development of the last three plans. However, the 2005 long-range plan update, *Transportation 2030*, was the first for which performance assessment was required under state law. In 2001 performance measurement was utilized in the RTP from a programmatic standpoint based on whole packages of investments which were compared. California law also requires environmental impacts to be evaluated through a program level environmental impact report. In 2005 the MTC released *Transportation 2030*. The original intent was to evaluate the performance of all individual projects; however, with 1,000 diverse projects, it became more practical to do an assessment of need focusing on 100 key projects organized on a corridor bases. Need was evaluated based on congestion, use of interchanges, and other similar metrics, but the assessment did not give a sense of impact or cost-effectiveness.

MTC’s most recent RTP, *Transportation 2035 Plan for the San Francisco Bay Area*, was released in 2009. Performance assessment played a more central role in this plan due in part to new emphasis on performance-based resource allocation from MTC’s Executive Director, who championed performance-based resource allocation with staff and elected officials.

The development of the plan started with the development of performance objectives (see Table 6) and the setting of very aggressive performance targets. Economy, environment, and equity—the “Three E’s”—served as a common framework for these objectives and targets to which commissioners and the public could relate. Performance objectives were selected based on:

- Usefulness;
- Measurability and data availability;
- Keeping measures limited and focused;
- Existing regulations and mandates at the Federal, state, and regional level; and

The Commission did not adopt weights regarding the priority of goals or objectives.

Scenarios, including transportation investments, land use, and pricing, and were assessed according to their contribution to progress towards targets. A benefit/cost analysis of 50 primarily capacity expansion, roadway, HOV lane, major interchange, and arterial reliever projects was performed to look at reductions in emissions, delay, collisions, and affordability, with tie-back to performance objectives. A separate qualitative analysis of 700 projects ensured the extent of alignment with goals and objectives. An ongoing assessment of the performance objectives will occur as part of the region’s “State of the System” report and as part of each update of the RTP.

For projects that were cost-effective but not included in the RTP, a strong justification was required. Conversely, a strong reason for including a project of low-cost effectiveness, such as meeting equity goals, was required. The analysis, therefore, was helpful as a starting point for making a case for including or not including projects in the RTP.

**Table 6. MTC Performance Objectives**

Three E's	Goals	Performance Objectives
Economy	Maintenance and Safety	Improve maintenance Local streets and roads: maintain pavement condition index of 75 or better State highways: distressed lane miles no more than 10 percent of system Transit: average asset age no more than 50percent of useful life and average distance between service calls of 8,000 miles Sources: State and local strategic plans Reduce injuries and fatalities Motor-vehicle fatalities: 15percent from today Bike and pedestrian injuries and fatalities: 25 percent each from 2,000 levels Source: California State Strategic Highway Safety Plan
	Reliability Freight	Reduce delay 20percent per capita from today four Source: California's Strategic Growth Plan
Environment	Clean Air	Reduce vehicle miles traveled and emissions
	Climate Protection	Vehicle miles traveled: 10percent per capita from today Fine particulate matter (PM <sub>2.5</sub> ): 10percent from today Coarse particulate matter (PM <sub>10</sub> ): 45percent from today Carbon dioxide (CO <sub>2</sub> ): 40percent below 1990 levels Sources: State regulations and laws
Equity	Access Livable Communities	Improve affordability 10percent reduction from today in share of earnings spent on housing and transportation costs by low and moderately low-income households Source: Adapted from the Center for Housing Policy

Source: MTC, Transportation 2035 Plan for the San Francisco Bay Area.

Though performance assessment plays a strong role primarily in policy, it also is a key component in roadway maintenance. The MTC distributes STP and CMAQ funds for local roadway maintenance and pavement rehabilitation. The MTC uses a regional performance-based system to determine funding allocation, centered on the StreetSaver® program it

developed (see Data Support Systems below), and localities are not penalized for own investment. To a lesser degree, annual operating assistance for ferry operators is tied to performance, with certain farebox recovery ratios required to receive funding.

## Improving the Process

MTC's performance-based process has been evolutionary. Numerous advances in introducing a performance-based framework were made even within the last year of developing the most recent RTP.

The MTC identified several elements that have worked well and helped the Commission feel comfortable getting a performance-based framework in place, such as keeping requirements flexible for now (with potentially less flexibility in the future as the processes mature), and linking to existing policy.

However, the MTC's existing analysis and modeling tools are not equipped for a rigorous performance analysis at the project level, with precision levels lower than desired. It is also difficult to compare performance between modes, or even measuring impacts within non-auto modes, such as capturing benefits from bike networks or transit programs. For programming, the MTC would like to develop an approach to allocating transit funding that mirrors the current pavement management system, using a transit asset management system that uses metrics such as average fleet age. In order to support such a system, and all existing performance analyses, additional funding for data collection would be beneficial.

## Target Setting

The development of the current RTP started with the setting of very aggressive performance targets:

- Reduce per-capita delay to 20 percent below 2006 levels;
- Reduce daily vehicle miles traveled (VMT) per person to 10 percent below 2006 levels;
- Reduce carbon dioxide (CO<sub>2</sub>) emissions to 40 percent below 1990 levels;
- Reduce emissions of coarse particulates (PM<sub>10</sub>) by 45 percent below 2006 levels;
- Reduce emissions of fine particulates (PM<sub>2.5</sub>) to 10 percent below 2006 levels;
- Reduce by 10 percent the share of low-income and moderately low-income residents' household earnings consumed by transportation and housing;
- Maintain local road pavement condition index of 75 or greater for local streets and roads

- State highway distressed pavement condition lane miles not to exceed 10 percent of total system
- Achieve an average age for all transit asset types that is no more than 50 percent of their useful life; and increase the average number of miles between service calls for transit service in the region to 8,000 miles;
- Reduce fatalities from motor-vehicle collisions by 15 percent from today by 2035;
- Reduce bicycle and pedestrian fatalities attributed to motor vehicle collisions by 25 percent each from 2000 by 2035; and
- Reduce bicycle and pedestrian injuries attributed to motor vehicle collisions by 25 percent each from 2000 by 2035.

Some targets are based on government requirements. Currently, California has a statewide mandate regarding carbon dioxide reduction and emissions, with long-term targets; statewide interim targets are likely to be mandated in the future. Particulate matter targets set by the MTC go above and beyond real requirements and are tied to state particulate matter reduction goals. VMT targets are also likely to be regulated in the future. The “affordability” target was the most difficult to develop due to lack of precedent or regulation, and was based on research in this field.

Overarching goals and strategies were set at the executive level. A subcommittee of the Bay Area Partnership, a confederation of the top staff of transportation agencies in the region, advised MTC staff in developing the performance measures. The MTC Planning Committee voted on and approved measures and targets. The Commission had the final word in approving the targets. Keeping flexibility in the target-setting process, and using language such as “voluntary” and “interim,” was critical in getting the Commission to approve targets. This approach was also considered prudent from a legal perspective.

There are currently no penalties in place for not meeting targets. The current investment plan gets quarter of a way towards targets. The MTC is discussing policy initiatives or advocacy positions to achieve more progress towards targets. Also under consideration is the need for setting interim targets, and how realistic those interim targets will be. If they are based on the current long-term targets, they may be difficult to meet.

## **Data Support Systems**

### **General Relationships**

Data for MTC’s performance measure program is generated from their regional travel model. Because they are not an operating agency, they do not invest resources in new data management or data collection activities. Rather, they tend to rely on data already being collected by state DOT’s and transit operators. Collisions and safety were identified as weak points in MTC’s performance measurement capabilities. In the context of the long-range plan,

the MTC would like to include a metric to reduce collisions. However, their forecasting strategies are not useful in addressing collisions. MTC determines priorities based on regional needs on the local roads and streets side; this includes pavement, non-pavement, and local bridge needs (using Pontis®).

The Center for Clean Air Policy is currently leading a discussion on how to address climate change, and MTC is participating in group discussions on climate data. There are many questions on the effectiveness of available tools for measuring progress in this area. MTC would like to have better data as it relates to expectations for monitoring carbon dioxide.

There is a need for a connection between performance targets and those who collect data or make decisions on data programs. There is an opportunity to make this connection with regards to carbon dioxide targets, in that statewide regulations will soon be set. Local entities responsible for actually meeting these targets will need the tools to do so. There is a lot of attention in this area both nationally and statewide.

## **Pavement Management Program**

MTC developed a pavement management system called StreetSaver® that is used by nearly all local jurisdictions in the Bay Area. StreetSaver® is a network-level system (not project level) that gathers data on seven different distresses in pavement. It then generates a Pavement Condition Index (PCI) for street segments at the local level, which is used as the primary measure of condition of the pavement. Local pavement condition data is used by MTC at the regional level because they are able to generate a regional pavement condition summary and PCI index, which they then use to predict regional needs for pavement maintenance as part of their regional transportation planning process.

StreetSaver® is a web-based program with GIS capability. It was initially developed 20 years ago and has continued to evolve and grow over time. MTC depends on user feedback to determine what enhancements to add to StreetSaver® software. Free training and support is provided to all users in the Bay Area, and a nominal fee is charged to outside users to offset the cost of software development. StreetSaver® is the most popular pavement management system used on the west coast, with 350 users nationwide. Because StreetSaver® is geared toward local and regional pavement management, and because of the nominal user costs and support provided by MTC, it offers agencies a better value compared to similar software packages offered by competitors.

The impetus for creating StreetSaver® came from a need to know the condition of local streets and roads for transportation planning purposes. Another objective was to prioritize project funding and construction investments. MTC now has access to good pavement condition data for all local jurisdictions using the software, and because the software is web-based, they have ready access to local jurisdictions' databases to download data and generate regional summaries. MTC has a grant program called the pavement technical assistance program (PTAP) – paid for with Federal funds that are used at MTC's discretion – to provide funding assistance to 30 percent of Bay Area users each year to update their inspection programs and databases. Because local jurisdictions must update their pavement condition data to continue

to receive this funding, MTC knows that the data is relatively up to date and that fairly recent data is used for regional analysis.

In the most recent update of the Regional Transportation Plan (RTP), MTC was able to evaluate the consequences of various funding scenarios using data from StreetSaver®. Typically, funding for streets and roads comes from discretionary funding, and it is up to MTC to decide how to distribute those funds. They used StreetSaver® to identify pavement maintenance needs in the region. Initially, there was a huge shortfall in maintenance funding, with only half of the region's needs covered by available revenue. MTC was able to allocate more funds to pavement projects by demonstrating the benefits of these investments compared to “worst first” investing, which would cost the region billions in deferred maintenance costs over time. Using a weighted benefit/cost ratio index, they demonstrated how the region could save five times as much money by investing now rather than deferring maintenance over a 25-year period. This would allow the region to achieve a certain regional PCI, while having more money available to invest in the future. For the current RTP, MTC is investing \$7B for local streets and roads maintenance, compared to \$0-1.5B in previous RTPs. The success of the StreetSaver® program is attributed to their ability to use it to demonstrate consequences of various investment decisions. Ongoing development and management of StreetSaver® and user services costs \$400,000 per year, which is subsidized by the revenue MTC earns from the sale of the software (about \$250,000 per year). The Federal grant program, PTAP, is funded at about \$800,000 per year. MTC also makes money on the sale of the software.

The value of collecting pavement condition data is recognized by both local jurisdictions and decision-makers. At the local level, data collection is performed by consultants who collect the pavement condition data and enter it into the StreetSaver® program. At the regional level, there is a Local Streets and Roads Working Group who is responsible for developing a strategic plan for streets and roads using data from StreetSaver®. Upper management is ultimately responsible for investment decisions made based on the data. Regional funding for pavement maintenance has increased using this type of analysis, so local jurisdictions clearly see the benefit. Use of the software also enables them to go to their city councils and present scenarios that impact local funding decisions made at the regional level.

MTC has a very good system in place for pavement management, but they would like to add an inventory module to the software to manage other roadway assets such as curb/gutter, drainage, sidewalks, and bike routes as well. Data accuracy for these assets has always been guess work, and MTC would like the ability to calibrate against actual inventory data for these items.

MTC recently instituted a new approach to allocating funding to local jurisdictions as an incentive to improve their maintenance strategies. They examine every jurisdiction's database to see how much of their budget is allocated to preventative maintenance projects and compare that to their target ratio of preventative to total maintenance as determined by StreetSaver®. Each jurisdiction's recommended percent of budget that should be spent on preventative maintenance is different since StreetSaver® bases its recommendation on the jurisdiction's individual street network characteristics and conditions. Jurisdictions with good pavement conditions will have a higher preventative maintenance target than those with poor streets since the aim of preventative maintenance is to keep the good streets good, thereby reducing long-term costs. Their ratio of

“actual versus targeted” determines the jurisdiction’s performance score and is a factor in calculating the amount of funding that will be allocated to that jurisdiction. MTC started this method several years ago, when only seven percent of available funding was initially allocated based on preventative maintenance performance. For this RTP, the region agreed to increase the allocation of regional funds conditioned on preventive maintenance to 25 percent. Their allocation method can be presented before local city councils as an incentive for local jurisdictions to improve their investment strategies and potentially obtain more funding from MTC.

MTC has had very good buy-in for their pavement management system at the local level, and they attribute their working relationships with local jurisdictions as a success factor. In the beginning, local agencies were leery of working with MTC because local roads were neglected in the RTP. The emphasis in the region was always on transit, and this was reflected in previous investment decisions made by MTC. As they have been able to support regional investment decisions with better pavement condition data, local jurisdictions have become more supportive of the program. This has been a good strategic move in terms of regional investment decisions, as MTC has been able to demonstrate the benefits of preventative maintenance over “worst first” funding decisions. The local program is called Saving Our Streets (SOS).

## **Organization and Governance**

### **Data as an Asset**

MTC thinks of their pavement management system as an asset management system because they can establish goals for pavement condition and examine the tradeoff of meeting those goals at the regional level. Data is treated as an asset in terms of being able to monitor pavement condition and knowing what streets need to be fixed. Having pavement condition data allows them to develop a strategy for preventative pavement maintenance and funding. While the Pavement Condition Index (PCI) drives the whole program, there are many individual performance measures used that are also based on PCI.

The pavement technical assistance program (Federal grant) is another example of how data is treated as an asset. MTC uses this program to invest funds that enable local jurisdictions to update their local databases and monitor data validity. MTC requires that pavement condition on major streets be updated every two years, and on residential streets every five years. Local jurisdictions are not qualified to receive grant funding unless they perform regular updates of their pavement condition database.

### **Data Governance Framework**

In general, the MTC does not own a lot of data, so they do not have a formal data stewardship or data governance model for their performance measures program or pavement management system. Individual jurisdictions own their own pavement condition databases, although they agree to grant MTC access based on the software license agreement.

## **Institutional Arrangements/Policies to Support Data Management**

There is a Local Street and Road Working Group that is made up of public works directors and staff from local jurisdictions. They report to a partnership board made up of various officials from around Bay Area, who are subsequently advised by a Commissioner on Transportation Policy.

### **Relationship to Target Setting/Decision-making**

The pavement management system has been very beneficial in terms of setting targets effectively.

### **Data Sharing**

#### *Institutional Arrangements/Policies to Support Data Sharing*

MTC does not normally share pavement condition data for other jurisdictions unless they get permission to do so. They do produce a regional summary report on pavement condition, and they include rankings of local jurisdictions based on PCI. This report is published annually and is available to the public. It can be helpful for lower ranked jurisdictions to see how they compare to the rest of the region. MTC considers pavement data from local government agencies as part of the public domain; however, they do inform jurisdictions before they publish anything, and they provide an opportunity to make corrections. Only the PCI number is published in the annual report – not information on individual streets and maintenance activities of the jurisdiction.

#### *Internal/External Data Access*

There are no formal data sharing agreements in place. MTC makes requests to California Highway Patrol (CHP) for collision data and to Caltrans for carpool lanes and volume data. They also obtain data on local streets and roads from individual jurisdictions. For pavement condition data, there is a requirement that local jurisdictions provide updated pavement condition data to MTC, and they are not eligible to receive Federal grant funding unless they submit their data.

MTC publishes all available data on the Internet, and they fulfill outside requests for data on an ad hoc basis. Since 2002, MTC has published an annual State of the System report that includes information on congestion, regional statistics, transit ridership, etc. They also produce an annual report on state highway volumes. The publication is intended to be readable and user friendly, so it is not very data intensive.

## Documentation and Reporting

### *Enterprise Data Model*

StreetSaver® is capable of producing reports in MS Excel, PDF, and map (GIS) format. These can be used for reporting pavement-related performance measures at the local level. For regional reporting, MTC tends to produce its own charts through their graphics department.

## Technology

### *Data Management Systems / Business Intelligence (BI) Tools*

MTC's StreetSaver® program is available on-line, which allows MTC to perform software updates easily. It also allows instant access to local jurisdictions' databases, rather than having to submit a formal request and wait for jurisdictions to submit their data. This format also cuts down on support costs since running the program does not conflict with other programs running on a user's desktop. Gaining user confidence in the security of their data was the biggest hurdle in having StreetSaver® as an on-line application. This has been resolved partly because more and more applications are now on-line.

StreetSaver® has a GIS component that has gained strong interest among users. Many of the larger jurisdictions have GIS capabilities within their agencies; however, 30 percent of local agencies are small and do not have GIS capabilities. MTC introduced a new module with a GIS toolbox that can be used to produce maps using Tiger Data as a base map. This allows smaller agencies to plot various maintenance strategies on a map, which can be presented before city council when arguing for more funding.

## Improving the Process

MTC identified the following improvements they would like to make:

- MTC would like to see an asset management approach to funding transportation infrastructure at the regional level, similar to what is used for pavement management. At the MPO level, funding decisions are often based on other priorities. A great use for this type of data would be to make funding decisions for other modes such as transit, new construction, etc. Funding for these areas tends to be more politically driven, with 23 different transit agencies, including CalTrans and other groups, competing for regional funds. They would like the ability to allocate funding for transit based on some target or performance element, rather than just based on need. On streets and roads, they would like the ability to allocate funding based on who deserves the most and where it can do the most good. Even in the face of having lots of good data available, it can still be difficult to prove the benefits of investments in these areas, since political pressures exist on that side.
- MTC has found that it can be hard to convince agencies to use their pavement management system software, even though it is important and can help them save money down the road. It has been a hard sell on the educational side, even with MTC as a long-standing success story.

## Success Factors

MTC identified the following success factors for their pavement management system:

- Asking users to help develop the software.
- Providing support, both on the technical and training side, as well as with pavement inspection training and inspection support.
- The PTAP program helped local jurisdictions get on a regular schedule for updating their software.
- Obtaining buy-in from local jurisdictions. MTC gained the trust of local jurisdictions by letting them know they were on their side, and working with them to gain their trust. The Local Streets and Roads Working Group was a big part of this success. MTC was able to use StreetSaver® to get local jurisdictions more money to fund their street programs. In the 2001 RTP, streets and roads was allocated only \$100M in funding. MTC was able to use the StreetSaver® software as a tool to demonstrate local needs and get more funding.
- Every local jurisdiction is using the same pavement management software. In the southern region of California, it is not uncommon to have seven or eight different pavement management systems in use by various jurisdictions. Having a 20-year development history with StreetSaver® is a huge advantage for MTC. At a point when they had 60 users, MTC started reporting pavement condition only for jurisdictions that used the software, and they would put an asterisk by those who did not. The intent was to make an apples-to-apples comparison on pavement condition across the region. This influenced agencies to take an interest at the regional level, and the number of StreetSaver® users increased to 100 within the course of a year.
- The software is user friendly, even for those who do not use it day-to-day. It is an inexpensive product compared to other pavement management systems out there. The training and software support provided by MTC has also attributed to its success.

## Other

The following list summarizes key points from the Metropolitan Transportation Commission Case Study, which are applicable to other state DOTs, for the use of performance measures and targets and establishing Data Governance programs:

- In the most recent update of the Regional Transportation Plan (RTP), MTC used StreetSaver® data to identify pavement maintenance needs in the region and evaluate the consequences of various funding scenarios. MTC was able to allocate more funds to pavement projects by demonstrating the benefits of these investments compared to “worst first” investing, which would cost the region billions in deferred maintenance costs over time.

- MTC recently instituted a new approach for allocating funds to local jurisdictions. They examine every jurisdiction’s pavement condition database and determine how much of their budget is allocated to preventative maintenance projects and compare that to their target ratio of preventive to total maintenance as determined by StreetSaver®. Each jurisdiction’s recommended percent of budget that should be spent on preventive maintenance is different since StreetSaver® bases its recommendation on the jurisdiction’s individual street network characteristics and conditions. Jurisdictions with good pavement conditions will have a higher preventive maintenance target than those with poor streets since the aim of preventive maintenance is to keep the good streets good, thereby reducing long-term costs. Their ratio of “actual versus targeted” determines the jurisdiction’s performance score and is a factor in calculating the amount of funding that will be allocated to that jurisdiction. This approach serves as an incentive for local jurisdictions to improve their investment strategies and potentially obtain more funding from MTC.
- MTC gained the trust of local jurisdictions by working with them and letting them know they were on their side. The Local Streets and Roads Working Group was a big part of this success. MTC was able to use StreetSaver® to get local jurisdictions more money to fund their street programs.

# Minnesota State Department of Transportation (Mn/DOT)

## Background

The Minnesota Department of Transportation (Mn/DOT) is a multimodal agency with a vision to be a “global leader in transportation, committed to upholding public needs and collaboration with internal and external partners to create a safe, efficient and sustainable transportation system for the future.” Its declared mission is to “provide the highest quality, dependable multimodal transportation system through ingenuity, integrity, alliance and accountability.”

As stated in Mn/DOT’s 2010-11 Biennial Budget request, its investment objectives are to:

- **Preserve Existing Infrastructure** – Maintain the roads and bridges on the trunk highway system in safe and sound condition.
- **Improve Safety** – Implement the Strategic Highway Safety Plan, investing in systemwide, proactive safety strategies to reduce intersection and runoff the road crashes.
- **Improve Mobility** – Engineer solutions that accelerate delivery of projects to reduce congestion and improve mobility.
- **Innovation** – Develop 21<sup>st</sup> Century Solutions to 21<sup>st</sup> Century Problems, using innovative approaches to project development, design, construction, and financing.

In February 2008, in addition to Mn/DOT’s 2008-09 annual appropriations of more than \$2 billion, the Minnesota legislature passed a transportation funding bill providing for investments in trunk highways and local roads. This bill (Chapter 152) specifically directed monies towards trunk highway bridge replacements and repairs, new interchanges, transit facility improvements, and facilities construction statewide as well as providing \$1.8 billion additional revenues over the next 10 years for local roads maintenance and construction. With this bill, Mn/DOT receives an estimated \$2.6 billion in new revenues as well as \$1.8 billion in bond funds over the next 10 years. Of these revenues, \$75 million per year goes to Mn/DOT operations and program delivery and an estimated \$1.036 billion for debt service.

While Mn/DOT manages a multimodal transportation program, the performance-based resource allocation process described in this case study applies only to the highway construction program. Management of the other modal functions, including highway system operations, transit, and aeronautics is performance-based but not as well developed as the highway construction program.

Mn/DOT has integrated performance-based decision-making into its resource allocation process for highway planning, programming and project development through five key elements: 1) the production and adoption of a performance-based state plan with goals, measures and targets; 2) the use of measures and targets to assess the status of the transportation system; 3) the selection of projects for the annual highway construction program; 4) incorporation of performance measures into the biennial legislative budget request; and 5) the adoption of a performance-based allocation formula for distributing highway funds appropriated by the state legislature and the national congress. This case study describes these elements in Mn/DOT's resource allocation process focusing on the development and use of performance measure targets and the data systems required to support performance-based decision-making.

## History

Mn/DOT's performance management journey began in the early 1990s stimulated by both internal and external interest in developing a more transparent and accountable investment decision process. This initial interest manifested itself primarily in the application of Quality Management in the maintenance area. As part of this new focus, a Maintenance Business Management Team produced detailed statewide performance measures and targets for snow and ice removal, pavement markings, signing, customer satisfaction, and other measures. This new approach was well received and the department senior staff directed a broader application of the performance measure concept to other areas such as the highway capital program. As the launch point for this broader application, the department developed a performance-based Statewide Transportation Plan under the Direction of the Program Management Division and established a small Performance Measurement Unit in the Office of Program Management to assist in the plan's production and implementation. The department's decision coincided with a new requirement from the Minnesota Legislature and Department of Finance that agencies use performance measures in biennial budget documents.

In August, 2003 Mn/DOT adopted its first performance-based state plan titled "Minnesota Statewide Transportation Plan – Moving People and Freight from 2003-2023." The plan, considered a national forerunner in performance -based planning, won the Transportation Planning Excellence Award from the Federal Highway Administration in 2006. The plan declared three strategic goals, aligned 10 policies under these goals, identified outcomes for each policy, and established specific modal performance measures and targets or in some cases, i.e., freight, identified areas for the future development of measures and targets. The plan also contained strategies for achieving specific modal objectives such as safety. The plan is being updated in 2009. The update eliminated modal elements of the plan where previously identified outcomes and targets did not work, and added new modal goals and outcomes developed as performance-based planning matures. The plan can be found at <http://www.dot.state.mn.us/planning/program/index.html>.

Under the umbrella of the 2003 state plan, Mn/DOT refined its modal planning by adopting several specific statewide performance-based modal plans, including Freight (also a 2006 national award winner), Bicycle, Transit, Highway Systems Operations, Highway Safety and

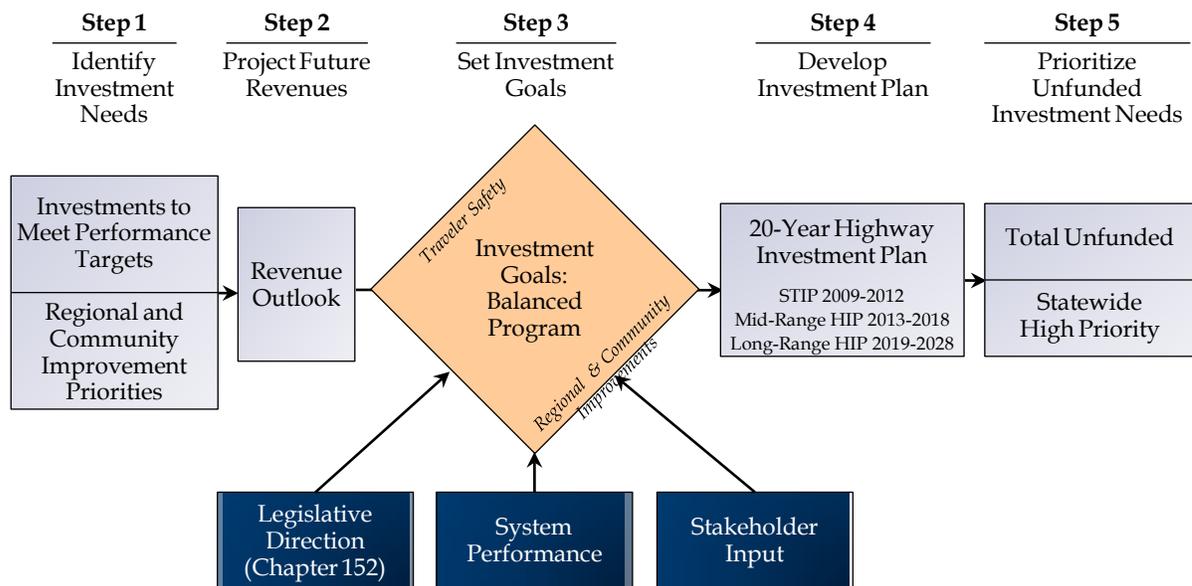
Aeronautics. Together these plans provide the foundation for a performance-based resource allocation process.

## Planning and Programming Resource Allocation

### Resource Allocation Framework

After completion of the 2003 Statewide Transportation Plan, Mn/DOT integrated performance-based resource allocation into its highway planning, programming and project development process. Each year every Mn/DOT district, following uniform guidance, identifies investment priorities. These priorities are based on quantifiable performance measures and targets that establish an impartial statewide basis for identifying critical transportation improvements for the entire trunk highway system. This process, first identified in 2003 and refined over the last five years, is illustrated in Figure 16.

**Figure 16. Mn/DOT Highway Investment Plan Development Process**



This five step investment process, described in the 2009 Statewide Transportation Plan, provides the framework and guidance for developing Mn/DOT district 20-Year highway investments plans. These 20-year investment plans, newly updated in 2009, provide the link between the policies and strategies established in the Statewide Plan and the capital improvements that are made to the state highway system. Together, the eight district plans constitute a State 20-Year Highway Investment Plan for 2009- 2028. The plans were developed in accordance with the following five steps:

### ***Step 1 – Identification of Investment Needs***

Investment needs fall into two categories: improvements to address system performance and improvements to address regional or community priorities. Performance-based needs include investments to meet established system performance targets related to traveler safety, infrastructure preservation, interregional corridor mobility, Twin Cities mobility, and Greater Minnesota urban mobility. The analytical models and methodologies used to calculate the investments to meet these system performance targets are described more fully in the District Plan Summary section of the Statewide Transportation Plan. Regional priorities include a wide range of highway improvements to support local business or community development goals, from major highway expansions and new interchanges to intersection modifications, trails and sidewalks.

Statewide, investments to meet system performance targets during the 20-year period are estimated at approximately \$62 billion. Mobility needs related to interregional corridors and congestion mitigation in the Twin Cities and Greater Minnesota urban areas represent the largest proportion, about \$43 billion, or 68 percent, of the total. For now, congestion mitigation needs in the Twin Cities have been estimated based on previously identified needs from the 2004 Metro District Plan. The approach to mobility and congestion mitigation will be further examined in 2009 and will likely result in a revised estimate of need. Infrastructure preservation accounts for about \$16 billion, or 26 percent, and roadway improvements targeted toward safety total about \$3 billion, or six percent of the total needs.

An additional \$3 billion to \$5 billion is needed to address regional and community improvement priorities. This estimate reflects the sum of each district's understanding of local concerns expressed during the past several years and, as such, does not represent a comprehensive assessment of every potential local request. It does illustrate, however, that there are many demands on available transportation funding beyond the investments needed to meet established statewide performance targets.

### ***Step 2 – Project Future Revenue***

Next, revenues were projected based on the trends in state and Federal revenue sources for state highway construction. No new sources of revenue were assumed but the increased bond funding for trunk highways enacted by the 2008 Legislature was factored into the projection. Construction cost trends were also analyzed and projected so that investment needs and expenditures could be estimated in year-of-construction dollars. A more complete description of revenue and cost trends and projections is provided in Chapter 5 of the Statewide Transportation Plan. Given the volatility in both costs and revenues and the current discussion of increased Federal infrastructure funding as an economic stimulus package, the projections assumed in this plan represent a snapshot in time and will need to be updated annually as long-range investments become programmed in the four-year State Transportation Improvement Program.

### ***Step 3 – Set Goals: A Balanced Program of Investments***

The investment priorities reflected in this update of the District Plans differ significantly from the 2004 plans. At that time, Mn/DOT identified infrastructure preservation as its top priority and districts were directed to fully fund preservation needs before other priorities, including safety, mobility and local community priorities. The revenue and costs outlook in 2004 projected sufficient long-term funding to meet not only preservation needs, but other areas of need as well.

Since 2004, revenues have not grown as anticipated and construction costs have increased dramatically. Even with the increased transportation revenues provided through Minnesota law 2008, Chapter 152, the costs to fully preserve bridges, pavements and other roadway infrastructure during the next 20 years will exceed projected funding.

The investment goals for this update of the district plans reflect Chapter 152 legislative direction, consideration of system performance trends and stakeholder input. While infrastructure preservation continues to be an important priority for Mn/DOT, it cannot be the exclusive priority. The goal for the 2009 District Plan updates is to lay out a balanced program of investments that achieves three objectives:

- Supports the continued development of the statewide economy and livability of Minnesota communities.
- Represents the optimum allocation of projected revenues among the four strategic investment priorities of safety, mobility, infrastructure preservation, and regional and community improvements.
- Results in a consistent level of investment effort across districts toward statewide system performance targets, including the investment directions established in Chapter 152 for the rehabilitation or replacement of fracture critical and structurally deficient bridges and other highway improvements.

### ***Step 4 – Develop Investment Plan***

Given the needs, projected revenues and investment goals, each district developed investment plans for 2009-2028. The investment plans are divided into three timeframes: 2009- 2012 State Transportation Improvement Program, 2013-2018 HIP (MidRange Highway Improvement Plan), and 2019-2028 LRP (Long-Range Highway Investment Plan). Investments identified for the STIP include projects that have developed scopes and cost estimates. Investments identified for the HIP represent very preliminary cost estimates subject to change as projects are developed. The Long-Range Plan investments in the second 10 years represent general estimated investment levels in various improvement categories.

About \$15 billion is projected to be invested statewide over the next 20 years, from 2009-2028 (Table 7). Costs are expressed in projected year-of-construction dollars. Investments to preserve pavements, bridges and other infrastructure average 77 percent of the total for the 20 years. Roadway enhancements and capacity improvements for safety account for 10 percent of

the total, with seven percent planned to improve mobility and four percent to address regional and community improvement needs.

**Table 7. Proposed Statewide Highway Investment Plan 2009 to 2028  
 (dollars in millions)**

Strategic Investment Priority	Planning Period							
	2009 to 2012		2013 to 2018		2019 to 2028		2009 to 2028	
	STIP (\$)	Percent of STIP	HIP (\$)	Percent of HIP	LRP (\$)	Percent of LRP	TOTAL (\$)	Percent of Total
Traveler Safety	450	12%	390	8%	600	9%	1,440	10%
Roadway Enhancements	280		200		290		780	
Capacity Improvements	170		190		300		660	
Infrastructure Preservation	2,230	61%	3,920	83%	5,430	83%	11,580	77%
Chapter 152 Bridge Program	820		1,600		100		2,520	
Other Bridge	150		630		1,750		2,530	
Pavement	1,130		1,470		3,310		5,910	
Other Infrastructure	130		220		270		620	
Mobility	400	11%	290	6%	310	5%	1,000	7%
Interregional Corridors	80		0		0		80	
Greater MN Trade Centers	20		20		30		70	
Twin Cities Metro Area	300		270		280		850	
Regional and Community Improvement Priorities	230	6%	160	3%	220	3%	610	4%
Right-of-way, Consultants, Supplemental Agreements	370	10%	NA		NA		370	3%

To improve traveler safety, the planned investments in the first 10 years focus on both systemwide safety enhancements, such as median cable barriers and edge treatments, as well as a few safety/capacity improvements. Other investments for mobility and regional/community priorities are summarized in Chapter 8 of the Plan.

***Step 5 – Prioritize Unfunded Needs***

With a total estimated investment need exceeding \$65 billion during the next 20 years, and projected revenues of about \$15 billion, this analysis indicates that almost \$50 billion remains in “unmet needs.” To place this level of funding in perspective, every five cents on the motor vehicle fuel tax in Minnesota provides just under \$100 million per year to the State Road

Construction fund. To generate an additional \$2.5 billion in revenue over 10 years would require the equivalent of a 12.5-cent increase in the State gas tax.

This plan fully acknowledges that future transportation funding will never be increased to meet this degree of “unmet need.” This plan’s policies and strategies, therefore, emphasize a new approach to meeting system improvement needs through stronger partnerships and innovation. This is especially evident in the plan’s vision for mobility in the Twin Cities, calling for more comprehensive and fiscally realistic approach to congestion mitigation.

This plan also stresses the need to set priorities. Toward this end, Mn/DOT has identified five percent of the “unmet needs” as high priority investment options should additional revenue be available during the next 10 years. Additional funding, such as a Federal economic stimulus bill, would likely carry specific-eligibility criteria or investment direction. For this reason, the identified high priority unfunded investments are distributed across all four strategic investment categories (Table 8).

**Table 8. Strategies**

<b>Strategies</b>	<b>Dollars</b>	<b>Percent</b>
Enhance Traveler Safety	\$385 Million	15%
Improve Mobility on IRCs and Twin Cities Freeways	\$1 Billion	40%
Preserve Infrastructure	\$1 Billion	40%
Regional Community Priorities	\$115 Million	5%
Total	\$2,500 Million	100%

These priorities were identified because they would provide the opportunity to enhance traveler safety on rural roads across the State as well as Twin Cities metro freeways; upgrade underperforming Interregional Corridors; fund a low-cost/high-benefit congestion management program as well as some key capacity expansion projects in the Twin Cities, and support partnership projects for local economic development efforts throughout Minnesota.

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### **Tracking Investment Impacts and Integrating Highway Capital Needs into the Legislative Budget Process**

Mn/DOT has institutionalized several steps to ensure that the highway planning and programming process remains consistent with department goals and policies. The most

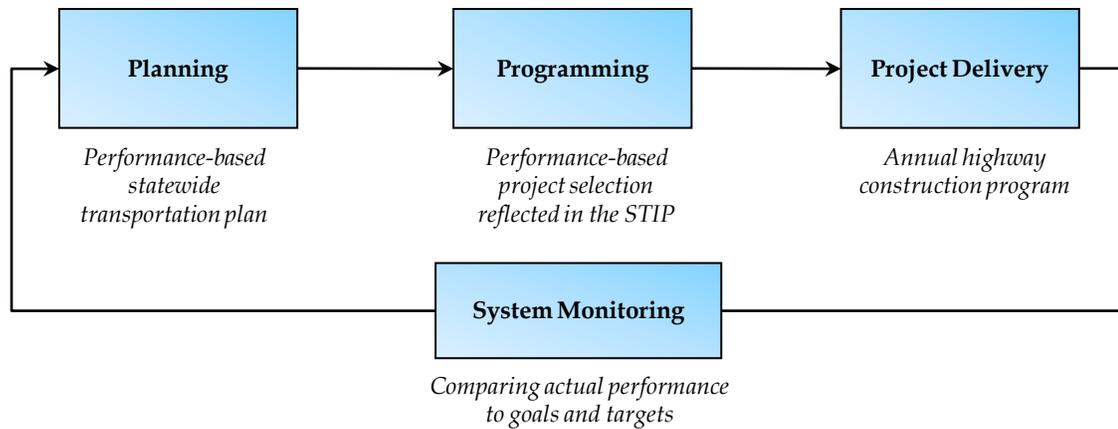
important step includes the periodic assessment of the transportation system's performance with a regular review of the modal measures data by senior staff. This review has resulted in program adjustments in the 10 year capital investment program and in some cases the STIP. For example, in 2005, the senior staff remixed the projects in its highway construction program based upon data which indicated diminishing pavement conditions. Such actions are captured in the department's annual publication of a "Snapshot" comparing actual performance goals to targets. The "Snapshot" for Infrastructure and Investment Planning in Appendix A illustrates the status of Pavement, Bridge, Interregional Corridor Travel (IRC) Speed, Congestion and Fatalities. Though not attached to this document, Mn/DOT also has a "Snapshot" for Construction Project Development and State Roads Operations and Maintenance.

The information in the Mn/DOT "Snapshot" provides the base-level information for developing a biennial budget request for the Minnesota State Legislature. This request is performance-based showing the specific impact of funding requests on transportation system performance measure targets. For example, in its 2005 legislative budget proposal, Mn/DOT requested a shift in funds from highway construction to highway maintenance based on the agency's performance measures data. The legislature, persuaded by the logic of the performance-based approach, agreed that a greater investment in maintenance would yield long-term savings.

While performance data has played a key role in biennial state legislative budget allocations, it has also played an important role in the debate for new transportation funding. With the completion of the 2003 State Transportation Plan, Mn/DOT quantified its highway performance measures and targets and concluded that Minnesota was under investing in its highway program by \$1 billion per year. This performance-based analysis was accepted by the legislature and virtually ended the legislative debate on level of need. The legislative discussion shifted from the question of need to the question of payment. How will the State raise the money to fill the investment shortfall? In 2008, the legislature overrode the Governors' veto of a major transportation funding package providing over six billion dollars in new transportation funds over 10 years. The new law, referred to as Chapter 152, identifies a bridge tier system based largely on specific performance measures and targets, including Average Daily traffic Counts, Sufficiency Rating, and Fracture Critical status.

Once highway funding is approved by the State legislature, Mn/DOT's funds are distributed to the districts on the basis of a performance-based formula. The formula, illustrated in Appendix B, is tied to measurable performance needs on the transportation system that reflect Mn/DOT's goals and policies. The formula aligns with Mn/DOT's priorities: preservation, safety, and mobility. The statewide list of highway construction projects that emerge from this process constitute Mn/DOT's annual highway construction program. As Figure 17 below indicates, the results of the project investments are monitored against performance targets as the process begins anew each year.

**Figure 17. Performance-Based Highway Investment Process**



## Target Setting

Mn/DOT's 2003 Statewide Plan established the framework for a performance-based resource allocation process. The framework allows Mn/DOT to track system performance and to assess the degree to which performance objectives are being achieved. Establishing realistic performance targets is key to this process. Mn/DOT believes that targets should be "realistic." Setting targets too high can lead to over-investment and non-attainment. Setting targets too low can lead to underinvestment and a system that does not meet customer expectations.

As stated in Chapter six of the 2003 Statewide Plan, in setting performance targets, trend-based projections were used to estimate levels of performance, based on an extrapolation of recent trends. Policy-based targets were set to achieve desired performance levels, based on policy or customer expectations. The long-term targets were not constrained by current funding levels, but were expected to be attainable under some reasonable achievable, increased future funding scenario.

In combination, the targets established a vision for the transportation goals that Mn/DOT wanted to achieve over the long-term, based on its understanding of system condition and of customer preferences and expectations. However, it was acknowledged that while redistribution of existing resources could improve performance in some areas, all the targets could not be reached without additional funding levels. Over time, performance was expected to generally decline, at least slightly, even if current funding levels were maintained.

The methodology for setting performance targets in the 2003 Statewide Transportation Plan consisted of the following steps:

- Measures were first classified in one of three categories:

- Mature Measures: These are measures for which baseline data exists and policy targets have been in use previously.
- Emerging Measures: These are measures for which data exists, but targets have not been set previously.
- Developmental Measures: These are measures for which neither data nor targets were previously developed.
- Whenever available, historical data was collected to better understand levels of performance and investment in the recent past. In some cases, a long history of data existed; in others only four to six years of data were available, while in others data did not exist, but collection of the data was initiated.
- If data was available, a best-fitting curve (usually a straight line) was drawn through the baseline data to generate “trend-based projections” to the year 2023.
- Policy-based targets were developed using the trend-based projections as reference. More importantly, targets were set using policy considerations, customer market research, and Mn/DOT’s ability to influence the performance measure. In some cases, targets already existed.
- For policy-based targets for which there were no existing data, no performance target was set as the plan was developed, however it was anticipated that as the plan was implemented targets would be identified to represent reasonable, cost-effective future levels of achievement.

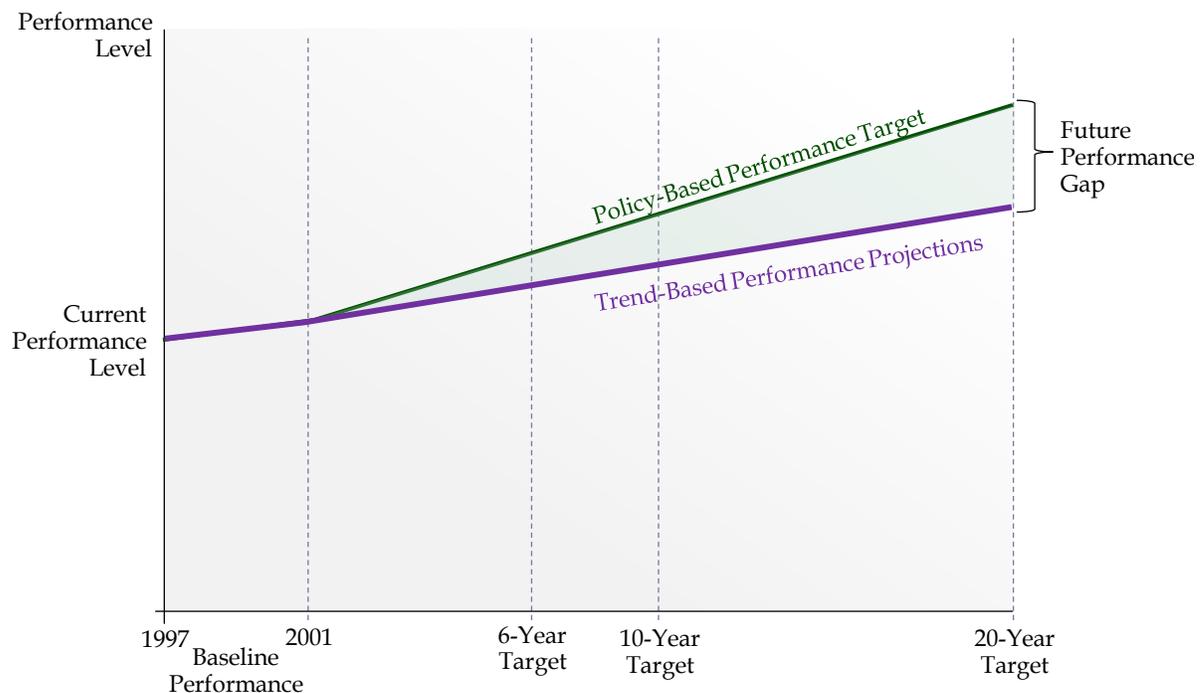
Four important cautions about target-setting methodology were noted in the 2003 State Plan.

- When only a limited number of baseline points are available, trend-based projections were used more as a reference than as a predictive tool. Over time, as more data was collected and as more experience was gained with specific performance measures, better predictive tools were developed for a number of measures.
- When policy-based targets can be adjusted over time, especially for developmental or emerging measures. It will be important to track actual levels of performance in the short- and midterm and to compare them to targets to determine if targets are achievable. This is particularly relevant for measures over which Mn/DOT only has indirect influence.
- The performance targets are 20-year targets that the department would like to achieve based on analysis of system conditions, customer expectations, and Mn/DOT’s policies. In most instances, the targets are not fully achievable under current levels of funding. However, the targets are not set at unrealistic levels. In all cases, every effort is made to develop targets that can be achieved under a reasonable, but nonetheless increased, funding scenario.
- There is a varying degree of control or influence that the department has over individual performance measures. For instance, Mn/DOT has direct control over the quality of pavement, but it can only influence transit service provided in Greater Minnesota through

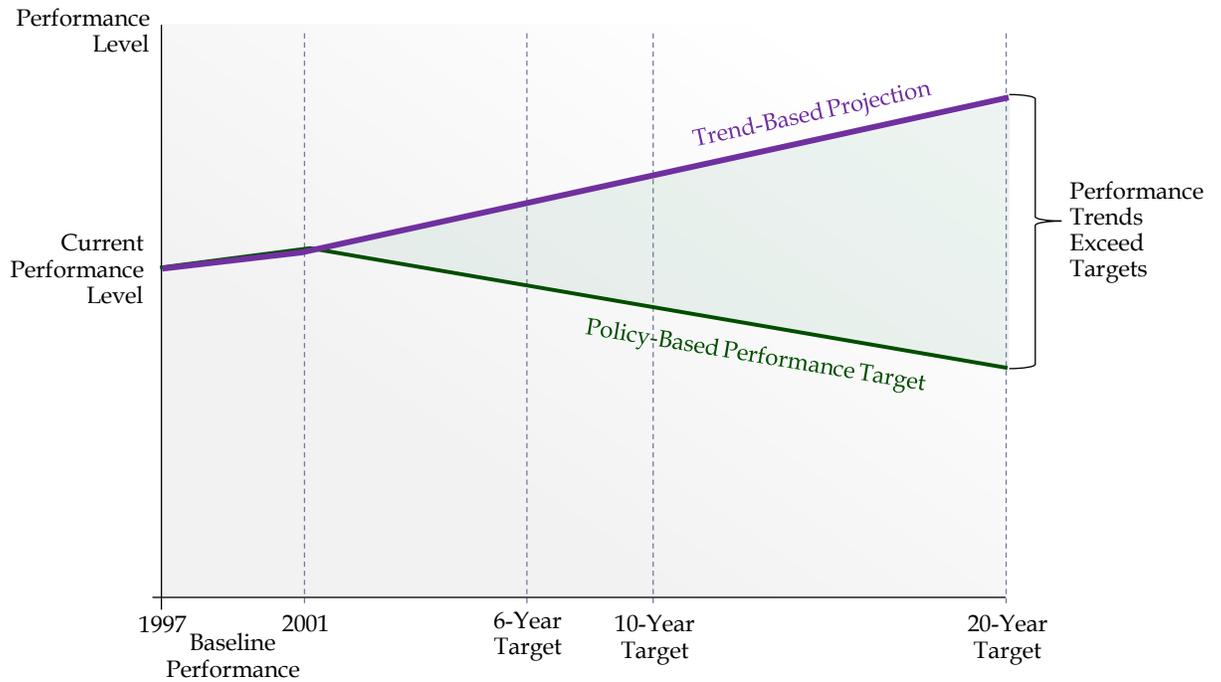
funding. In all instances, the level of influence that the department had over a particular measure affected the target that was eventually set.

Figures 18 through 20, found on pages 145 to 146 of the 2003 Statewide Plan, illustrate three conditions encountered in setting targets. In Case 1, baseline data shows that performance levels have been increasing, but the desired policy-based targets are higher than the trend-based projection levels. Case 2 indicates that the desired performance levels have already been exceeded and, thus, policy-based targets are set at a lower level than current performance. Case 3 shows that performance levels are fast declining and policy-based targets are set so as to reverse or slow this trend.

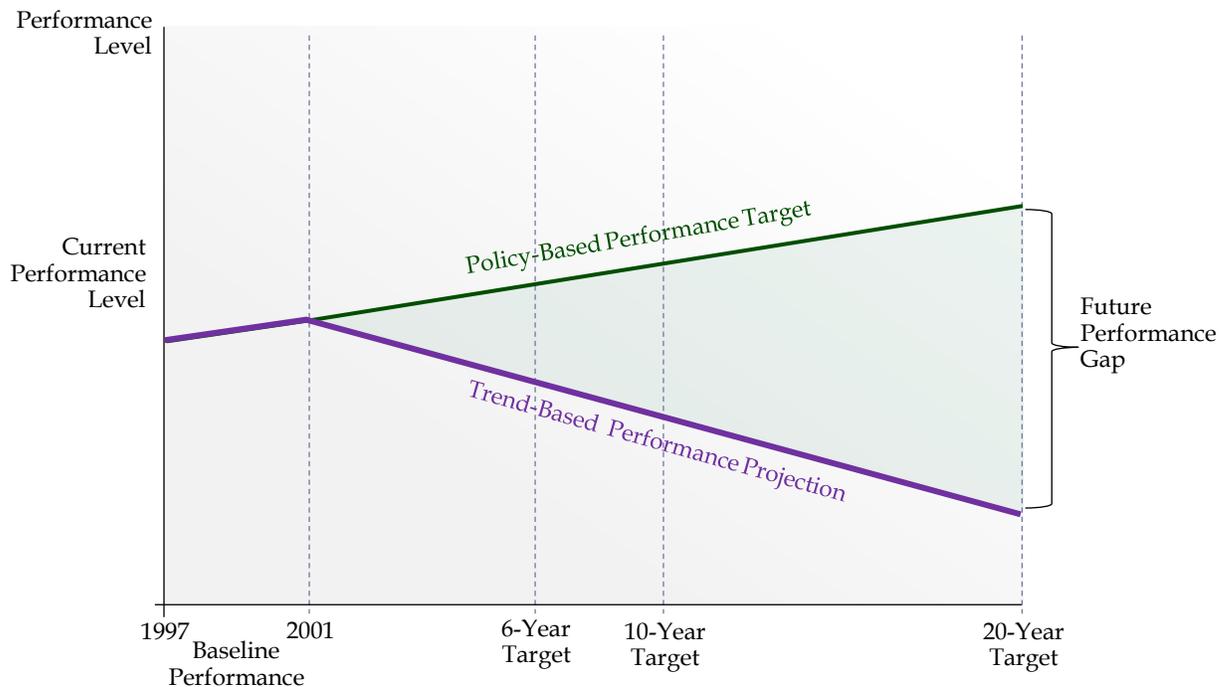
**Figure 18. Case 1 Performance Target Levels**  
*Performance is Improving*



**Figure 19. Case 2 Performance Target Levels**  
*Desired Performance Level Has Been Exceeded*



**Figure 20. Case 3 Performance Target Levels**  
*Performance is Worsening*



Many but far from all targets were reviewed and codified in the 2003 Statewide Transportation Plan, and are being rereviewed in the upcoming 2009 plan. New measures are arising regularly to meet new needs and priorities. There is not a standardized official method for selecting and approving targets, but generally it is done as follows: The Mn/DOT specialty office (Bridge, Maintenance, Aeronautics, Environmental Services, etc.) charged with providing leadership for a given product/service reviews: baseline data, policy goals, resource factors, economic efficiency-lowest life-cycle cost, legal and administrative mandates, customer research and other factors and recommends a target. This may also be done by one of the “functional groups” representing assistant district engineers combined with specialty offices – the Preconstruction Managers Group, Construction Managers Group, Operations Managers Group, or Administrative Managers Group. Depending on their importance and scope of impact, the proposed target is typically reviewed and approved by a higher level management body – District Operations Division, Division Directors, or Commissioner’s Staff. New measures and targets also come forward and are approved as part of an updated plan process – the Statewide Transportation Plan, Highway Systems Operations Plan, State Aviation Systems Plan, Statewide Transit Plan, and so on. In a few cases, such as Fleet Management, measures and targets have been developed by a consultant and then reviewed and approved through the management process outlined above. The Office of Investment Management, including Planning and Performance Management, provides consultation on targets to meet department objectives and maintain quality assurance.

When reviewing and refining performance targets, it is important to keep in mind that setting targets typically involves balancing a number of factors, which may vary in importance among different measures or products/services. The driving factor is not always the same.

**Engineering** – e.g., Bridge Structural Condition.

**Safety** – e.g., Pavement Markings Retroreflectivity.

**Baseline performance** – the level of the department historically delivered and customers are accustomed to. e.g., Snow and ice, Pavement ride quality.

**Customer research** – surveys and simulations to determine acceptable or desired service level. e.g., Snow and ice removal; Pavement ride quality.

**Cost-effectiveness or lowest-life cycle cost** – e.g., Pavement ride quality, bridge preventive maintenance.

**Strategic policy priority** – Leadership may choose to set aggressive “stretch” targets for high priority goals. e.g., Safety.

**Legal or administrative requirements** – e.g., FHWA bridge inspection requirements; GASB commitments for condition of infrastructure.

**National benchmarks or targets** – e.g., U.S. DOT targets for highway fatality rate reduction.

**Resource availability** – targets are not constrained, but should be achievable under some reasonably achievable future funding scenario. Excessively high-target levels for one service should not unreasonably drain resources need for other important services.

As stated previously Mn/DOT’s performance targets are generally policy-based and not constrained by immediate resource availability. The 2003 Minnesota Statewide Transportation Plan stated that, “Policy-based targets are set to achieve desired performance levels, based on policy or customer expectations. These long-term targets are not constrained by current funding levels, but should be attainable under some reasonably achievable, increased future funding scenario.” This basic approach was upheld in the 2009 Statewide Plan.

The effect of this approach is to drive improvement and drive proposals for acquisition of additional or reprioritized resources where they are necessary to meet targets.

## Data Support Systems

### General Relationships

This portion of the Minnesota Case Study examines how Mn/DOT manages existing data systems to support the performance management process within the agency.

The Minnesota Department of Transportation (Mn/DOT) has a long-standing and substantial commitment to performance-based planning and decision-making. Capital and operations programs and investments benefit from performance and data based plans, measures and goals.

Although performance targets and goals exist for most key areas, there continue to be a few challenges that can be categorized into four basic areas: 1) the need for better integration between data systems; 2) the need for more robust predictive forecast models for key performance measures, in more areas; 3) the development of new measures for Mn/DOT services not previously measured, due to smaller budget impact or lower priorities to customers; and 4) lack of performance measures for a few critical areas, such as financial management and cost analysis, which impedes progress in performance-based investment decision-making.

This case study examines how Mn/DOT manages existing data systems to support the performance management process within the agency.

Similar to other state DOTs, Mn/DOT overall, has good data available in many areas for decision-making, but lacks data in emerging areas for performance-based investment decision-making. The areas where there are data gaps include travel time reliability; condition of utility and underground drainage structures (under development), and tracking of other assets such as location of signs and lane markings. The data needs continue to evolve as state and Federal mandates and strategic priorities change from one Administration to another. The availability of more and better quality data would significantly improve performance measures for the various programs.

The source of data, for the various data systems, comes from the specialty offices and districts who are mainly responsible for data collection, and who may also participate in the development of new data systems. The primary responsibility, however, for system development, resides with the Office of Information Technology and Services, which uses a formal “IT Portfolio Management” process to select, manage, and evaluate projects to achieve important business objectives.

Like many state transportation agencies, Mn/DOT operates a number of legacy data systems. As time passes, more and more of these systems are in need of enhancement and/or replacement. To better understand and plan for legacy system needs, the IT Office has initiated a legacy system “Health Assessment” process. IT produces a report documenting the state of the current legacy systems and needs and recommends actions to senior staff. This report will be critical in determining where the most important deficiencies are and in recommending approaches for new system development.

Project development at Mn/DOT is basically a collaborative effort between the divisions and the IT Office. The Division Directors must approve project development and must consider the cost, benefit, and risks associated with developing any new data system or modifying existing systems before giving their approval. Even though the primary concern in developing new systems is to meet business objectives, Mn/DOT acknowledges that some systems are developed as the result of “office-level decisions” or research project needs.

To support the continued improvement of data programs at Mn/DOT, the agency has recently begun the process of developing a Data Business Plan. The Plan will incorporate Mn/DOT's strategic objectives, and performance management measures. The Plan will also identify any gaps in the data, tools, and processes which impacts Mn/DOT's decision-making ability to successfully meet agency needs and will recommend a Data Governance structure to support the overall Data Plan for the agency.

## Organization and Governance

### *Data as an Asset*

In the past, data has not been traditionally managed as an asset at Mn/DOT, however, they are beginning to acknowledge the importance of placing a higher priority on managing data as an asset. The development of a Data Business Plan at Mn/DOT is expected to facilitate the change in perception of the importance of managing the data programs which support the business needs of Mn/DOT.

### *Data Governance Framework*

Mn/DOT does not currently have a Data Governance framework, but, is anticipating implementing Data Governance as part of the Data Business Plan. There is an established Business Information Council (BIC) which will guide the development of the Data Business Plan and the BIC is responsible for providing guidance on data management policies to the Division Directors. As with many DOTs who have implemented a Data Governance framework, experience has shown that this process usually begins with some type of Data Council within the organization.

### *Roles and Responsibilities*

Mn/DOT has defined roles and responsibilities for various groups, traditionally identified as part of a Data Governance framework, and these definitions will likely carry over into the Data Business Plan. The definitions were developed and implemented by the Office of Information Technology and Services and have been in use as part of the current IT management efforts. The definitions primarily pertain to the project development of data systems.

The **Division Directors' Group** has the authority for project approval as well as the responsibility to allocate and manage project funding. In addition they ultimately have authority to cancel project(s) if needed.

The **Executive Sponsor** for a data project should be at an Office Director level or higher within the Organization and is ultimately responsible for the project's success or failure. In addition, the Executive Sponsor must have an understanding of Mn/DOT's strategic direction. There should be only one person assigned to this role. Specific responsibilities include:

- Approve and sign-off on project charter to ensure project is positioned for success;
- Provide overall project vision and guidance;

- Resolve high-level project issues or conflicts;
- Act as the decision-maker for the project as it relates to business decisions;
- Allocate and commit business resources;
- Ensure stakeholders are involved;
- Work with the team to break down barriers as needed;
- Provide approvals/rejections for Change Requests (was sponsor); and
- Should continually assess the project’s viability and alignment with the sponsoring organization’s strategic objectives.

The **Project Manager** is responsible for the day-to-day planning, management, and control of the project. This includes the successful completion of the phase products on time, within budget, and to the specified quality standards. This role leads the project team and reports project progress and issues to the Sponsor and the Stakeholders. Specific responsibilities include:

- Establish and execute project management plans (communication, risk, quality, change, schedule, cost, resource, and procurement);
- Establish project work plan, estimates, and schedule;
- Act as a subject matter expert for the new processes;
- Identify and facilitate project team training;
- Perform project performance reporting and stakeholder communication;
- Take corrective actions when needed;
- Manage and control the project;
- Proactively monitor and manage risks, issues, and changes;
- Facilitate project quality assurance process;
- Responsible for implementation and transition planning;
- Facilitate and document lessons learned; and
- Conduct project closure meeting.

The **Steward/Product Owner** provides a single point of accountability for a Mn/DOT resource or product and ensures the project successfully delivers high quality information resources from the users' perspective.

- Ensure operational support is in place and performance requirements are met (reliability, availability);
- Ensure communication with users and stakeholders;
- Ensure change management process exists and is followed;
- New Development – IT project development;
- Ensure required policies, standards and security measures are followed;
- Manage budget and licensing;
- Promote proper use of the application; and
- Promote user involvement in planning for application changes.

The **Stakeholder Group's** responsibility is to advise the project when critical decisions are required, to ensure that the overall business needs are being satisfied, and to ensure the project's overall success. Specific responsibilities include:

- Validate project touch-points within their area of expertise;
- Advise in project requirements;
- Provide final issue resolution for strategic issues;
- Act as a sounding board for project team decisions in conjunction with the sponsor, if necessary;
- Participate in meetings regarding project status, design, and implementation as needed; and
- Serve as the communication link between the project and their respective departments.

### ***Data Standards***

Some data standards do exist at Mn/DOT, however, much of the data does not have defined standards, resulting in difficulties in integrating data from various systems. Other experiences at many state DOTs have shown that the establishment of data standards not only reduces the cost in collecting and maintaining duplicate data sets, but also facilitates the integration of data from various systems within an Enterprise Data Management system.

### ***Institutional Arrangements/Policies to Support Data Management***

The Business Information Council currently has the primary responsibility for recommending policies and guidelines for Data Management processes at Mn/DOT. The responsibility for ensuring data quality is primarily a function of the specialty offices overseeing the various data programs such as Pavement Management, Pontis®, Construction Management, Freeway Management, etc.

### ***Relationship to Target Setting/Decision-making***

The development of data standards and governance has not been a major factor in target setting or decision-making, prior to now at Mn/DOT. The managers of the various programs have to continue to make decisions on a daily basis, regardless of the quality or availability of data. There is a belief, bolstered externally, that Mn/DOT data quality in key areas such as pavement, safety, freeway operations, incident management, and snow and ice removal – is very good relative to many states. Nevertheless, the implementation of a Data Governance model is expected to help Mn/DOT improve the quality of their data and better manage their data systems.

## **Data Sharing**

### ***Institutional Arrangements/Policies to Support Data Sharing***

Mn/DOT has a mainframe Transportation Information System that integrates several management systems and maintains a common location referencing system. Data extracted from these management systems is relatively easy to share due to this common location information. Data that resides outside the mainframe system may not use this location reference system which can lead to increased difficulties in sharing data. From an institutional perspective, Mn/DOT's Office of Information Technology and Service does provide guidance on the management of data systems regarding standard for hardware, software, and other IT infrastructure, resulting in improved processes for data sharing.

### ***Integration with Outside Data Sources***

Mn/DOT utilizes local agencies as a source of data pertaining to local road network changes and roadway features. The department collects and processes traffic data on county and city streets (except in Minneapolis-St. Paul metro area where data is collected by local agencies). In addition, Mn/DOT has recently begun collecting pavement condition data for county roads eligible for state aid funding. They also use data from other state agencies, such as crash data and environmental data, and are currently experimenting with purchasing data for measuring arterial travel time and speed.

### ***Internal/External Data Access***

The mechanisms for internal access to data through the various data systems is primarily determined by the Office of Information Technology and Services. Some individual offices,

however, do have staff available to develop methods for accessing data, which are used internally to support business operations.

External access to data such as performance measures is provided via the web, where Mn/DOT has posted the top 14 performance measures, with goals and trends analysis, on the State’s Accountability Minnesota web site. Reports pertaining to pavement condition, Metro Congestion and freeway incidents are also reported on the Internet.

## **Documentation and Reporting**

### *Enterprise Data Model*

A database management system was implemented at Mn/DOT for a period of time, but, this system was unable to efficiently process the demands for the data. Mn/DOT now uses ORACLE as its enterprise database environment, with spatial data primarily managed by ESRI’s Spatial Data Engine (SDE) and some use of Oracle Spatial, as well.

### *Data Dictionaries and Metadata*

Mn/DOT indicates that it is critical to continue to share metadata information with the managers and decision-makers. More consideration needs to be given to providing metadata, throughout the department, to ensure the consistent use of data both internally and externally.

### *Change Data Tracking Methods*

Mn/DOT uses the GYRA software system to manage change requests during the development of IT projects. Mn/DOT also has a request management system, MAGIC, to record and track issues or incidents with production systems, however, it is not intended to be used to maintain requests for system changes.

## **Technology**

As noted previously, Mn/DOT uses ORACLE and ESRI for database management at the Enterprise level, while individual offices use Excel spreadsheets and Access databases for management of data at the “office” level. They use both Service-Oriented Architecture (SOA) and Open Database Connectivity (ODBC) in the design of new systems or enhancements to existing systems, in order to support sharing of data.

### *Data Management Systems/Business Intelligence (BI) Tools*

Mn/DOT also uses ArcGIS to facilitate integration of data from disparate systems. They are in the beginning stages of developing a data portal using ESRI and ArcServer to increase data integration methods and are developing a new Linear Referencing System to be used across data systems as a common data “key” between the various databases.

Earlier in the decade, Mn/DOT owned licenses for a commercial business intelligence software. However, attempts to deploy it for large scale snow and ice performance reporting were dropped after chronic limitations in the application were experienced.

### ***Data Systems' Relationship to Target Setting/Resource Allocation***

The data systems have contributed on an individual basis to target setting and resource allocation challenges at Mn/DOT. In particular, the GIS and mapping tools have been instrumental in helping decision-makers visualize alternative measures, targets, and decision scenarios. The use of GIS as a Business Intelligence tool is expected to continue in support of setting performance measures and targets in the future.

### **Success Factors**

Mn/DOT has been successful in monitoring the progress of meeting targets based on performance measures by:

- Conducting regular Annual and Quarterly face-to-face reviews of measures results, which helps managers to better assess the status of individual programs.
- Developing predictive performance scenarios for making tradeoff decisions in STIP investments.
- Creating an “annual” official data set that is used for all data systems, so that consistent information is provided throughout the year.
- There are growing concerns about the “health” and status of many older legacy data systems in the department. At the same time, there are increasing needs for greater integration of existing data systems and increasing demands for non-traditional data to support business processes. Creating the “Health Assessment Report” which pertains to the state of the legacy systems helps decision-makers determine which systems to replace, based on business needs.

### **Other**

The following list summarizes key points from the Mn/DOT Case Study, which are applicable to other state DOTs, for the use of performance measures and targets and establishing Data Governance programs:

- States should start by asking the following questions:
  - What business decisions need to be influenced by data systems?
  - What data is needed to support those business decisions?
  - What methods, processes, and criteria can help us understand data gaps, needs and priorities?

- What resources are needed to address priority data gaps and needs and how do we plan to meet these needs over the long term?
- Identify which targets are linked to which agency goals. Don't use a "one size fits all" approach to setting targets. Link targets to specific business needs. Create performance measures for the "critical need" programs to support performance-based investment decision-making.
- Some measures not currently associated with strategic objectives or budget decisions may not have targets. They are monitored as "indicators" and are not actively managed.
- For budget planning, managers prefer to have policy-based performance targets for all major services, in order to evenly determine where there are funding gaps and to respond to requests from the legislature and stakeholders who want to know funding needs.
- Setting targets and monitoring achievement of targets is a powerful motivator for behavior: "success breeds success."
- Develop a Data Business Plan to link agency strategic objectives with performance measures using Business Intelligence tools. This will help managers to make better decisions based on better quality data, in a timely manner, to meet business needs. Also, strengthen data governance models to foster better data access and integration.
- Use "annual" data sets for reporting purposes to ensure consistent responses to ad-hoc and standard reports used for Federal, state, and local needs and inquiries from the public.
- Share metadata information with managers and policy-makers throughout the organization so that managers and policy-makers have a better understanding of data quality, reliability, and limitations.

# Multinational Conglomerate (MNC)

## Background

Multinational Conglomerate (MNC) operates in many businesses, including Infrastructure, Aviation, Transportation, and Healthcare. MNC generates annual revenue of over \$100 billion and is financially successful: revenues and earnings have grown at 10-15 percent annually for the last five years. Its competitive advantage is its ability to get new products to market ahead of its competitors.

Being a conglomerate, the corporation makes products valued from \$1 (small consumer products) to \$1 million (high-technology equipment) per unit, so each business unit has a unique supply chain. The business unit that was used as the basis for this case study buys raw materials worldwide and ships them to manufacturing sites, which manufactures in a continuous process – once the plant is started, it can't be shut down – and replenishes inventory in a continuous process. The supply chain must be synchronized to assure the uninterrupted flow of raw material and other required resources so as to avoid production interruptions and minimize cost. Therefore, excellence in logistics and transportation are essential. Therefore, it works with carriers that can transport the material inbound and outbound on the optimal mode and at a service level that meet the need at the least possible cost.

The company operates primarily on an outsourced transportation model. With the exception of some plant-level trucks, the company has no corporately owned or operated fleets. While each business may maintain transportation assets, the corporate Shared Services group negotiates air freight, LTL, rail, and ocean transportation contracts. The business units decide which Shared Service contracts it wants to use. Corporate transportation management manages no capital expenditures.

Shared Services sources transportation contracts valued at a small percentage of revenues, but for a company its size this amounts to billions of dollars per year. Its purpose is to leverage transportation volume where two or more units have a common need. It aggregates corporate transportation expenditure and cultivates strong relationships with reliable transportation providers. It seeks out providers that are considered to have high quality and service (providers that deliver consistent, on-time and damage free). The transportation procurement organization, whose scope is global, consists of two leaders, two IT staff, and 12 outsourced employees who manage data and analysis. The team covers all modes, lanes and directions, negotiates rates, receives and pays bills, and manages transportation-related data. The business units execute transportation operations based on the contracts negotiated by the Shared Services group.

## Performance Feedback and Management

For at least the last 10 years, the Shared Services transportation procurement group has had no connection to the measurement process. The business units manage carrier performance, since they are measured on achieving their independent financial and service goals. The corporate transportation manager doesn't keep track of business unit performance for transportation, logistics, warehousing, or production, and does not compare performance across business units. Measurement and performance is considered relevant only at the business unit level.

Employees' annual incentive compensation, which is tied to clear performance objectives, plays a key role in stimulating good results. To avoid short-term cost-based decisions that might create jeopardize long-term performance, bonuses are linked to previous years' performance. The company also distributes equity to emphasize long-term contributions to overall corporate performance. Its compensation committee evaluates a broad range of subjective factors in determining appropriate levels of compensation, including whether they inspire trust and confidence and whether they have track records of acting with integrity and respect.

For corporate and business unit leadership, the company has a strong process for developing talent, performance management and generating long-term value, but this process remains largely at the business unit level and the corporate management to which it is connected.

The company exhibits two of the five elements of performance-based management: goals and targets.

- The goal is “cost take-out.” The focus on cost is unmistakable, but the word “take-out” instead of “reduction” allows the company to succeed at eliminating or avoiding cost even when prices and volumes are rising. “Take-out” references an implicit baseline. This puts the burden on employees to understand and quantify that baseline.
- There are no prescribed or defined metrics by which “cost take-out” is articulated – no specifications, operating definitions, or control charts. The basic metric is direct cost paid to carriers, but there is room for interpretation. The interview explored the boundaries of the goal – for example, whether inventory reduction or reliability improvements would be considered cost reductions. While business units may consider “total cost” savings to meet their criteria, the corporate transportation group is only seeking reductions in the amount it pays to carriers. The metric is not measured in the aggregate because each business' supply chain is so different that a roll-up would be a meaningless comparison (not “apples-to-apples”).
- The target is clear, unilateral, and financially driven. The target comes from senior management. Shared Services has no input into it. Senior Management (above Transportation Procurement) designates the transportation cost take-out goal at a specific percent of current expenditure each year. The figure is financially driven, who does not involve staff in the determination of the figure.
- There is no resource allocation process. The third party and IT resources have evolved over time as the subject matter expertise and demand was needed. Remarkably, there is no

process to verify that the shared service resources (facility, human, IT, etc.) are adequate for the workload, nor is there is a requirement to justify these resources. There is no tie between the achieved costs savings and the number of people allocated to the work. Shared Services is not responsible to corporate. The Lighting business unit has one transportation manager that sets his own priorities and shared services is not involved with the process, except that it knows that the unit's transportation manager works on what is important to him. Of course, senior business unit managers have goals that influence the transportation manager and his choice of priorities. For example, there might be a call to improve in areas such as fill rate, on-time performance, or damage claims.

- There is no monitoring of results at the corporate level. The business units may or may not monitor results, but this is not the concern of the Shared Services transportation procurement department. This group is not aware whether the businesses monitor their transportation performance or not.

The cost reduction goal is given ultimate priority, and there is an intensely strong focus on achieving that goal. Corporate transportation procurement does not take part in policy issues affecting the providers and or the customer, which would seem to be a distraction from achieving the goal. While there is some risk in having an overwhelming focus on cost reduction, the organization has overcome a historical focus on lowest-*price* to its current focus on lowest-*cost*. The company has found that the way to the lowest cost is frequently to deal with higher-priced carriers, since these carriers can offer solutions that reduce the total amount of transportation that it needs to consume.

Any goal at the company must have a target. The company is sensitive to the meaning of its targets, and prefers to have fewer goals, and hence fewer targets, rather than having multiple goals and a lack of, or misaligned, targets. In a similarly simplistic manner, the target is set on an annual basis and has no time-phasing. There is no visibility to long-term targets or stretch targets. There are no scenarios, caveats, or other “what-ifs” that could cloud the meaning and importance of the supreme goal. There are no public policy considerations that could change the goal or the target – the goal is above any and all internal and exogenous circumstances that might make it easier or harder to attain. While many might consider this inadequate, the company considers this simplicity to be a critical enabler of its record of high-performance.

Failure to achieve a target begins with a meeting between the employee and their boss. It will be determined if it is the employees fault or if there were some extenuating circumstances. In the past 10 years, the corporate transportation Shared Services team hasn't missed the annual target in any year. If it did, the business manager would need to justify to corporate policy-makers why it missed the target. There is, however, no demonstrated ramification to the corporate shared service group of missing the target. Conversely, if those targets are consistently met with ease or are exceeded, the team would not receive any rewards, recognition, or resources because of its high-performance.

Simplicity has worked well for this company, as demonstrated by its extraordinary and consistent firm's financial results.

## Data Support Systems

### Linkage between Data Systems and Business Goals

Transportation shipment and expenditure data is critical to supporting carrier negotiations. In addition, carrier negotiations are essential to the corporation's cost savings goals as well as its ability to realize cost savings goals connected with the numerous acquisitions it makes. Many of the companies it acquires are still processing freight through their Accounts Payable departments and therefore not capturing enough data to negotiate freight transport effectively.

In order to negotiate properly, the company needs clean and accurate consolidated data by mode, lane, and carrier. When carriers come to negotiate, representatives from each business come to the negotiations and they sit at a U-shaped table with the carriers sitting at the front of the room. The MNC staff has access to all the carrier's spend data on its computers, which puts it in a strong negotiating position. Their computer screens show MNC's volumes and expenditure, as well as bid results from the carrier's competitors in recent requests for quotation.

MNC's Accounts Payable operations do not capture enough data to support the negotiations described above, so MNC employs two freight payment auditing firms. In addition to using their rating engines to preaudit the freight bills, they capture other data that MNC finds useful in negotiating with its carriers. For example, the data gathering and analysis process involves monitoring leakage – off-contract purchases of transportation services – to ensure that the rates it negotiates with carriers at the corporate level actually save the business units money. The data management group, with the help of the services of the freight auditors, prepares a leakage report based on the freight payment process. The overall process helps MNC obtain accurate and detailed shipment-level data on over 90 percent of the transportation that it purchases.

When the company decides how many resources to devote to data management, it does so using a zero-based budget. Any increases from the current level need to be justified on a case-by-case basis. In addition, the company has arrived at its current configuration by making numerous make-versus-buy decisions regarding various activities related to freight data reporting and analysis. Its decision to outsource the freight auditing, but in-source the management of the process is an example of such a make-buy decision. At another level, its decision to gather data centrally and distribute it to the business units also affects the resources needed in the central freight data management organization.

### Data Governance

The central data management group “owns” the data and the process, and serves as data governor. Over 100 logistics and financial analysts in the business units have access to the data generated by the data management process since each of the company's business units has access to the freight data generated by the central freight management group.

There are numerous error-proofing mechanisms and checks and balances to ensure data quality.

Even before the data enters MNC, the freight payment companies employ their own data auditing processes. For example, certain data has to be manually entered twice at the freight payment companies, and if the fields don't match after the first two data fields are entered, they determine the source of any error or mismatch.

When the data is being analyzed at MNC's corporate transportation group, each data field has certain number of alpha or numeric or alphanumeric data, and the content that is uploaded has to fit those parameters or the system rejects it. Key fields have to be populated with data or the whole data feed fails.

After the data is distributed to the business units, the sheer number of people who use the data is a safeguard since major errors tend to be discovered quickly. People submit trouble tickets to the On-line Help Desk, and the trail of trouble tickets brings problems to light.

## **Data Sharing and Technology**

Carriers send standard EDI 210 transaction invoice records to the freight payment auditors. The auditors transform their data into MNC's predefined standard data record, which is similar to the EDI 210 format. The payment companies submit the record in the proprietary format to MNC's Oracle data warehouse.

Users can view standard reports through Oracle Business objects user interface. They can also customize their own views and drill down into data sets at will. For example, a Logistics analyst might want to construct a mode-specific leakage report showing payments to carriers for which MNC does not have negotiated agreements.

To get the greatest benefit for the least cost, MNC evaluates e-bidding solutions, auction software, and similar software-as-a-service procurement applications. Their decisions have varied depending on the mode and the need. For example, in truckload transportation, MNC formed an agreement with an outsourced contract provider since some solution providers offered impressive products and demonstrated track records. In contrast, for ocean transport it could find no readily-available solution that fit its requirements, so its team developed its own e-bidding system in-house.

## **Strengths and Weaknesses of the Current Data Management Approach**

MNC's central transportation management team's process and systems do not involve non-cost metrics such as on-time delivery rates or damage claims. This is by design, it says, since the businesses units interact most closely with the carriers and are in the best position to track that data, and also given the recent consolidation among carriers, most of the large integrated carriers have unassailable on-time records. Instead of negotiating a service level, the central group establishes a multitiered pricing structure that stipulates one-day, two-day, and three-

day prices. This mechanism automatically ensures that the carrier is penalized for late delivery by the lower rate that would apply to late deliveries.

Ideally, MNC would like to improve two aspects of its process. Primarily, it would like to increase the percent of transportation expenditure that flow through the freight payment companies. In North America, 90-95 percent of transactions are processed through them, but that figure is much lower outside the U.S. Secondly, it would like to accelerate the time that it takes to bring new shipment flows into its data management process so it can more rapidly achieve savings from newly acquired businesses.

# Ohio Department of Transportation

## Background

The Ohio Department of Transportation (ODOT) manages approximately 19,000 centerline miles of Interstate and State Highway System roads; they do not handle any local or county roads. Ohio is a home-rule state, but recently state agencies have been taking on a greater amount of responsibility. ODOT also is responsible for designing projects, although outside contractors are hired to do most construction and maintenance. ODOT's core workforce conducts snow and ice removal.

ODOT's annual budget includes \$1.8 billion for capital funds and \$750 million for maintenance. Spending on capacity expansion projects averages \$500 million per year over 10 years (not adjusted for inflation), with more spent over the first years. Preservation spending is about \$800 to \$850 million annually (adjusted). ODOT has a "preserve first" policy. Unlike other DOTs, ODOT has taken into consideration the impact of inflation in funding needs projections; ODOT has identified a time when there will be no available funds for capital projects. Just as in many states, Ohio's preservation needs are taking up an increasing share of its overall budget.

## Resource Allocation

### Resource Allocation Framework

Performance-based management evolved as an outgrowth of ODOT's involvement in the Total Quality Management (TQM) process, which initially started in the mid-1990s. Using the Xerox model as their basis, all ODOT employees were trained in the TQM process to identify ODOT customers, their needs and requirements, and problem solving processes. An outgrowth of TQM was to identify performance metrics that ODOT could manage their internal processes by. This process occurred at the same time as an agency-wide reorganization, and so comprehensive performance measures were identified for the newly created Construction, Planning, Production, and Business Administration divisions. From the comprehensive list, ODOT identified 65 key performance measures that were elevated to define the organization's overall objectives. They also identified measures based on Malcolm Baldrige criteria, using their own state model of Baldrige. In fact, ODOT was instrumental in drafting the public sector version for Baldrige criteria, and several ODOT districts have been recognized as top tier state Baldrige award recipients.

ODOT's process for performance-based resource allocation is based on a Funds Management Process, in which major program areas identify measures that define acceptable performance (e.g., inventory size, condition of inventory, how much funding is necessary to sustain inventory). There are many individual performance measures within major program areas, but ODOT tends to boil them down to specific key measures. For example, the pavement

maintenance program includes multiple pavement condition measures such as pavement inspection, international roughness index, etc., but resources are allocated according to an overall pavement condition composite index. There is common language that defines both performance measures and targets with each program area.

The process is used in day-to-day programming of projects and evaluating how a project will impact overall performance. ODOT's goal is to sustain a certain level of performance over a period of time, and to implement necessary projects and funding to sustain that level. ODOT currently has the ability to forecast project benefits and impact on performance out for a 10-year period.

ODOT does not conduct any tradeoff analysis between capital versus operational improvements; rather, the analyses are done more independently. Allocation of funding is tied to the inspection process, and on the costs required to sustain individual district performance over time. A similar process is done for lands and buildings.

The resource allocation process for major statewide and regional transportation investments is guided by an appointed body called the Transportation Review Advisory Council (TRAC), which was established in 1998 to bring a more objective, rational approach to prioritizing transportation investments. ODOT relies on TRAC for all projects that cost more than \$5 million and which do one or more of the following: increase mobility, provide connectivity, increase the accessibility of a region for economic development, increase the capacity of a transportation facility, or reduce congestion. The TRAC is a permanent body of predominantly non-ODOT personnel which develops and modifies a project selection process and which approves major new projects for funding. The TRAC has nine members and is chaired by the Director of ODOT. Additional details are available at <http://www.dot.state.oh.us/trac/>.

ODOT's concept of performance-based management has evolved significantly over time. Today, the core principles of ODOT's performance-based management model are still intact, although there is not as much support for TQM by upper management. Performance-based management was more a focus of the previous administration, and there has been backlash with the new administration in that managers no longer want to be measured like before. However, because the process has been institutionalized, performance-based management is still used as a key indicator of day-to-day operations within the agency.

## **Priority Setting/Tradeoffs**

“Preserve first,” is a guiding principle that is written into TRAC's charter. Preservation and management of the existing system is accomplished by funding system preservation needs first and providing funds for new construction only after the Director and Governor are assured that basic maintenance needs of the existing transportation system are being met.

ODOT's mission, goals and priorities are written into the ODOT Business Plan, which is submitted every biennium to the Ohio Legislature. As required by law, the plan also includes organizational performance indices and financial plan. The primary focus is on bridges and pavement, but it also includes a discussion on safety. The Business Plan is accessible to the

public, so that they can see key performance measures and the rationale for why specific projects were selected.

## Target Setting

Performance targets are reviewed every biennium as part of the budgeting process. Targets are tied to funding availability and need for improvement in a certain area. For the most part, however, targets are static. After managing the process for awhile, ODOT has raised and lowered some targets over time.

ODOT recently reviewed their organizational performance indicators with the goal of ensuring each division has measures to report. The new administration is more interested in conducting quality assurance reviews at the office level rather than the individual level. For example, rather than measuring the percent of individual reviews conducted on-time, ODOT is more concerned with the quality assurance review process at the office level.

## Improving the Process

ODOT's biggest improvement has been in measuring performance at the operations level. Previously, they measured deficiencies on roadways by district, but there was no way to correlate the data to the total number of miles managed by that district. For example, they measured guardrail deficiencies, but had no idea of the total miles of guardrail in the district. District allocated funding was based on historical spending in a particular area. Now, ODOT is able to tie funding to district needs, and they have a way to measure the efficiency of individual districts in applying the funds allocated to them.

## Data Support Systems

### General Relationships

ODOT uses an information management system called Ellis to manage its project development and decision-making process for funding bridge, highway and transit projects. The Web-based system, named after Ellis Island, once the immigrant entry point to America, allows ODOT project managers to control the timing of money, staff and project advancement so ODOT can select good projects, then move them through the project development process predictably and efficiently. The Ellis System contains data on a project's location, characteristics, funding information and milestone dates. In terms of data availability, a key success factor was making Ellis an open data model that every employee has access to.

ODOT uses a key identifier called a Network Linear Feature Identifier (NLFID) for linear data referencing. The NLFID provides a linear reference for all data collected on a roadway and helps facilitate the ability to tie all the data together. The Ellis System was developed on top of the NLFID. They have also undertaken a large effort to introduce temporal stability into their

roadway identification scheme. The impacts of roadway improvements over time changes their analysis results considerably.

The impetus for development of the NLFID concept came out of the GIS Department. While mapping out crash locations, the group had a difficult time incorporating project data on top of crash data. It was a very manual, labor intensive process. The NLFID has provided a common linear reference for all data collection and roadway improvement projects.

## **Organization and Governance**

### ***Data Governance Framework***

ODOT has a data governance model that defines the data to be collected as part of the data collection process and standards that define consistent results when inspecting items. ODOT has identified which groups/offices own certain data models, and they have established a quality assurance review process to establish policies and procedures for data collection. For example, the Safety Office is the primary owner of operations-related performance measures such as reliability and congestion because their measures are coupled with TRAC and feed the selection criteria for funding improvements. The owners of the data collection process contribute significantly to the process.

### ***Institutional Arrangements/Policies to Support Data Management***

Having a TQM culture was a great facilitator to obtaining buy-in for the Ellis System across the department. By going through the initial quality process, ODOT was able to put together cross-functional teams of surveyors, IT people, etc., to discuss their needs. In many cases, it was the first time such diverse groups talked to each other.

## **Data Sharing**

### ***Institutional Arrangements/Policies to Support Data Sharing***

Local jurisdictions are now developing their own base maps with ODOT standards built into them, using the NLFID as a key component. For example, crash data is now integrated into ODOT's system by coding crash locations with the NLFID. Implementation at the local level was based on requirements for 911 dispatch through the Location Based Response System (LBRS) project. The LBRS establishes partnerships between state and county government to support the creation of spatially accurate street centerlines with address ranges and field verified site-specific address locations. The next step will be to extend the ODOT process to the local level by educating the local communities on how to manage their assets.

ODOT's Business Plan is the highest level of data sharing throughout the department. There is also a web-enabled database they report on monthly, and a Quality Assessment Review (QAR) is conducted on the data contained there.

## ***Integration with Outside Data Sources***

It is a management decision to determine whether certain outside data supports ODOT needs, and the extent to which to integrate these data sources. An example was incorporating PONTIS into their system, which was a very data intensive process. In terms of safety, ODOT is now spending money on Location Based Response System (LBRS) projects. These examples evolved from gaps identified by management, as well as an assessment of data needed to support systems. ODOT has struggled for decades to implement a pavement management system within the department. However, they do a very good job at extracting pavement condition data from their existing databases.

## **Documentation and Reporting**

When ODOT first started its performance measurement program, they instituted an Office of Quality to oversee development of the performance reports, with a long-range objective of individual divisions eventually taking ownership of their own measures. Once this was achieved, the Office of Quality was phased out.

Each division produces custom performance reports using General Query Language (GQL) analysis queries. These queries are used as a tool to produce performance metrics and other time series of information. Reports are tied into inventory size and level of investment.

## **Technology**

### ***Data Management Systems/Business Intelligence (BI) Tools***

ODOT's information management system, Ellis, is used to manage all projects that go through the NEPA process, and project information is coupled with pavement condition forecast and bridge deficiency information. ODOT is used primarily for capital improvement and ITS projects. The operations group uses a different process, so their projects are not managed using Ellis.

ODOT continuously reviews degradation rates of pavement and bridges and examine the cost to sustain these assets over time. All of the projections are adjusted when there are any changes to project cost, scope, etc. Ellis is used to examine the impacts of such changes on their projections, and it can also provide a basis for performing "what if" analyses, although it is more common for ODOT to use spreadsheets for these types of analyses.

ODOT also has a data warehouse, and they use a Spatial Query Server (SQS) to efficiently integrate geospatial information into the data warehouse. The data warehouse has been a great asset for them. They still have their old mainframe system, but they are doing a data dump into the data warehouse. ODOT has plans to eventually migrate to Oracle, but it will remain an open system that can be leveraged across the organization. ODOT does not want to be tied to a single vendor, so all new applications are built in an open environment.

## Success Factors

ODOT identified the following success factors to implementing their performance-based resource allocation process:

- ODOT attributes their success to the iterative process used to develop and refine their performance-based resource allocation process. The Total Quality Management Process that initiated the program was beneficial in terms of identifying ODOT customers and their needs. The TQM model defined their core processes and identified meaningful output measures that ODOT could manage from.
- Institutionalizing the performance management and TQM process was key to the continued success of the program. They trained all of their employees on performance measure definitions (e.g., pavement measures, bridge measures, etc.), and explained how the measures were tied to ODOT's strategic objectives and employees' day-to-day activities. ODOT relied heavily on training materials to accomplish the institutionalization of the process, and they also tied it to individual performance.
- The ability to effect change is another major success factor. When they first looked at bridge and pavement conditions across the State, conditions varied widely from district to district, and money was generally allocated based on historical funding. Once they were able to tie bridge and pavement deficiencies to the total number of miles managed by that district, they were able to measure the efficiency of individual districts in applying the funds allocated to them. Districts are now evaluated on their ability to manage the process and achieve results over time. If a district is not performing, the managers are taken off the team or reassigned.
- The Ellis System has supported future decision-making at ODOT. It has given them confidence that their investment levels are at the right level in particular areas and they are making good decisions.

# Orlando/Orange County Expressway Authority

## Agency Background

The Orlando/Orange County Expressway Authority’s (OOCEA) primary function is the operation of a system of toll roads in the central Florida area, basically within the Orange County and Orlando area. OOCEA operates more like a business than a Department of Transportation (DOT), and as such, their “business” is to sell “safe travel time” to the general public.

## Resource Allocation and Target Setting

The OOCEA publishes a monthly report entitled “Expressway Travel Time Performance” which documents the morning and evening peak travel times per lane on the designated roads which are under the operation of OOCEA. This report is critical to the OOCEA as a “performance management” tool to assess the effectiveness of managing the travel time for the public on the toll system. The report, as well as weekly data for each plaza, can be used to determine when and where to add staff at toll stations in order to keep traffic moving safely through the expressway system. Other resource allocation decisions resulting from these data include budget adjustments and capital project prioritization and scheduling. Another important use of this report is to monitor performance of travel time on roads, before and after road improvements are completed. The information from the Expressway Travel Time Performance report is used by many people in the organization from the technical staff to the managers and Board of Directors to consistently monitor the progress in congestion management for the toll system. Pavement conditions, congestion, travel time, safety, and cost/capacity are all used in prioritizing projects.

However, these performance measures, as well as high-level performance measures defined by the Florida Transportation Commission, do not drive the OOCEA’s business. Business processes internally to the OOCEA are driven largely by revenues and costs, which are tracked relative to bond covenants. The bond covenants define the primary targets for the OOCEA, which are all financial in nature. If the targets and minimum thresholds are not met, then the agency can be taken over.

## **Data Support Systems**

### **Organization and Governance**

#### *Data as an Asset*

Data is not particularly viewed as a “corporate” asset by OOCEA, but, it is critical to successfully managing the operation of the toll system in central Florida. The type of data collected is not meant to be an “incident” detection system either, however, they are able to link the travel time patterns with the reports of incidents on the system, by reviewing the average a.m. and p.m. peak travel times on a monthly basis.

#### *Data Governance Framework*

Due to the small number of staff involved in the collection, review and reporting of the travel data on the toll system, there is not really a need to have a Data Governance framework at OOCEA. The maintenance of the data systems is outsourced, with the most significant work done in managing the archive data system. There is an elaborate data management process in place, however, for the archive data.

#### *Roles and Responsibilities*

There also is no need to have the traditional “data steward, data owner, data custodian” type roles for the operation of the OOCEA data systems, again, due to the small number of people involved. The only area where strict standards and policies are in place regarding data, is in the financial operations of the OOCEA, since it is run like a business and does have a “bottom line” to consider.

#### *Data Standards*

The data standards in use at OOCEA are primarily associated with the Credit Card companies’ rules and regulations. All of the financial reporting requirements are very rigid and structured, and data standards used at OOCEA would pertain more to the financial data system.

#### *Institutional Arrangements/Policies to Support Data Management*

The primary Data Management challenge for OOCEA is managing the archive data system and as stated previously, this process is outsourced.

#### *Relationship to Target Setting/Decision-making*

The type of travel time data collected by OOCEA has a direct correlation to the decision-making process used by the managers. As noted earlier, the current data as well as the historical trends in the “travel time” performance data helps the managers determine when to allocate additional staff resources to operate toll plaza stations, in order to keep the traffic moving safely throughout the toll system.

Since OOCEA is run like a business, most of their focus is running the operation as “lean” as possible. This allows them to maximize their capacity to build more transportation infrastructure, therefore, the decision-making process always involves consideration of the “bottom line.” Target setting includes such targets as estimating the percentage of “on-time” arrivals that passengers can expect to achieve based on the analysis of “free flow” travel times versus travel times during peak periods. During October 2008, the on-time arrivals was estimated at 95 percent on specific links of the expressway system. (source: Expressway Travel Time Performance Report, October, 2008.)

## **Data Sharing**

### *Institutional Arrangements/Policies to Support Data Sharing*

OOCEA shares all of their travel time data with the public. The policies in place require the public to submit a request and then the data is provided to them. The Florida Department of Transportation (FDOT) also looks at the data and the traffic monitoring sites used by the OOCEA as part of their routine oversight of the State road system in Florida. FDOT and OOCEA are able to identify crashes or incidents on the roadways by reviewing the travel time data provided by OOCEA.

### *Integration with Outside Data Sources*

OOCEA does not integrate data from outside sources, per se, but they do have a data system that was obtained from the Texas Department of Transportation. This system was built on a SYBASE database and runs on SUN servers. OOCEA reports that this system works well for their needs.

### *Internal/External Data Access*

The staff at OOCEA and the public have access to the many statistical reports related to travel time data through the following web address: <http://www.ooce.com/Corporate/administration/Finances/StatisticalReports.aspx>

## **Documentation and Reporting**

### *Enterprise Data Model*

OOCEA did not address the use of an Enterprise Data Model as part of their operations.

### *Data Dictionaries and Metadata*

N/A

### *Change Data Tracking Methods*

The archive data system which is managed through outsourcing is presumed to have a change data tracking method, as old data is archived and continuously replaced with newer “archive”

data. There was not any specific mention of any other standard “change data tracking methods” used at OOCEA.

## **Technology**

### ***Data Management Systems / Business Intelligence (BI) Tools***

OOCEA did not address the use of Business Intelligence tools as part of their operations. In lieu of a Geographic Information System (GIS), for instance, they use ADOBE scalable vector graphics as their mapping technology tool. They are considering replacing this system, however, in the future. The most robust Data Management system would be associated with the management of the archive data. Since this process is outsourced, OOCEA did not elaborate on the technology used.

### **Data Systems’ Relationship to Target Setting/Resource Allocation**

The data systems in place at OOCEA, for monitoring travel times, has a direct relationship as noted earlier to resource allocation. This is particularly applicable for operating the toll plazas throughout the system.

Target setting for “on-time arrival” also is done utilizing the data from the “Expressway Travel Time Performance” report. As noted previously, travel times can be reviewed to determine the comparison of the “free flow” travel times at the posted speed limit, versus the “average” travel time during peak periods, over the weekdays for a given month. By comparing these travel times, OOCEA is able to project a target for vehicles to achieve on-time arrival, for example, 95 percent of the time when traveling during the peak period on a specific link of the expressway system. In the event that the 95 percent on-time arrival is not achieved, the data collected is so precise that they are able to determine when and where an incident occurred which disrupted travel times. Having this level of data detail has been very helpful in explaining these type of situations to the general public, which holds OOCEA accountable for running a smooth operation on behalf of the traveling public.

## **Success Factors**

OOCEA notes that it is important to use indices when comparing data side-by-side, especially for travel time data. Others in the industry may have different definitions of “travel time reliability,” i.e., 95 percent travel time, and it limits the confusion to refer to this type of information as “planning time” instead of “95<sup>th</sup> percentile reliable travel time.” In the above example then, the motorist can “plan” to arrive on-time 95 percent of the time when traveling during peak periods, based on the data collected by OOCEA.<sup>11</sup>

Other success factors include:

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<sup>11</sup> “Expressway Travel Time Performance”, October 2008.

- The simplicity of targets set by Bond Covenants makes prioritization relatively straight forward.
- The Data systems used at OOCEA are kept “lean” in order to utilize their revenue for building more transportation.
- Coordination with other agencies is key to successfully operating the Toll Expressway Authority for Central Florida.

## **Other**

The following list summarizes key points from the OOCEA Case Study, which are applicable to other state DOTs considering how best to implement data systems to support key performance measures:

- Collect the right data to support performance measures.
- Partner with other agencies, where feasible, to minimize the cost of data collection.
- Keep the agency targets simple, so that performance measures and data to support those measures are sustainable over time.
- Performance measures and targets are useful for determining staffing resource allocation within an agency, especially, for DOT offices involved in sales to the public for such items as license plates, or oversize/overweight permits.



# Port Authority of New York and New Jersey

## Background

The Port Authority of New York and New Jersey (PANYNJ) was established in 1921 to administer the common harbor interests of New York and New Jersey. The Mission of PANYNJ states in part that they are responsible for “providing the highest quality, most efficient transportation and port commerce facilities and services that move people and goods within the region, providing access to the rest of the nation and to the world, and strengthening the economic competitiveness of the New York-New Jersey metropolitan region.” The Port Authority serves an area of about 1,500 square miles in both New York and New Jersey, centering about New York Harbor. The mandate of the agency is to promote and protect the commerce of the bistate port and to undertake port and regional improvements that are not likely to be paid for by either state alone (e.g., wharfage for the harbor, tunnel and bridge connections between the states, terminal and transportation facilities to promote the region’s economic activity). PANYNJ manages and maintains a diverse multimodal transportation system, which includes bridges, tunnels, bus terminals, airports, Port Authority Trans-Hudson (PATH) Rail Transit system and seaport that are critical to the bistate region’s trade and transportation capabilities<sup>12</sup>.

The Port Authority is a financially self-supporting public agency that receives no tax revenues from any state or local jurisdiction and has no power to tax. It relies almost entirely on revenues generated by facility users, tolls, fees, and rents. The Governor of each state appoints six members to the Board of Commissioners, subject to state senate approval. Board Members serve as public officials without pay for overlapping six-year terms. The Governors retain the right to veto the actions of Commissioners from his or her own state. Board meetings are public. The agency has an Executive Director, similar to a state DOT that is responsible for carrying out the agency’s policies and managing the day-to-day operations<sup>13</sup>.

The Port Authority’s current \$6.7 billion dollar investment program (FY 2009) is used for maintenance, capital investment, and operations for a number of multimodal infrastructure and improvement projects. This includes the PATH Rail Transit System station at the World Trade Center (WTC) site; AirTrain JFK; making improvements at LaGuardia, Kennedy International and Newark Liberty International airports; expanding ferry service; deepening the port’s shipping channels to accommodate the next generation of deep-draft containerships; and

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<sup>12</sup> [www.panynj.gov/AboutthePortAuthority/HistoryofthePortAuthority](http://www.panynj.gov/AboutthePortAuthority/HistoryofthePortAuthority).

<sup>13</sup> [www.panynj.gov/AboutthePortAuthority/Governance](http://www.panynj.gov/AboutthePortAuthority/Governance).

furthering security projects at many of the facilities. More specific budget expenditures for FY 2009 are as follows<sup>14</sup>:

- By activity – \$2.5 billion for operations, \$3.3 billion in gross capital expenditures, \$825 million for debt service, and \$87 million for other.
- By Mode – Aviation (operations \$1.3 billion, capital \$594 million), PATH rail transit (operations \$295 million, capital \$370 million), Port (operations \$136 million, capital \$246 million), Tunnels Bridges and Terminals (TB&T) (operations \$440 million, capital \$209 million), Development (operations \$86 million, capital \$30 million), World Trade Center (operations \$162 million, capital \$1.42 billion).

## Resource Allocation

As documented in the FY 2009 Budget, the Port Authority, in conjunction with the development of its annual budget, carries out a planning process designed to ensure that the agency is consistently moving towards achieving its long-term, strategic goals. These goals are provided for in the agency’s Strategic Plan, most recently adopted in 2005. Over the past two years, the Port Authority has worked to unify and strengthen this planning process by coordinating the development of its long-term Strategic Plan, the shorter-term 10-year Capital Plan, and the annual budget; with the Capital Plan and annual budgets “nesting within” the longer term strategy of the agency. This unified planning model, developed by the Port’s planning group, is intended to allow the agency’s Strategic Plan to have a greater impact on each aspect of agency operations (i.e., across modes and agency departments and functions). The goals identified in the Strategic Plan are incorporated into departmental business plans and the agency’s capital program. In turn, business and capital plans drive resource allocation decisions provided for in the yearly budgets.

The budget process begins with a scanning process in which the Executive Director and senior staff review agency performance over the past year and the environment in which the agency will be operating in the coming years. This information is then used to reassess agency priorities and develop short-term strategies in line with agency-wide goals identified in the Strategic Plan. The Executive Director’s office then issues planning and budget guidance that includes agency wide priorities, the regional planning context, and budget targets for each department. This guidance informs the development of department business and work plans, the capital program, and the budget for the coming year. Line Departments, the five departments that reflect the Port Authority’s major lines of business (Port Commerce, Aviation, PATH, TB&T, and Development), are asked to submit business plans that identify department wide strategies and initiatives, both operating and capital, that reflect over-arching agency goals and take into account the planning context and priorities identified in the Executive

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<sup>14</sup> [http://www.panynj.gov/AboutthePortAuthority/InvestorRelations/pdf/MasterBudget\\_2009.pdf](http://www.panynj.gov/AboutthePortAuthority/InvestorRelations/pdf/MasterBudget_2009.pdf).

Director's planning guidance. Similarly, staff departments, which support the agency's major lines of business, submit work plans that identify the ways in which these departments will help line businesses achieve agency-wide goals given the preestablished regional planning context. The Executive Director, in conjunction with the Planning Department and the Management and Budget Department, provides feedback on departmental business/work plans as they are developed. In conjunction with incorporating agency feedback into finalized business/work plans, departments develop updated capital project lists and budget proposals. Once these have been submitted, the Management and Budget Department assesses the financial impact of the submissions and works with departments to finalize a budget and capital plan that meets agency and department goals within the financial constraints of the agency. Following repeated review and analysis throughout the department, a final budget proposal is presented to the Board of Commissioners for approval. Once approved, the budget is presented to the public<sup>15</sup>.

The last two executive directors of the Port Authority have been very focused on implementing a more formal performance-based resource allocation framework as part of the planning process defined above, and have established strong leadership in this area. The performance-based process has grown over time, with increasing importance due to financial and economic issues which have caused the agency to pay greater attention to the singular benefits and impacts of potential projects. A framework which clearly links the agency's strategic goals, to more specific objectives, and performance metrics has been developed and is provided for in the FY 2009 Budget. While the Port Authority has developed a strong performance measurement framework to link agency wide goals to budget and resource allocation decisions, in response to these issues, the performance measures themselves, are limited largely to measures of project implementation/project delivery, with limited number of measures associated with benefits/impacts of projects. Per discussion with Port Authority staff, the Port is not as far along in this aspect of performance measurement. Despite the framework for performance-based planning, the linkage between the planning staff and budget staff is not yet consistent.

### **Priority Setting/Tradeoffs**

Currently, the performance measures in the Capital investment arena, have to do primarily with the efficient delivery of projects; or more specifically, project development, how to get a good estimate of a project, and how to get a project out the door and into revenue service as quickly as possible. A cost/benefit analysis is conducted based on the following cost thresholds: Projects under \$20 million (cost analysis in-house), under \$50 million (in-house cost/benefit analysis), over \$50 million (full blown industry cost/benefit analysis).

System-enhancing or revenue producing projects would be the type of projects that would require a more thorough cost/benefit analysis, with benefits/impacts such as travel time, signal system failure, and customer service measurements evaluated.

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<sup>15</sup> [http://www.panynj.gov/AboutthePortAuthority/InvestorRelations/pdf/MasterBudget\\_2009.pdf](http://www.panynj.gov/AboutthePortAuthority/InvestorRelations/pdf/MasterBudget_2009.pdf).

There also is a specialized field for threat-based security analysis done by consultants on projects related to security issues.

There also are many low-priority projects that are handled internally with the PANYNJ engineers. State of good repair projects needed to maintain facilities in good operating state, as an example, are analyzed by the engineering department typically to assess priority and timing of project.

Project selection remains more consensus-based, as opposed to being driven by quantitative measures of project performance. The quantitative information is available to support the decision-making process, but project selection occurs largely as a result of internal discussion. The agency is “absolutely” looking to support a more formalized evaluation framework. PANYNJ is redesigning their capital project management system to have the data in the same place as the financials, with the scheduling and funding of the project. The agency is trying to create a more formalized framework, but is likely one to two years away. They perceive that this is done fairly routinely in the private sector and they want to confirm their approach.

According to Port Authority staff, the current financial pressures have been critical in advancing performance-based resource allocation decisions. Projects are not advanced unless there is a better understanding of their benefit and unless you are “ready to go.” People are more aware of the constrained environment they are working in. However, there still needs to be more transparency and objectivity in the project selection process and that is what is driving the performance measurement portion of current strategic planning efforts.

## Target Setting

There are currently specific targets in place, as part of the Port Authority’s performance framework. Many of the targets are operations oriented, i.e., How many people did you get through the port today? There also are targets associated with how well the Authority is spending money that is available, e.g., targets for construction and contract awards that are set at the beginning of each year, and whether a project came close to being completed within planned budget and schedule. These are more of a capital, technical nature, not a *strategic plan* set of targets.

## Data Support Systems

### Organization and Governance

#### *Data as an Asset*

Data is considered an asset at the agency, with particular emphasis on maintaining a core financial data system known as SAP, which tracks financial and asset management information and manages the payment of bills and costs associate with a project. Many of their data systems were developed primarily to serve a line department, such as the Capital Project Area,

and are therefore, independent systems which are not incorporated into an enterprise data management structure. Eventually, the agency intends to develop an enterprise database to provide information from the core data systems. In order to protect the integrity and quality of the data used for financial reports and other reporting needs, PANYNJ downloads a lot of data from source data systems, into excel spreadsheets for further analysis and to support decision-making within the departments. Only authorized users and designated owners of the data are allowed to update data through the use of the source data system.

### ***Data Governance Framework***

While there is not a traditional data governance framework at PANYNJ, with a data governance charter, board, etc., there is a robust governance process in place for considering and approving any potential enhancements to systems which support the core functions of the agency, such as the SAP system.

The governance process is based on the primary business focus of the agency, which is the asset and maintenance management of the physical infrastructure of the agency. Any requested changes to a data system, is reviewed for how this modification supports agency functions, and to determine the impact of requested changes on the affected line departments. All of the stakeholders have to be aware of what impact the requested change will have on their operations.

The role of the IT Department has become more prominent regarding the data management process, within the last couple of years, and any line department wanting an application developed must coordinate this effort through the IT Department.

The role of data stewardship and data owners is not defined by an official policy, however, the individual line departments are considered to be the data stewards and owners of the data systems developed for their areas. In the case of data systems which serve a more agency-wide function, such as the PeopleSoft system, the HR department serves the primary role of data steward.

### ***Data Standards***

Data standards have been established for some of the enterprise and critical systems, such as the case with public safety data. PANYNJ uses existing police definitions and data standards where applicable. The Engineering Department is another example of where strict definitions and standards are adhered to, based on the nature of the work, compared to other departments.

In addition, the development of the forms used at PANYNJ is standardized under the direction of the Office of the Secretary for the Port Authority. The information from these forms is usually entered into a database at some point, so the standardization of the data happens as point of data capture from the forms.

### ***Institutional Arrangements/Policies to Support Data Management***

The IT Department basically is responsible for developing the applications which support the enterprise and for coordinating the development of applications for particular line departments with those departments.

The requirements for review of the impact of changes to a data system from a line department on other line departments downstream, is an effective means for managing their data systems, considering the independent, silo, structure of many of the existing applications.

### ***Relationship to Target Setting/Decision-making***

The Port Authority Capital Area department uses financial data to monitor progress in meeting targets such as, was a construction project completed on-time and with “+” or “-” 10 percent of the planned budget?

Other data, such as traffic volumes on a particular bridge, tunnel or ferry, also is used to determine where funds need to be spent for improvements and/or investments on that particular asset.

## **Data Sharing**

### ***Institutional Arrangements/Policies to Support Data Sharing***

There are institutional arrangements to support data sharing on a per application basis. The Port Authority interacts with and shares data with local police, Federal and other state government agencies. There is an official data sharing agreement for sharing traffic data from the George Washington Bridge with the regional traffic centers and other local agencies. The Aviation Department of PANYNJ also used data from FAA databases to integrate this data with internal Aviation division applications. The Operating and Planning staff also work closely with the State DOT for exchange and sharing of data with that agency.

### ***Internal/External Data Access***

As discussed previously, the Port Authority does use FAA data to integrate with internal data systems within the Aviation division. This is for the purpose of scheduling maintenance of a gate at the airport to coordinate this activity with the arrival/departure of air traffic at the gate.

On a per application basis, data and information is shared through the use of the COGNOS system. COGNOS is not currently used on an enterprise basis, but, eventually, PANYNJ intends to use something like COGNOS to facilitate their data sharing and reporting needs.

The access to data and information internally is based on a security model which identifies the roles that people perform relative to a specific application.

Data is made available to the public through the “Annual Financial Report for the Year Ending...” This report contains information about traffic volumes on the facilities, freight

information, volume of passenger traffic and tonnage, and a wealth of financial information about expenditures on each of the facilities.

The public does not, however, have access to internal, sensitive information or video images of any of the facilities.

## **Documentation and Reporting**

Since PANYNJ is a civil engineering construction agency, they are not like a banking system which is heavily *transaction* oriented. They use reports which are created on a monthly and annual basis and do not need real-time reporting capabilities for decision-making.

### ***Enterprise Data Model***

The data models that are used are specific to an application. There also budget planning models, not data models per se, used for resource allocation. PANYNJ uses Oracles' Hyperion product to manage the budget planning process.

### ***Data Dictionaries and Metadata***

There are data dictionaries and metadata available on a per application basis. The metadata for budget planning, for example, includes information about what capital investments are needed, how many people are needed, costs, and timeline for a specific project.

### ***Change Data Tracking Methods***

As discussed previously, there is a change control process in place in the IT Department to request changes to a particular system. There is an associated governance process in place in the line departments to ensure that they are aware of any impacts to other line departments downstream, due to the requested changes.

## **Technology**

### ***Data Management Systems / Business Intelligence (BI) Tools***

The Port Authority currently uses COGNOS and Business Intelligence tools on a per application basis for mining information from source data systems and downloading the information to Excel spreadsheets for further analysis and decision-making. They also use Crystal Reports to extract the data needed to support business decisions.

They are beginning to use Service-Oriented Architecture (SOA) in the development of applications and Open Database Connectivity (ODBC) between databases to make the data more shareable. They also are developing an enterprise application *bus* to allow the users to subscribe or unsubscribe to the bus, based on their needs. This will allow the transfer of data between systems, using the bus tools as needed.

They also use Oracle and MS SQL as their databases, and use an export function to extract and load data to appropriate applications as needed.

The quality review of legacy data is performed when that data may be needed for a new application system. Some of the data has been grandfathered and was never edited or cleaned up since the previous use of the data. They are currently investigating the use of Talend's Extract Transform Load (ETL) tools to assist in extracting data from the source systems and setting up the business rules that are needed to use the data, and also to determine what quality data checks are needed to clean up the data before it is loaded into the new system.

PANYNJ also uses ESRI ArcGIS for their GIS software and are investigating the use of other, smaller and more affordable options for data integration tools.

## **Data Management Systems' Relationship to Target Setting/Resource Allocation**

The effectiveness of the data systems in setting targets and allocating resources is again, specific to the line department. PANYNJ tries to maximize the use of tools such as COGNOS to assist them in looking at data from many different angles, in order to assist them in the decision-making process. They use COGNOS on a day-to-day basis for a lot of the capital program initiatives and the Hyperion software for budgeting purposes. They want to make the decision-making, including resource allocations, a more quantitative rather than subjective exercise.

### **Success Factors**

The Port Authority is maximizing the use of available technology for reporting and database maintenance functions in order to support business decisions at their agency. While a lot of the data applications were built to serve a specific need in a particular line department, the elevation of the role of the IT Department in recent years has helped improve the coordination in the management of the data systems from an enterprise perspective.

The use of a governance framework which requires stakeholders in all impacted line departments to participate in the approval process for requested changes to existing data systems helps to ensure data quality and integrity of data in the source data systems.

The standardization of data definitions and metadata helps in the data sharing process with external agencies such as the FAA, local police, and other state and Federal agencies.

### **Other**

The following list summarizes key points from the PANYNJ Case Study, which are applicable to other state DOTs considering how best to implement data systems to support key performance measures:

- Use Business Intelligence and data integration tools to facilitate the efficient extraction and reporting of data in a timely manner. Data quality controls can also be established as part of the ETL process, using ETL tools and business rules for the data.
- For agencies with many silo data systems throughout the agency, utilize the expertise of the IT department to coordinate and manage the maintenance and development of new applications to meet business needs.
- Build the data applications for the agency, with the goal of satisfying core business needs first, and also consider data management needs, including making the data more shareable between systems, and developing easier access/reporting capabilities of the systems.
- Partner with other agencies, where feasible, to minimize the cost of data collection.
- Ensure that all stakeholders are involved in decisions regarding the revisions to existing data programs, or development of new data programs which serve the agency or individual departments.



# RCG Information Technology

RCG is an information technology consulting company whose main clients are in the insurance, financial, hospitality, retail and supply chain industries. However, their services and experiences are just as applicable in a state department of transportation (DOT) environment, where many DOTs have similar challenges in data management, data warehousing, data integration, data migration, and supporting business intelligence (BI) operations within the DOT.

The Business Intelligence and Data Delivery Division of RCG works with companies to implement executive dashboards, data warehouses, replacement of legacy data systems, and examine ways to reduce the number of existing data applications to meet customer needs. RCG's Data Integration Division also supports companies in the move towards Service-Oriented Architecture (SOA) for designing systems or integrating existing systems.

Their vast experience in working with multiple clients in the steps to implementing data governance within an organization will be the primary focus of this Case Study.

The Case Study examines how the use of Business Models cannot only help organizations in the private sector, but, how this approach can also be useful for state DOTs, to gain a better understanding of how data systems support business decisions and why it is so critical to have the highest quality data available when needed.

## General Relationships

RCG utilizes a systematic approach for understanding the data systems, targets and performance measures used by their clients.

They begin by performing a risk assessment of the data systems to help clients gain a better understanding of the relationships between the data and decisions made, based on that data. The risks associated with those decisions are also examined, especially in a retail environment, where the cost of making decisions can have significant positive or negative fiscal impact.

Similarly, many state DOTs have to assess the impact of their decisions, based on data systems, as these decisions may have adverse consequences for the traveling public, or the organization itself. Since DOTs are dependent on their legislatures for funding, they are aware that the decisions they make will always come under scrutiny, especially since the legislature has to balance the needs of the state with available funds.

One of the methods used by RCG to help businesses better understand how the decisions are made, and the costs of those decisions, is to create a graphical model of the business operations,

with decision-points and impacts in dollar amounts of those decisions. These models give an overview from the high-level business perspective to the data flow model level. RCG found that by doing this exercise, many organizations get a more realistic understanding of how decisions made at the senior management level are actually implemented by the workforce within the organization. Many DOTs have utilized similar business modeling tools when building Business Use Case Models for designing new systems or enhancing existing data systems.

## **Organization and Governance**

### ***Data as an Asset***

Data is considered a valuable asset in a company, especially when it is used to support business decisions that have an impact on company revenues.

Since there is a cost associated with maintaining data to run company operations, many senior executives will carefully examine the cost of obtaining data and will adjust their expectations accordingly. For example, the cost of getting information in a shorter turn-around time may be too expensive and the executive(s) will decide to adjust his/her deadlines for getting the information, to a more feasible timeframe.

While many state DOTs may not assign a dollar value to their data systems, as they do other physical assets such as buildings, vehicles, etc., there is significant investment made in collecting and processing of data, and the reporting of information based on the multiple data programs. Detailed security and back-up procedures also are implemented to protect the data assets.

Another component of RCG's approach in working with organizations is to help them better understand the cost of having poor data as a basis for making decisions. Accordingly, a state DOT, can derive great benefit from assessing the negative impacts to their agency, of using poor quality data or not having the necessary data at all, as a basis for making decisions. In some cases, this may result in ensuring continued funding for the most mission-critical data programs.

### ***Data Governance Framework***

RCG uses a very structured, well-defined framework for assisting clients in implementing data governance within an organization. They use what they have defined as a Data Governance Maturity Model. The Maturity Model has several steps and RCG assists their clients in stepping through each of the stages of the Maturity Model until full data governance implementation is achieved. They do acknowledge that, depending upon the organization, this may take from six months to two years to fully implement. In the case where more time may be required, a readiness plan is prepared, so RCG can continue to assist the organization when it is ready to move to the next step of the Maturity Model. One of the first steps to the successful implementation of data governance, as noted by RCG, is to get buy-in from the organization and to make sure that the persons and offices involved understand how this

process works. Managing expectations is key to making data governance a success within any organization or state DOT.

### ***Roles and Responsibilities***

RCG has found that in many organizations, the responsibilities of the organization do not change, it is how the responsibilities are divided that changes. This is a similar situation in a state DOT where the responsibilities for providing safe, efficient movement of people and goods may be a primary mission of the agency, while the specific Divisions within the DOT responsible for executing the mission, may vary from one Administration to another.

Since the roles and responsibilities may be assigned to different areas of an organization, as the senior leadership changes, RCG has found the Maturity Model to be very valuable in explaining to executives and the day-to-day data stewards what the roles and responsibilities should be, to effectively use data governance within their organization. Using a similar Maturity Model with clearly defined roles and responsibilities would be very beneficial to a state DOT considering the implementation of data governance within the organization. See Appendix C for further information regarding the seven stages of the Maturity Model<sup>16</sup>.

Some of the roles and responsibilities include those of the Data Governance Council and Data Stewards. RCG identifies that there are traditionally two categories of steward. One is the day-to-day stewards, who have the respect within the organization to make decisions about the data; the other are the issues/practices stewards, who are usually the supervisors or operational technicians. The owners of the data, likewise, have the responsibility for the security or high-level decisions regarding the data.

Many of these same roles and responsibilities are identifiable within a DOT environment as part of various Divisions, or Offices. Business Analysts generally work at a Division or a special Office, separate from the Information Technology division or office. However, the Business Analysts usually work closely with the Data Analysts, Metadata Stewards, and Data Architects at the IT Division in the development of requirements for new systems, and will often participate in the design, development and implementation of new or enhanced data systems.

### ***Data Standards***

Within RCG's recommended framework for data governance, the duties of the Business Data Steward includes ensuring that the data definitions and standards are adhered to for their assigned data system, and likewise, the Metadata Steward needs to ensure that the metadata is defined correctly and adheres to AAP Metadata Standards.

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<sup>16</sup> Excerpted from a White Paper entitled "The Data Governance Maturity Model" by Martha Dember, CBIP, Director Business Intelligence, RCG Information Technology (2008), and is used with permission.

The importance of establishing and adhering to data standards cannot be understated, as this ensures data quality, closest to the source of the initial data capture. Subsequently, any decisions made higher up in the organization, based on this data, are more easily justified when the data can be proven to be accurate, timely and of consistent high quality, on a repetitive basis.

### ***Institutional Arrangements/Policies to Support Data Management***

The Institutional arrangements and policies to support Data Management are usually established by a data governance Board or Council which may include senior executives and division or office directors. The responsibility for the execution of the policies set forth by the data governance Board resides with the day-to-day data stewards and issues/practices stewards.

This can include functions such as managing requests for new or enhanced data systems, validating business rules for use of specific data, and participation in the issue resolution process when decisions need to be made about the best approach for handling what is usually considered enterprise data.

### ***Relationship to Target Setting/Decision-making***

RCG has learned that many of their clients do not understand what the true performance indicators are within their organization. This makes it somewhat difficult to relate target setting to decision-making. A company may have a set of metrics for instance, instead of one metric, and they may need assistance in determining when/how to use which metric(s) for making decisions.

The use of a Business model is extremely helpful in addressing this issue. The Business model defines what data supports which metrics, and which metrics are used for making which business decisions. In the case of a Call Center, for instance, it may not be as important to measure how many calls are being processed each day, as to ensure that accurate information is being relayed to each caller. This is an important lesson which is also applicable to a state DOT. The better the understanding by the staff of what the true performance measures are, the more likely that the data systems developed and maintained by the staff will be successful in sustaining the measures needed to support agency targets and goals.

## **Data Sharing**

### ***Institutional Arrangements/Policies to Support Data Sharing***

RCG emphasizes the importance of having effective institutional arrangements and policies which support data sharing. As Martha Dember, Director of BI and Data Delivery, at RCG noted, “it’s about insights, not about more data.” The sharing of information is what’s most important, not just providing more data.

The sharing of information includes making metadata available to offices and persons needing the information. This can be easily facilitated through the use of Business Intelligence (BI)

tools. BI tools can be used to link information across data programs so that staff can get information, such as, when data was last extracted or updated, and this can then impact how/when decisions are made.

Many DOTs have already established Enterprise Data Warehouses with mechanisms in place for integrating data across various systems in the warehouse. Metadata and data definitions and data standards also have facilitated data sharing across data programs and offices within a DOT. The implementation of Geographic Information Systems at DOTs also has supported the sharing of data at the Federal, state, and local levels. These and many other BI tools are available to provide the mechanisms, with the necessary security protocols, for sharing data across multiple systems within any organization.

### *Integration with Outside Data Sources*

RCG's Case Study did not specifically address the integration of data from outside data sources, however, the use of Service Level Agreements between RCG and their clients is an effective means to document the data needs and data program expectations of their clients and similar arrangements can also be made for DOTs, needing to obtain data from external sources, or to share DOT data with external sources.

### *Internal/External Data Access*

Access to internal data can be facilitated through the use of a various number of BI tools. Metadata, which contains both technical and business information about the data, should be made available to all staff across the organization, in order to ensure a consistent use of data for various programs within the organization. Access to metadata can be easily established through an agency intranet.

External access to data for a private sector company would not be as prevalent as in the public sector. Many companies as well as DOTs will utilize discretion in determining what data will be made available externally and on what frequency.

## **Documentation and Reporting**

### *Enterprise Data Model*

The use of an enterprise data model is one of the BI tools that can be used by a company or a DOT to document the specific data being integrated within the enterprise data warehouse and to document the relationships between the business data stewards and the technical data stewards for the maintenance of the data. The Enterprise Data Models will document the various data sources throughout an organization with security controls, back-up procedures and timing sequences for scheduled updates of the data from the source data bases.

### *Data Dictionaries and Metadata*

The use of Data Dictionaries and Metadata throughout an organization is a key component of the Data Governance Maturity Model used by RCG with their clients. One of the primary roles

of the business data steward is to ensure that the data definitions and metadata are documented correctly, in accordance with agency, and data governance board policies and procedures.

RCG also emphasizes the importance of having something like a business terminology dictionary on the business side of an organization, in order to align the use of business terms throughout the company. This type of dictionary would also be useful to a DOT, in order to facilitate the consistent use of business terms throughout the DOT, and would be helpful to IT division staff involved in developing data programs for the various business units.

### ***Change Data Tracking Methods***

While change data tracking methods were not specifically discussed as part of the RCG Case Study, state DOT IT departments will generally have database administrators or information resource administrators who have responsibility for tracking user requested or steward requested changes to data systems and programs. These requested changes usually require approval at some level on both the business side and the IT side to ensure that department systems are not adversely affected. Tracking methods can be done through the use of a department intranet, database support applications, excel spreadsheets or other methods.

## **Technology**

### ***Data Management Systems / Business Intelligence (BI) Tools***

RCG advocates the use of BI tools and using Service-Oriented Architecture (SOA) for designing and developing application systems, for their clients in order to make all systems more flexible for data sharing. RCG focuses on helping a client to determine the criteria that's needed for purchase of specific software/hardware, but, does not recommend any vendor's products. They remain "vendor neutral" when it comes to recommending any products.

## **Data Systems' Relationship to Target Setting/Resource Allocation**

As discussed previously, RCG has learned that many of their clients do not understand what the true performance indicators are within their organization. Therefore, the data needed to support the performance indicators and set targets may not be easily identifiable. A careful review of performance measures and the underlying data systems to support those measures is necessary, in order to achieve the correct resource allocation to meet agency targets and goals. Again, this can be done through the use of something similar to a Business Model. There are many BI tools available for developing Business Use Cases and diagrams which depict these intricate relationships.

## **Success Factors**

RCG has found that it is equally important to get both the Business side and IT side of an organization to partner together in order to have an effective Data Management program, which includes components of a data governance framework and clearly defined

roles/responsibilities which are shared throughout the organization. On the IT side it is very critical to have the Data Architecture team as part of any data system development effort, and on the business side, it is necessary to have acceptance getting to a common business language. As noted earlier, this may require somewhat of a cultural change within an organization.

There also has to be a champion of data governance in the organization for this effort to be successful and a strong executive leadership is definitely a requirement. Someone in the organization needs to identify where the data problems are in order to convince others in a leadership role that data governance policies, procedures, and roles of data stewards can be used effectively to address issues with the data systems.

In the best case scenario, there would be champions for data governance on both the business side and IT side of a DOT, in order to build the best available data support systems. This is especially important where data systems are used to support agency performance measures and are used to determine if agency targets and goals are met, as expected, by a state legislature and even more importantly, the traveling public.

## **Other**

The following list summarizes key points from the RCG Case Study, which are applicable to any state DOT considering the implementation of data governance and Data Management initiatives at their agency:

- Perform risk assessment of existing data systems to better understand the relationships between the data and the decisions made, based on that data.
- Get buy-in at the senior executive level for implementing data governance by ensuring that the executives, and all persons involved understand how the process works.
- Clearly define the roles and responsibilities of all participants identified within the data governance framework.
- Make sure the correct metrics are used for making decisions. Revise/add new metrics as needed.
- Ensure that IT staff and Business analysts in the organization understand what the metrics are in order to build information systems which can support agency targets and goals.
- Sharing of metadata throughout the organization is key to ensuring consistent use of data for various data programs within the organization.
- Create a business terminology dictionary on the business side of the organization to standardize the use of business terms throughout the organization. This will also be helpful to IT system developers.
- Utilize Business Intelligence (BI) tools to facilitate the integration of data systems and access to information throughout the organization.



# U.S. Army Armament Research, Development, and Engineering Center (ARDEC)

## Background and Resource Allocation

ARDEC uses a performance-based process to design advanced weaponry. The Armament Research, Development, and Engineering Center is the internationally recognized center for the advancement of weapon technology and battlefield engineering. Its roots stretch back to the Revolutionary War and it continues to be the major source of technology research and development for the U.S. Army. It boldly asserts that it does not want U.S. forces to engage in a fair fight. It wants to provide them “overmatch capability” with technological supremacy whenever they engage in battle. It has two major objectives. The first is to provide the best available technology to American Warfighters. The second is to simultaneously support a complete transformation of future U.S. military forces.

To meet these extraordinary customer requirements and to live within demands for cost, schedule, and performance, ARDEC has used the Baldrige criteria and continuous improvement as the means by which to allocate scarce resources and to optimize investments. It has adopted what it terms Enterprise Excellence which uses the Baldrige process, as well as complementary process improvement approaches such as Lean Six Sigma and ISO. These latter two are particularly focused on eliminating defects in manufacturing and other processes, while the Baldrige approach presents a broad, corporate improvement framework. The results it cites include:

- Providing 90 percent of the Army’s suite of armaments;
- Recognition from Time magazine for “The Most Amazing Inventions of 2004”;
- Dominating the Army’s 10 Greatest Inventions of the Year Awards;
- Overall Lean Six Sigma improvements to quality of 91 percent, Cost 70 percent, Schedule 67 percent and Risk 84 percent;
- Customer labor cost avoidance of \$525 million since 1995; and
- Consistently scoring customer satisfaction ratings of 3.78 out of 4.0.

Its research and development focuses upon small, medium, and large caliber weapons, guidance system explosives, warheads, propellants, ammunition, and related support systems. Like a Department of Transportation, it has cradle to grave responsibility for its main products

and it works closely with consulting engineering firms. It produces new products through a team-based approach which involves close collaboration between its employees, the customer which is some branch of the military and consulting firms.

*ARDEC has a customer focused, team-based culture that is dedicated to achieving continuous improvement and innovation through integrated, best-in-class work system processes and practices. Leadership and employees are dedicated to our Purpose, Vision, Mission, and Values. In addition, our leadership and employees are motivated by a deep sense of responsibility to the Warfighters, knowing that often their lives – and the security of our nation – depend upon the technology of the products we research, develop, and engineer.*

As with all Baldrige winners, ARDEC uses a strong customer-requirement gathering process combined with a performance management process to allocate resources and to expend those resources in the way which best meets customer requirements. Its customer requirements gathering process is extensive and is embodied in the Voice of the Customer management practice. It includes at least the following steps:

- Highly classified assessments of weapons development under way by foreign countries;
- Assessments from military leaders as to emerging military strategies and how they can be complemented with technological advancement of American weaponry;
- Strengths, Weaknesses, Opportunities and Threats analysis of new technology to provide insights into threats and opportunities in weapons technology;
- Market Development Teams work closely with high-level military customers to identify new areas of development;
- A Warfighter Central Office was formed to systematically gather information from the battlefield on how weapons perform;
- Soldiers are regularly invited to its New Jersey headquarters for standing-room only sessions in which they can give feedback to weapons developers on how the products perform in the field; and
- ARDEC's web site has a Soldier Hot Line which enables field soldiers to contact it directly with comments about the performance of weapons and how they could be improved. ARDEC commits to responding to every comment in 24 hours and to seek a solution within 72 hours.

These customer-input processes have changed how ARDEC allocates its resources of people, technology, engineering, laboratory times, and money. For instance since 2001, the armed forces are increasingly focused on counterinsurgency and counterterrorism campaigns. Because of the rapidly changing counterinsurgency tactics it revamped its product development and materials application processes. These revamped processes helped produce advanced vehicle armor to counter roadside explosives. When the private sector could not provide quickly a multiburst artillery cartridge its engineers set up its own manufacturing operation to produce the shells for the soldiers who requested them for quick deployment in

the field. ARDEC says its customer-response processes requires it to be both strategic in developing long-term innovation in weapons systems but to also be agile in quickly altering development projects to respond to new battlefield conditions.

Meeting these short-, intermediate-, and long-term customer requirements becomes the driving force for a rigorous Strategic Planning process which identifies priorities and assigns resources to achieve those priorities (Figure 21).

The strategic planning process sets goals of five years, two years, and annual objectives. It is updated beginning with an assessment seen in the first three steps of where the organization has been, whether its Mission and Vision need updated and where it stands in terms of meeting its mission.

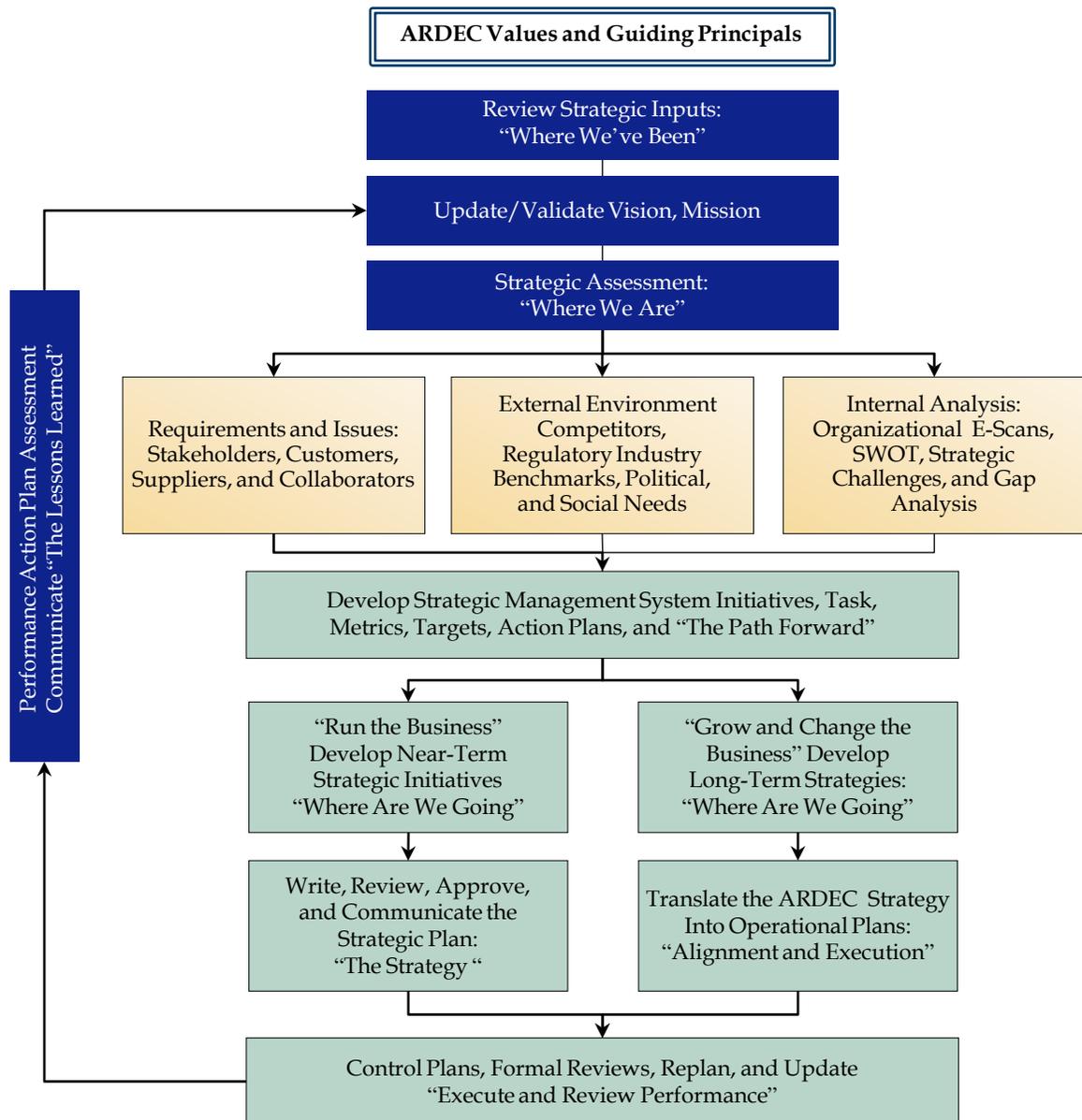
Then customer requirements and external and internal developments are evaluated to determine how they may require new long- or short-term goals and objectives. “The Path Forward” is defined with clear initiatives, performance measures and action plans. At this stage, resources are allocated to ensure that performance is met.

Then both short- and long-term business strategies are identified in the “Run the Business” and “Grow the Business” areas. “Run the Business” includes the short-term operational objectives necessary to produce customer products in the short term. “The Grow the Business” are the longer-term, more strategic products and efforts which may not produce a product in the current year but which are viewed as essential for long-term U.S. military supremacy.

Next, the short- and long-term plans are translated into communication strategies embodied in the Strategic Plan Update. This update is viewed as the means by which the overarching strategic direction of ARDEC is translated into the action plans, assignments, budgets and metrics which propel the day-to-day activities of the organization’s staff. Throughout the execution of the Strategic Plan each year, the feedback loop runs continuously by feeding performance information and any changing customer requirements back to all levels of the organization. This feedback is manifested in a comprehensive Knowledge System, which is described later.

In terms of performance-based resource allocation, ARDEC indicates that resources are allocated directly in relation to the intensity of customer requirements. As battlefield priorities dictate, resources are redirected from less essential research and weapons-development activities to more pressing and immediate needs. It indicates that its Voice of the Customer continuous input allows it to constantly calibrate whether resources of money, staff, and facilities are focused upon the highest strategic needs for the U.S. Military and its soldiers, marines and special forces.

Figure 21. ARDEC Strategic Planning Process



Key unclassified performance measures include:

- Number of innovations under development;
- Percent of customer satisfaction;
- Percent growth in non-Army business;
- Return on investment;

- Timeliness of “Quick Reaction Task Force” responses;
- Number of new releases of materiel to the field;
- Customer loyalty and retention;
- Cost avoidance;
- Percent of technology providing a return on investment;
- Employee job satisfaction;
- Workplace accident rate;
- On-budget, on-time project performance;
- Independent ratings for evaluation of process controls;
- Number of audit findings; and
- Number of Inspector General findings.

### ***Knowledge Management***

ARDEC considers knowledge management to be essential to its success:

*The U.S. Army Armament Research, Development, and Engineering Center (ARDEC) is a role-model knowledge-based organization. As a part of our Strategic Planning Process, we set measures and targets for each strategic objective and Action Plan; then we track them carefully at appropriate time intervals from weekly to annual basis. We make fact-based decisions using this information and knowledge to ensure that ARDEC is successful in meeting or exceeding current customer requirements and its own business directions while remaining agile enough to respond to dynamic market changes and new business opportunities.*

*State-of-the-art, integrated and fully deployed information technology (IT) systems enable employees throughout the organization to track and access data on an as-needed basis. These systems also provide the power we need to capture, manage, and make available workforce knowledge, best practices, processes and procedures, templates and other information to the entire workforce. With our Enterprise Excellence System, we have the tools to plan, systematically analyze, evaluate, and continuously improve our processes for gathering data and converting it into the knowledge we require for performance excellence.*

ARDEC uses the SAP commercial off-the-shelf enterprise information system which augments traditional U.S. Army financial information systems. It has customized its information systems to track real-time labor hours, overhead, revenue, purchases, commitments and other information on an organization-wide or project-specific basis.

Its employee knowledge is captured through:

- Development of technical data packages;
- Reviews of projects and after-action analysis;

- Formal and informal mentoring;
- Succession planning;
- On-the-job training;
- Classroom training;
- Teaming;
- Documented lessons learned and best practices;
- Process documentation in a Process Asset Library; and
- An Armaments Knowledgebase.

It has a Knowledge Management Office which is responsible for providing the infrastructure to capture and disseminate information from the entire history of armament manufacturing. The Armaments Knowledgebase contains large volumes of information about historical and current technical reports, lessons learned, failure analyses, test reports, and other information relevant to solving current problems. Knowledge is transferred to and from customers through formal documentation of requirements, disciplined systems engineering, training, meetings, and the exchange of technical requirements. Best practices are identified in its Knowledge Management gathering, its benchmarking, Baldrige reviews, and other opportunities.

### *Summary*

The ARDEC applied the Baldrige process to the development of land-based armaments, literally taking the performance-based resource allocation process to the battlefields of Afghanistan and Iraq. Frontline soldiers are solicited to augment the military's technical product requirements to create rapid-cycle-time improvements to battlefield technology. With an amorous and opportunistic opponent, the armament refinement process is ongoing to ensure that U.S. armaments counter act changing insurgent tactics. An extensive Knowledge Management system tracks costs, performance and customer requirements to shift resources to high-return projects as battlefield conditions change.

## **Data Support Systems**

### **General Relationships**

The United States Army Armament Research, Development, and Engineering Center (ARDEC) considers knowledge management to be essential to its success:

*The U.S. Army Armament Research, Development, and Engineering Center (ARDEC) is a role-model knowledge-based organization. As a part of our Strategic Planning Process, we set measures and targets for each strategic objective and Action Plan; then we track them carefully at appropriate time intervals from weekly to annual basis. We make fact-based decisions using this information and knowledge to ensure that ARDEC is successful in meeting or exceeding current customer requirements and its own business directions while*

*remaining agile enough to respond to dynamic market changes and new business opportunities.*

ARDEC uses specific data such as cost, schedule, and project performance data as critical data sets to measure how they are performing. Their objective is to integrate data from the technical side into the business and management side, allowing them to answer performance-related questions such as: Are they costing their customers too much money? Are they prespending dollars from later phases of a project? Are they taking too long to provide a product?

Project performance data is gathered through project reviews that are conducted for major projects on a monthly basis. Performance in 16 different areas (e.g., budget, schedule, etc.) is tracked on stoplight charts with red, yellow and green indicators, while trend markers (up and down) indicate if the situation is getting better or worse. A red indicator indicates that senior leaders need to intercede because performance in that area is out of control and needs to be addressed. A yellow indicator means that the ARDEC Project Officer (APO) needs to address attention to that area. Detailed explanations are provided by the APO for areas of low-performance (e.g., due to scheduling problems, the planned schedule of events faltered one-month).

The APO is responsible for entering the progress within each area into the Project Management system. The overall performance score for each indicator is developed based upon input from the Systems Engineering Group and the project management team. Project reviews are currently conducted for Level 1 projects only, which are determined to be the most critical to ARDEC. The long-term goal is to incorporate Level 2 and 3 projects into the system.

In terms of other data collected on a regular basis, ARDEC's Systems Applications and Products system (SAP) collects performance data on finance-related indicators, including labor hours, revenue, purchases, obligations, and commitments, as well as human capital information. ARDEC's goal is to manage the status and availability of staff at the work-breakdown-structure level.

Priorities for data management system improvements tend to be set by top level management, while lower-level staff responsible for implementation do not always agree with the priorities.

## **Organization and Governance**

### ***Data as an Asset***

Data is regarded as an important asset within the organization, although this is a struggle since the data needed to measure the process originates from diverse areas, thus the challenge to connect.

For example, Portfolio Management is a result of a recent talent management study. ARDEC developed an Enterprise Project Management System as a key tool for the Project Portfolio Management approach. The system will provide a structured mechanism to enable data driven decisions about the “portfolio” of innovative programs/projects, their associated investment mix, resource utilization, work, and their contribution to the organization's vision, mission,

goals, and objectives upon completion. There are many different databases, files, structures, and organizations within the Department of Defense (DoD) that contain the data needed to accomplish portfolio management. However, they are facing challenges in collecting the necessary data and resolving issues related to database compatibility, data availability, and data privacy/security (i.e., only certain people are allowed to see security-restricted information).

### ***Data Governance Framework***

ARDEC's data stewardship and data governance models are mostly established by formal rules and regulations within which they must operate because they are an Army entity. Pertaining to data, there are rules and regulations that govern data security, data back-ups, what to do during a crisis, etc.

The Knowledge Management Office is responsible for managing knowledge systems and providing the infrastructure to capture and disseminate information.

### ***Data Standards***

Army Regulation 380-5 establishes the policy for the classification, downgrading, declassification, transmission, transportation, and safeguarding of classified information and material. There also are data standards that DoD follows, including data standards for secrecy, accuracy, and reliability.

### ***Institutional Arrangements/Policies to Support Data Management***

ARDEC's process asset library allows anyone within the organization to learn of policies and guidelines for processes to reuse across the enterprise.

## **Data Sharing**

### ***Institutional Arrangements/Policies to Support Data Sharing***

ARDEC's Knowledge Management Office provides the infrastructure to capture and disseminate information from the entire history of armament manufacturing. The Armaments Knowledgebase contains large volumes of information about historical and current technical reports, lessons learned, failure analyses, test reports, and other information relevant to solving current problems. The Knowledgebase has shortened the learning curve for new engineers to become familiar and comfortable with their programs. ARDEC's Engineering Support and Production group also uses the repository to revisit old projects as improvements in technology are made.

### ***Internal/External Data Access***

In terms of data sharing, ARDEC allows some customers to go into their Systems Applications and Products (SAP) system and see how their money is being spent on their projects. Formally however, knowledge is transferred to and from customers through formal documentation of

requirements, disciplined systems engineering, training, meetings, and the exchange of technical requirements.

## Documentation and Reporting

### *Enterprise Data Model*

ARDEC has their own Oracle Collaboration Suite which is used to store documents. Indexing tools similar to “windows search” are used to search for and access documents on an as-needed basis.

## Technology

### *Data Management Systems / Business Intelligence (BI) Tools*

The following statement describes ARDEC’s data management system/business intelligence tools:

*State-of-the-art, integrated and fully deployed information technology (IT) systems enable employees throughout the organization to track and access data on an as-needed basis. These systems also provide the power we need to capture, manage, and make available workforce knowledge, best practices, processes and procedures, templates and other information to the entire workforce. With our Enterprise Excellence System, we have the tools to plan, systematically analyze, evaluate, and continuously improve our processes for gathering data and converting it into the knowledge we require for performance excellence.*

ARDEC uses a SAP commercial off-the-shelf enterprise information system, which augments traditional U.S. Army financial information systems. They have customized their information systems to track real-time labor hours, overhead, revenue, purchases, commitments and other information on an organization-wide or project-specific basis.

There are many diverse databases within the DoD that contain data used by ARDEC, although ARDEC is not the owner. ARDEC uses Open Database Connectivity (ODBC) to make the data more sharable.

For performance reporting, ARDEC tends to use Microsoft PowerPoint and Excel charts. They have tried to implement an automated system to report performance at the corporate enterprise level, but have been unsuccessful because their measures change so frequently. The time it takes to input data into the system and make it automated is too long. They found that they cannot enter the data into the system fast enough or get people up to speed quickly enough.

## Success Factors

ARDEC provided the following success factors and lessons learned with regards to developing an effective data system to support performance measures and target setting:

- The data system must be designed so that it can be added to or changed in the future without having to completely rewrite the software. Throughout the planning process, consideration must be given to how the enterprise fits together, and what might be needed in the future.
- Open Database Connectivity (ODBC) is important to make the data more sharable.
- Communication is important to consider and assess the future needs of all stakeholders (i.e., no stove piping).

# Washington State Department of Transportation

## Agency Background

Washington State DOT (WSDOT) engages in a biennial budgeting exercise. While WSDOT manages programs across several modes and types of work, the performance-based resource allocation process described below applies only to the highway construction program. Management of other functions may reflect a degree of performance-based thinking, but organizational procedures, data, and analytic tools are the most fully developed and robust for the highway construction program.

## History

Washington State Department of Transportation (WSDOT) began working on a new, performance-based capital programming process in 1990. By that time it had become clear that an emerging set of policy issues at the Federal and state levels would confront WSDOT and Washington's Transportation Commission, and changes to the capital programming process would be needed. Key objectives to be met included: 1) a strong, clear connection between the programming process and the emerging policy concerns; 2) a strengthened ability to highlight and evaluate key tradeoffs in funding projects; and 3) incorporation of greater flexibility and accountability in recommending projects.

A study sponsored by the State's Legislative Transportation Committee in 1991 was charged with reviewing the existing process from both a technical and a policy perspective, and recommending changes. The resulting recommendation was a revised capital programming process that achieved: 1) a more clearly defined capital program structure; 2) clearer relationship of the programming process to policy goals and objectives; 3) a more flexible process for allocating resources to competing requirements for funds, as well as greater coordination with other agencies and stakeholders; 4) application of rational methods in ranking projects by priority, including the use of benefit/cost measures where appropriate; 5) consideration of the full range of transportation solutions to a problem; and 6) more complete and timely communication of policy objectives, resulting programs and projects, and performance measures. Enabling legislation was enacted in 1993, and WSDOT worked with its Transportation Commission, the legislature, the executive-branch Office of Financial Management, and other stakeholders to implement the new process.

Refinement of that process through extensions to meeting new transportation program needs, accommodating new funding sources, and updating analytic methods and decision criteria has continued to the current day. This example is included because of its comprehensive application of performance-based concepts going well beyond simply an alignment of

performance and cost data. Moreover, Washington State government has since embraced the performance management concept across all agencies, encouraging other levels of government to follow, as well.

## State of Washington Performance-Based Initiatives

### *Priorities of Government*

Since 2002 the Washington State government has relied on its Priorities of Government (POG) approach as a way to apply results-based thinking to inform budgeting.<sup>17</sup> The program encompasses all state agencies, covering a broad set of activities in areas such as education; public health and welfare; economic, cultural, and recreational opportunity; mobility of people, goods, and services; natural resources; public safety; and a results-oriented ethic across state government. With the information generated through POG, budgets can be better related to outcomes rather than being based incremental changes to individual agency funding. Hallmarks of this approach are as follows:

- Within the POG context, state government is viewed as a single enterprise rather than as a collection of individual agencies. This allows participants to focus on strategies that best meet objectives, rather than on budgets of particular agencies.
- The underlying objective is to identify strategies of Washington State government that will best apply taxpayer dollars to achieve results that are most important to its citizens.
- The approach centers on interactions between two teams.
  - A Guidance Team comprises executives from state and local government, and private-sector and non-profit organizations.
  - A Result Team comprises knowledge experts from different agencies, led by staff from the Governor’s budget or policy office.
- The teams meet periodically to develop results-based, citizen-oriented “purchase plans.” The purchase plans identify activities to be “bought” with budget money that will maximize results using strategies demonstrated to be effective, irrespective of potential funding source and statutory restrictions. The purchase plan is therefore not an actual budget, which would be affected by financial constraints, statutory restrictions, and dedicated funding. Rather, it is a plan that identifies the best solutions, and helps identify constraints and impediments that state agencies can work toward mitigating or eliminating.
- In conducting this exercise, the Result Team is asked to address several questions within its field: What are key indicators of success? What would you identify as the proven, or most promising, strategy for achieving success? What do experience and research indicate are

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<sup>17</sup> “Priorities of Government,” Office of Financial Management, State of Washington, On-line. <http://www.ofm.wa.gov/budget/pog/> : accessed May 2, 2008; reconfirmed Jun. 9, 2009.

factors most critical to success? What changes in practice or cost would maximize positive results delivered to citizens? How should progress be measured?

- While budget constraints on individual agencies are not considered at this stage, each team is given a dollar allocation of state funds (with no regard to funding source) to keep the exercise realistic fiscally.
- Citizen workshops also are held by the Governor to measure progress in areas such as health care, the economy, transportation, and education.

The POG performance areas that define key results expected by citizens from their government are as follows:

- Improve student performance;
- Improve the value of postsecondary learning;
- Improve the health of Washingtonians;
- Improve the security of Washington’s vulnerable children and adults;
- Improve the economic vitality of businesses and individuals;
- Improve statewide mobility of people, goods, and services;
- Improve the safety of people and property;
- Improve the quality of Washington’s natural resources;
- Improve cultural and recreational opportunities throughout the State; and
- Strengthen the ability of state government to achieve results efficiently and effectively.

With respect to the Mobility objective that is the focus of WSDOT’s activities, WSDOT managers, working with the Governor’s office and the Legislature, work to bring the findings of the POG exercise in alignment with the priorities that are reflected in Legislative policy and the actual programming and budgeting process that are described below.

### *Legislative Policy Objectives*

The policy goals for the transportation program have been defined by the legislature as follows (Revised Code of Washington, RCW 47.04.280):

- **Preservation** – To maintain, preserve, and extend the life and utility of prior investments in transportation systems and services.
- **Safety** – To provide for and improve the safety and security of transportation customers and the transportation system.
- **Mobility** – To improve the predictable movement of goods and people throughout Washington State.

- **Environment** – To enhance Washington’s quality of life through transportation investments that promote energy conservation, enhance healthy communities, and protect the environment.
- **Stewardship** – To continuously improve the quality, effectiveness, and efficiency of the transportation system.

The statute mandates that these goals be “the basis for establishing detailed and measurable objectives and related performance measures.” It calls upon the Office of Financial Management (OFM) to establish objectives and performance measures for WSDOT and other state agencies with transportation-related responsibilities, and to submit biennial reports on transportation objectives and performance measures to the legislature. OFM has prepared a 2007 Draft Baseline Report as the initial effort under this requirement, to allow the legislature to review and comment on performance measures. In some cases, explicit performance targets have been established through the State’s Priorities of Government program. In other cases, trends are monitored and discussed in relation to the legislative goals.

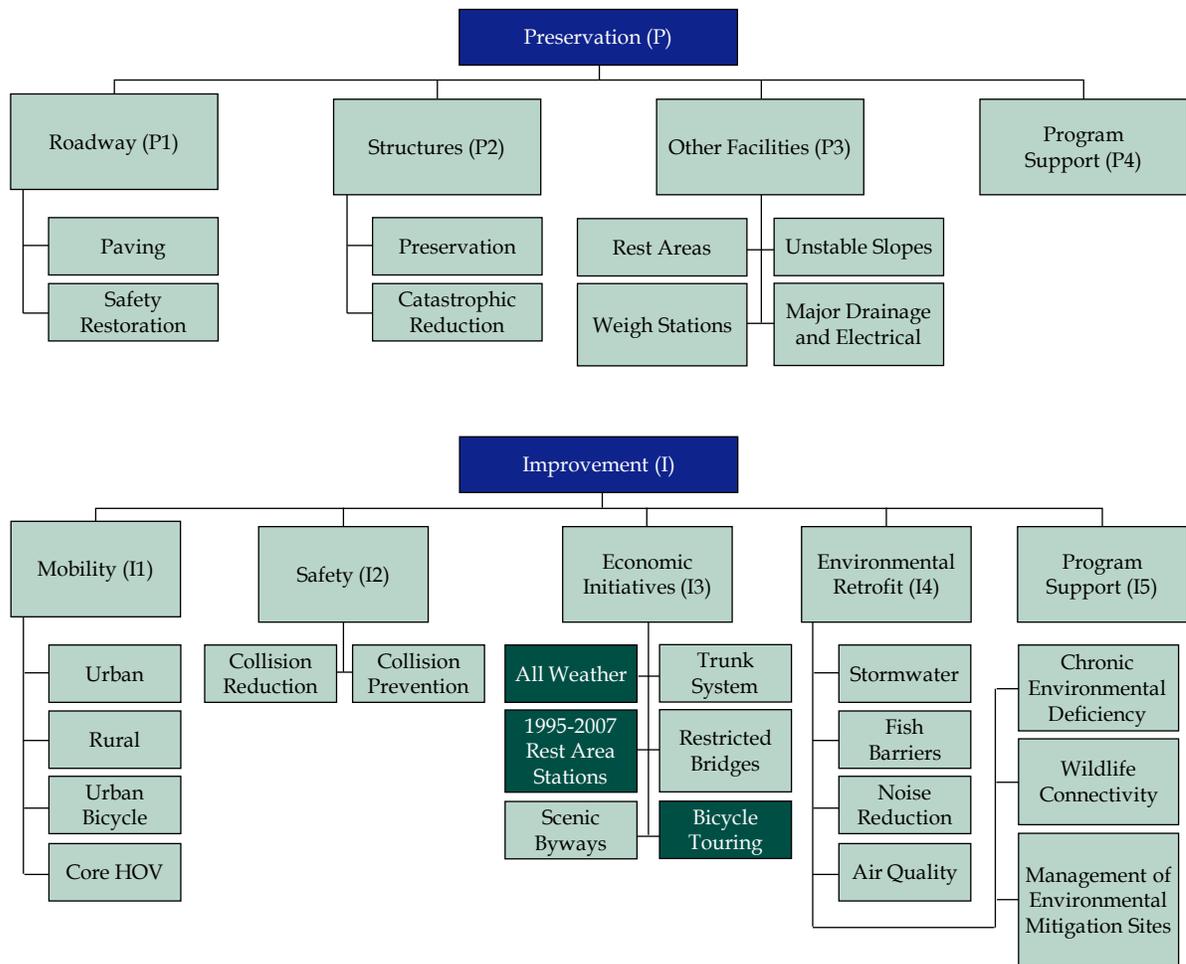
## **Programming and Resource Allocation**

### **Resource Allocation Framework**

#### *Program Structure*

WSDOT’s capital programming structure for the highway construction program was thoroughly revised in the 1990s initiative and is updated from time to time to reflect new priorities and programs. It has two high-level components, Preservation and Improvement, as shown in Figure 22.

**Figure 22. WSDOT Highway Construction Program**



Source: Washington State Department of Transportation.

The Preservation and Improvement programs are each divided into subprograms and categories of projects. This breakdown enables projects within each category to be compared to their peers during prioritization, using analytic methods and data appropriate to each category. The program structure also facilitates relating projects by category to corresponding policy goals, enabling a better understanding of the relationships among program expenditures and changes in system performance to meet goals and objectives.

### ***Project Prioritization and Selection***

Project prioritization and selection entail several steps to identify needs or problems, identify alternative solutions, scope the preferred solution in terms of costs and potential impacts on performance, prioritize projects within each category, and build a program that responds to the goals above while meeting funding constraints – not only the dollars available, but also the

eligibility requirements of each funding source (WSDOT projects are funded by three separate state funding mechanisms, each with its own project and program eligibility rules, in addition to Federal funds and some local funding). Long-term needs are identified in the Washington Transportation Plan. Determining the more detailed and specific needs for budgeting and resource allocation is described below.

Priority arrays are the mechanism by which needs are identified for solution by a project. The arrays derive from the highway construction program structure, but are more detailed. For example, pavement preservation needs are identified in a Pavement Management priority array in the following groups: Chip Seal (Due), Chip Seal (Past Due), Asphalt Concrete Pavement (ACP) (Due), ACP (Past Due), and Concrete. The designation “Due” means that, according to data and procedures from WSDOT’s pavement management system (PMS), the pavement has reached a technical condition level where resurfacing can be performed on a lowest life-cycle basis, as required by Washington State law governing the programming process (RCW 47.05). “Past Due” means that the pavement is still within a lowest-life-cycle cost range for resurfacing, but has declined somewhat. If the pavement continues to decline, the defined resurfacing may no longer be technically and economically viable, and more substantial repair or replacement may be needed, which is not economical on a life-cycle basis. The “technical measure” of pavement condition that underlies determination of pavements “due” for resurfacing. It also underlies the performance description of “fair or better” pavements that is provided to the legislature and published in WSDOT’s publicly distributed “Gray Notebook” performance report. The explicit consideration of performance measures in generating needs and priorities makes this a performance budgeting process. The specification of materials type for resurfacing asphalt pavements is an internal WSDOT control intended to avoid “creaming”: i.e., nominally meeting program numerical targets (such as miles resurfaced) by “cutting corners” such as placing ACP overlays that are too thin. Criteria for use of chip seal versus ACP resurfacing are based on traffic volume.

Priority arrays for the other program categories serve a corresponding purpose; however, the methods used by WSDOT to develop each array vary from category to category, for several reasons. One is the different type of work addressed by each subprogram and category, which entail different analytic methods and data. Another is that some methods for priority array development have been brought to a more refined, systematic level of development, including support by sophisticated management systems such as the PMS. Certain arrays also may benefit from years of prior data collection and analysis. Some tasks in array development have received more attention: e.g., WSDOT developed a numerical procedure to identify and prioritize locations of potentially critical slope instability. In any case, all of WSDOT’s “prioritization methods can benefit from an increased use of information management tools, as well as continuous review and improvement to gain the benefit of experience.”<sup>18</sup> Moreover, all

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<sup>18</sup> Prioritization Process for State Highway Projects. Washington State Department of Transportation. Submitted to the Legislative Transportation Committees of the Senate and the House of Representatives, February 2004.

of the priority arrays apply the respective performance measures in their underlying calculations of needs and priorities.

Pavement projects discussed above are identified on a first cut using the PMS. Regions (analogous to districts) verify these and make certain adjustments to rationalize the length of the proposed project. Projects in other categories are initiated through a project scoping process that defines the proposed scope of work, cost, and schedule of each project. WSDOT's Systems Analysis and Program Development Office (SA&PD) issues specific guidelines on how projects are to be scoped within each category, and what criteria must be satisfied. Maintaining proper attention to: 1) the projected performance impacts; and 2) the selection of the most cost-effective solution to provide these impacts, for each project tends to be a focus of discussions between SA&PD and the WSDOT regions before approval is given to the scoped project.

WSDOT is required by state law (RCW 47.05) to analyze project priorities in certain ways. Generally speaking, Preservation projects should be consistent with a minimum-life-cycle approach to maintaining these assets; Improvement projects should be consistent with economic efficiency using benefit/cost analysis. There are distinctions and adjustments by category, but this is the general thrust of the legislation and WSDOT's programming implementation. The analytic tools underlying the priority arrays, together with the guidelines and criteria established by WSDOT for project definition and scoping, help to achieve these objectives. Once priority arrays are populated with projects having an approved scope, priorities can be computed using analytic methods developed for each program category. Financial guidance on the availability of funding for the highway program can then be overlaid on the list of prioritized projects by category to build a recommended program and budget.

### *Performance Measures*

The proposed performance measures are listed in Table 9; in the OFM report these are accompanied by comments on current status.

These measures are reporting-type measures for communication to the legislature. Many are backed by technical measures (e.g., pavement structural condition, rutting, and roughness; bridge ratings; congestion delay times; collision statistics) that are obtained by system monitoring and inspection and are used in management or other analytic systems and quantitative prioritization procedures.

**Table 9. WSDOT Proposed Performance Measures**

Goal	Objectives	Proposed Performance Measures
Preservation	<ul style="list-style-type: none"> <li>Extend the useful life of existing facilities, systems, and equipment</li> </ul>	<ul style="list-style-type: none"> <li>State Highway Pavement – Percent of state highway pavement in fair or better condition.</li> <li>Local Roadway Pavement – Percent of city and county roadway pavement in fair or better condition.</li> <li>Bridges – Percent of state, city, and county bridges in fair or better condition.</li> <li>State Highway Maintenance – Percent of targets met for state highway maintenance levels.</li> <li>Ferry Vessels and Terminals – Percent of state ferry terminals in fair or better condition. (Future reports to include county terminals and state and county vessels.)</li> </ul>
Safety	<ul style="list-style-type: none"> <li>Reduce fatalities and serious injury collisions</li> <li>Reduce risks and ensure security</li> </ul>	<ul style="list-style-type: none"> <li>Traffic Fatalities – Number and rate of traffic fatalities per 100 million vehicle miles traveled.</li> <li>Collision Reduction – Percent reduction in injury and damage before and after safety improvements.</li> </ul>
Mobility	<ul style="list-style-type: none"> <li>Address congestion</li> <li>Maximize operational performance and capacity of existing systems</li> <li>Increase the reliability of travel for goods and people</li> </ul>	<ul style="list-style-type: none"> <li>Travel Times – Travel times on the most-congested state highways (commuter routes around Puget Sound).</li> <li>Hours of Delay – Hours of delay on the most-congested state highways.</li> <li>Trip Reliability – Reliable travel times on the most-congested highways around Puget Sound.</li> <li>Commute Modes – Percentage of commute trips taken while driving alone.</li> <li>Incident Response Times – Average length to clear major incidents lasting more than 90 minutes on key highway segments.</li> </ul>

**Table 9. WSDOT Proposed Performance Measures (continued)**

Goal	Objectives	Proposed Performance Measures
Mobility (continued)	<ul style="list-style-type: none"> <li>Reduce bottlenecks and chokepoints</li> </ul>	<ul style="list-style-type: none"> <li>Freight – (placeholder – measure is still being developed).</li> <li>Passenger rail – Percent of trips and ridership on state-supported Amtrak Cascades.</li> <li>Transportation-Efficient Land Use – (placeholder – measure is still being developed).</li> </ul>
Environment	<ul style="list-style-type: none"> <li>Protect habitat</li> <li>Reduce degradation of air and water quality</li> </ul>	<ul style="list-style-type: none"> <li>Fish Passage – Number of culverts fixed and miles of stream habitat opened up.</li> <li>Stormwater Quality – Number of WSDOT stormwater treatment facilities constructed.</li> <li>Air Quality – Tons of greenhouse gases produced statewide.</li> </ul>
Stewardship	<ul style="list-style-type: none"> <li>Improve program and project delivery</li> </ul>	<ul style="list-style-type: none"> <li>Capital Project Delivery – Percent of Nickel and Transportation Partnership Act (two state transportation funding statutes and mechanisms) capital projects completed on-time and within budget.</li> </ul>

### *Targets*

WSDOT has developed considerable experience on setting targets and tracking and reporting progress toward meeting these targets. Since target-setting is a key focus of this study and the discussion is somewhat lengthy, the description of performance targets is presented separately below in the section entitled “Target Setting.”

### *Resource Allocation*

Once the budget is approved, funds are distributed to the regions. If the budget has changed from the recommendation submitted by WSDOT as the result of legislative action, the distribution of program funding will be adjusted accordingly. WSDOT distributes funds to regions on the basis of *performance* as evaluated on a statewide basis – there are no “set” allocations or “guaranteed” levels of funding. In fact, WSDOT avoids the use of the word “allocation,” since it implies “entitlement.” Furthermore, guidance to the regions specifies that the objective of this performance-based resource allocation is NOT to spend a specified number of dollars, but rather *to deliver the committed level of performance in the most cost-effective way*. If a region meets its performance targets (or commitments) using less money than was

budgeted, it returns to SA&PD for redistribution. This mechanism restrains “gilt edging” and maintains cost-effectiveness of the program overall.

## **Priorities and Tradeoffs Among Goals**

Notwithstanding the several processes and sources contributing to transportation goals in Washington State, WSDOT makes an effort to view Executive and Legislative goals as a consistent framework for guidance. There are no formal distinctions in the priorities of individual goals, although it is generally understood that preservation and safety of the transportation system are paramount concerns of the governmental leadership and the public at large. There is one instance where public discussion is still ongoing as to the policy implications of a particular goal: congestion reduction. The issue is whether the intended result of this goal leans more to improved mobility or to economic development.

While alternative solutions are considered in project development and review, tradeoffs among programs are not yet formally considered either in program development or in reporting. “Tradeoffs among programs” in this context refers to a structured analytic comparison of the investments that are proposed in each program and their resulting benefits and other impacts. This comparison could be used, for example, to show whether shifting dollars from one program to another would yield a preferred result (in terms of adjusted benefits and impacts) that would better support stated policy goals and objectives. Current impediments to considering program tradeoffs in this way are discussed below. Regarding statewide reporting, WSDOT’s periodic reports under the POG initiative each focus now on “purchases” and “results” by individual goal, but not in terms of tradeoffs among goals. Similarly, the Department’s Gray Notebook reports accomplishments, but does not consider potential tradeoffs among programs.

## **Principles Guiding WSDOT**

### *Implications of a Performance-Based Approach*

WSDOT has found that a performance-based approach to budgeting and resource allocation influences thinking over time, and that “success is contagious.” Some implications of its method are as follows, in some cases pointing to the need for further work.

- Maintaining a focus on cost-effective performance forces managers and staff to think differently. Not only must they recognize a need or problem, but they also must evaluate the most appropriate solution, and be prepared to defend that solution during scope approval. One illustration of this process occurred following the decision to use chip seals on a larger number of roads, which ran counter to a tendency by to employ hot mix asphalt (ACP). Chip seals were shown to perform satisfactorily on roads with traffic volumes less than 5,000 vehicles per day, at less than one-third the cost of ACP.
- Changes in statewide seismic design criteria resulted in the need for bridge seismic retrofits to withstand a higher horizontal acceleration. Moreover, additional areas of liquefiable soils were identified throughout the State. The net effect of these changes was to add more

than a billion dollars to the bridge retrofit program, a prohibitively large increase. Rather than adopting blanket standards for the retrofit program, WSDOT approached the question on a performance basis: Where would seismic protection for bridges be most important? It established goals of access to emergency response supplies and ability to move them where and when needed. It consulted with emergency management agencies, identified the locations of airports and logistics centers that would be used following an earthquake, and defined emergency routes on which bridges would receive the higher-standard seismic retrofits first.

- In a similar manner, the need for a resilient freight system has resulted in the definition of priority corridors for investment.
- In examples like this, WSDOT might be accused of not “following standards” or “bringing assets up to standard.” WSDOT disagrees with this characterization and recasts it as follows: Standards are being maintained, but the real questions are: Which facilities must be brought up to standard first? In what order must the others, and how much can be spent each year? As noted by SA&PD, “tight money is helping change everyone’s outlook.”
- To illustrate the contribution of cost-effectiveness to performance-based satisfaction of goals, WSDOT cited the problem of head-on collisions on rural highways. Whereas a “typical” solution might have considered the installation of centerline guardrail (an expensive project for 1,000 miles of highway), WSDOT found that crashes decreased with the installation of centerline rumble-strips, with an estimated benefit/cost of more than 100 to 1. This example illustrates the encouragement of low-cost solutions to safety and other problems. It is being achieved through a combination of “grabbing the low-hanging fruit” plus greater enforcement, at a cost less than what previously “typical” capital projects would have entailed.
- Critical to promoting and expanding successful examples such as those above, however, is the need for managers and engineering staff “to get performance-based thinking” in terms of outcomes and benefits to costs. WSDOT is mounting a team effort to attain this, involving agency executives, managerial and technical staff, and SA&PD.
- Performance-based budgeting and management also reveal underlying policy issues that require dialogue among stakeholders to resolve. The specific example concerns mobility versus congestion: Which of these needs should be the focus of WSDOT’s program? The more urbanized Western Washington sees the critical problem as congestion, which triggers growth-management actions and limits on further development. Western Washington thus supports congestion-relief projects and, therefore, programming methods and criteria that promote these projects. Rural Eastern Washington needs greater mobility to support its agricultural and other industries, including access to transshipment locations. For the time being, WSDOT is addressing these dual needs through congestions-relief mobility projects in the West and economic-vitality mobility projects in the East. At a more general level, however, the issue will persist, since continual updating of priorities, criteria, and performance measures can influence the attention given to one objective or the other. Nonetheless, WSDOT feels that it is not only valuable to have this conversation among

stakeholders, but also that the policy level is the appropriate place to deal with this type of issue – rather than debating the merits of specific projects or performance measures.

### ***Maintenance Quality Assurance***

While the focus of this description has been on the highway construction program, WSDOT has developed performance-based management approaches in other functions. WSDOT has been among the national leaders in performance-based approaches to highway maintenance management. Its Maintenance Accountability Program (MAP) was recognized as an innovative implementation of performance concepts in terms of maintenance levels of service, and was embraced by WSDOT and the legislature as an effective tool for monitoring, budgeting, and reporting highway maintenance status, needs, accomplishments, and costs.

### **Support by the Office of Financial Management**

In addition to the Baseline Report discussed above, the OFM assists in the development and evaluation of transportation programs and budgets through the issuance of transportation budget instructions each biennium. These instructions deal with factors important to performance-based budgeting, including the requirement to provide copies of, or links to, strategic and other long-range plans (such as modal plans) to accompany the WSDOT budget submittal, the need for business plans for proprietary funds, and the use of agency-specific performance measures where needed.

### **Improving the Process**

Several examples of continual process improvement have already been given in the section entitled “Principles Guiding WSDOT.”

## **Target Setting**

### **Context**

Target-setting within the WSDOT capital programming approach is somewhat involved, in that it must account for broad policy goals and objectives, external reporting, and internal programming needs. WSDOT therefore speaks of several types of targets and related performance measures: e.g., internal versus external, aspirational versus specific, and formal versus informal or “understood.” Moreover, what are understood to be “targets” are established through several processes and therefore must be coordinated across several sources: e.g., WSDOT’s long-range planning process (LRP), its biennial Strategic Plan, the Governor’s GMAP, the Attainment Report submitted by OFM to the legislature, the Federal Stewardship Report, and the Washington State Quality Award (a Baldrige process). The approach is thus to apply a common set of metrics appropriate across these activities, and to work toward consistency among them. Some reports may display as many as 100-200 measures.

WSDOT’s experience is that target-setting requires a **solid history** of performance data as well as managerial comprehension and appreciation of that data. Managers must have the ability to understand transportation system behavior – i.e., “what the data are saying” – and to discern what they can or cannot control. It also is important that performance measures not only portray accurately the behavior they purport to represent, but also that they can be practically applied within a performance-based programming and budgeting process. For example, a common nationwide measure of pavement condition is the International Roughness Index (IRI). While the IRI captures an aspect of pavement performance important to road users, it is not easily related to program investment needs. By the time the IRI has deteriorated, damage to the pavement’s structural integrity has already occurred – it is too late to invest in economical solutions. WSDOT therefore tracks other measures of pavement condition that give a better indication of impending loss of structural integrity, enabling corrective action to be taken more efficiently. Also, WSDOT relies on pavement maintenance to sustain a good ride as well as good structural condition at low-cost. This preventive approach is likewise not well represented through IRI, but can be managed through other performance and work accomplishment measures.

The Governor may issue a target as a matter of public policy, particularly aspirational targets (e.g., to reduce highway fatalities due to highway conditions to zero). More specific program targets established through the Governor’s POG program are often the result of a negotiation. This negotiation considers the performance history related to a proposed target, and the needs of various stakeholders. Targets may therefore be somewhat arbitrary, often reflecting a number that is felt to be achievable (based on the performance history and knowledge of current and future costs of actions) as well as desirable and efficacious (based upon stakeholder needs and knowledge of what can be attained through current methods and technology). Meeting a single external target may entail WSDOT’s managers defining and tracking multiple internal performance measures, which tend to have “understood” targets, to ensure that the causes underlying system behavior are identified, accounted for, and addressed through actions that promise to be effective.

Discussions with the Legislature occur at a different level. Legislative members are more concerned with individual projects than with program targets per se, and the Legislature does not play a specific role in program-level target-setting. The Legislative discussions regarding performance focus instead at a higher level. They treat performance targets as aspirational goals rather than as operational indicators, without attributing any relationship between specific targets and program dollars. This situation may change, however, as financial pressures on the program increase.

The primary responsibility for translating long-term goals to short-term or “incremental” goals, objectives and targets thus falls to the Department of Transportation, in consultation with Executive and Legislative members and staffs. The process centers on how to set and describe these incremental milestones, how to communicate them to the public, and what legal liability the State may incur by promoting these short-term targets publicly. WSDOT managers may also consider alternatives and adjustments in the engineering solutions to problems, in the methods of service delivery, and in the construction materials and techniques to be used. These options help to achieve stated targets within current funding and other resource constraints,

and thus maintain consistency between short-term program accomplishments and long-term, aspirational goals. Relevant issues are illustrated by two examples below.

### **Example 1: Long-Term Goals versus Short-Term Measures**

The first example is posed by a long-term safety goal of “zero deaths” on Washington’s highways by 2030. Among issues to be resolved are interpreting what “zero deaths” means, identifying the degree of control WSDOT can exercise in reducing current fatalities, and identifying actions that are both effective and technically and fiscally feasible. WSDOT’s approach to these issues are summarized as follows:

- The goal of zero fatalities is an important aspirational one that captures the public purpose well and is easily understood. From a practical perspective, the department and other public agencies can control several factors that help reduce fatalities (e.g., better road design, installation of more effective safety and traffic guidance features, elimination of road hazards, driver education programs, more police enforcement), but it cannot control all of them.
- A practical translation of this goal would therefore be to set a target of, say, 1.0 fatalities per 100 million vehicle miles traveled (100MVMT). This target is achievable given current and projected levels of funding (WSDOT is already close to meeting this target), and it is supported by corresponding actions at the Federal level and by other state DOTs. This practical interpretation is further supported by degree-of-control and feasibility arguments based upon demonstrated experience. WSDOT is now able to reduce traffic deaths by nine per year. To reach a goal of literally zero deaths by 2030 would require a reduction of 25 fatalities per year.
- WSDOT further recognizes that the essential goal is to reduce fatalities, not necessarily to eliminate all accidents. This allows a focus on cost-effective solutions that yield a high rate of return in terms of reducing fatal and serious-injury crashes. For cost-effectiveness, however, the locations and causes of fatal and serious-injury accidents must be known. WSDOT relies on a GIS-based accident reporting system, supported by descriptive accident data provided by police, that enable WSDOT managers to identify where serious safety problems are, what are driving fatal and serious injury events, and what might be the best solution. (WSDOT’s Transportation Data Office heads a Collision Report Committee that provides uniform accident reporting across the State.)
- Based upon these data, WSDOT can pursue cost-effective solutions that provide the “biggest bang for buck” in addressing the targeted goal. In the example above, WSDOT’s analysis showed that many fatal accidents are caused by head-on collisions on undivided highways. The GIS reporting system allowed WSDOT to pinpoint those highway locations where the greatest concentration of these crashes, or of vehicles leaving the road after crossing the opposing lanes, occurred. Rather than installing relatively expensive centerline barriers, WSDOT tried more economical centerline rumble strips. The result was the reduction in these crashes with a benefit-cost ratio of greater than 100-to-1.

## Example 2: Pavement Preservation

Washington State manages almost 19,000 lane miles of paved roads of asphaltic (hot mix or bituminous surface treatment) or Portland cement concrete surfacing. State law (RCW 47.05) requires that the road network be preserved on the basis of lowest life-cycle cost. Using its pavement management data and life-cycle cost analyses, WSDOT has translated this policy stipulation to a technical threshold: Pavements should be rehabilitated when they are in “fair” condition to satisfy the minimum long-term cost criterion. “Fair” condition is represented by a score of 50 out of 100 with respect to Pavement Structural Condition (PSC), Pavement Rutting Condition (PRC=50 corresponds to a rut depth of 10mm), and Pavement Profile Condition (PPC=50 corresponds to a roughness of 190 in/mi IRI). The Washington State Pavement Management System (WSPMS) predicts when pavements will reach this minimum-life-cycle-cost threshold for rehabilitation, based upon data collected during annual pavement condition surveys. The year in which the pavement is due to be rehabilitated is referred to as its “due” year. WSDOT’s first priority is to rehabilitate “due” pavements; its second priority is to rehabilitate “past due” pavements if they have not been able to be repaired in their due year.

It is important to recognize that the identification of “due” pavements is not based upon an arbitrary engineering determination. Rather, it is the result of an analysis of the most economically-efficient point at which a pavement should be treated. Preserving a pavement in its due year serves the public interest in that taxpayer dollars are being spent in the most efficient way. WSDOT performance targets for pavement preservation therefore are based upon meeting the needs to rehabilitate due pavements in as timely a manner as possible. WSDOT endeavors to rehabilitate as many lane miles of pavement as feasible in their due year, and considers options in delivery and construction technology to achieve biennial program targets. The method of establishing this performance target is policy- and data-driven and transparent to understand and communicate.

The WSPMS provides managers the information needed to evaluate current pavement performance trends and to make adjustments where needed:

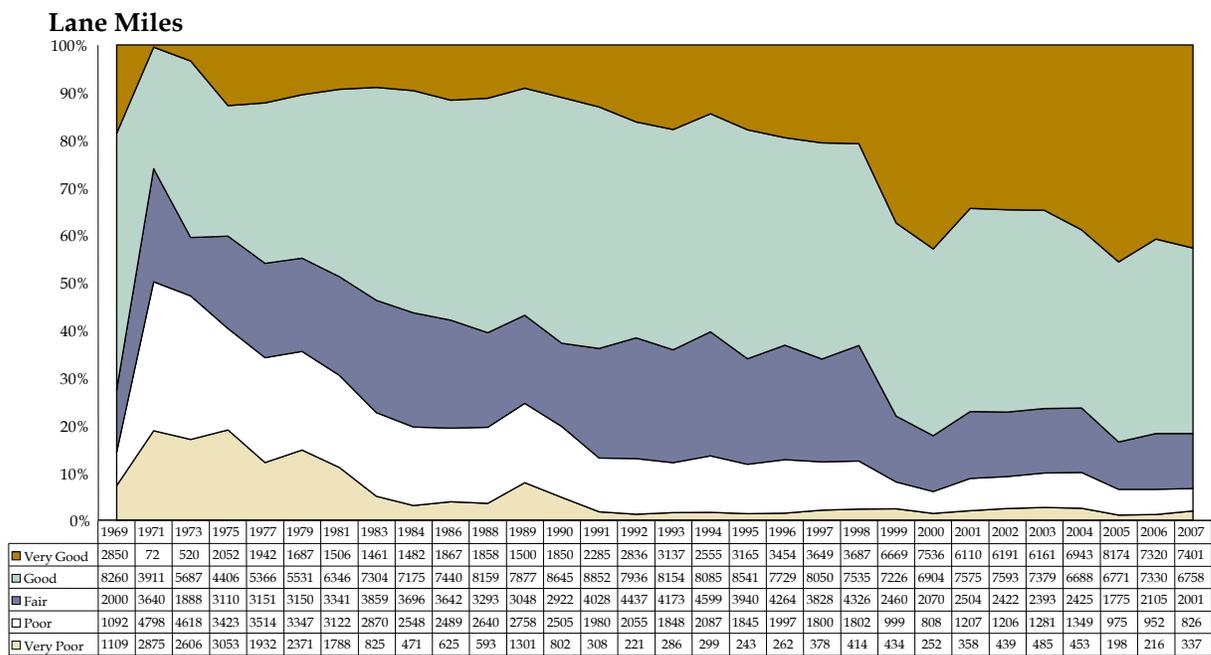
- Figure 23 illustrates historical trends in pavement condition. Two noteworthy characteristics: 1) the percentage of pavements rated Very Good has increased while the percentages of Poor and Very Poor pavements have declined; and 2) the percentage of Fair pavements has not grown (if it had, it would indicate a potential increase in work backlog in future years.)
- Figure 24 shows projected annual rehabilitation needs for hot-mix asphalt pavements through 2021 (the final bar shows needs in 2022 and beyond).
- Figure 25 compares required versus actual projected budgets for hot-mix asphalt rehabilitation through 2011. The gap between the two budget lines equals a shortfall, which is accumulated each year in the vertical bars showing a growing backlog of work.
- Figure 26 shows the corresponding growth in hot-mix asphalt paving backlog in terms of lane miles by due year through 2016.

The increasing rate of backlog growth in the next several years will present a fiscal and technical challenge to WSDOT managers. Again, recall that deferring pavement rehabilitation beyond its due year is economically and technically non-optimal. After a pavement has reached a score of 50, it begins to deteriorate more severely, and unit rehabilitation cost increases. WSDOT has therefore maintained pace for the most part with its pavement preservation targets to this point by exploiting more economical rehabilitation materials and techniques. It has developed guidelines for substituting bituminous surface treatments in lieu of hot-mix asphalt resurfacing on roads with appropriate traffic levels. The policy is to use BST alone on roads with average daily traffic (ADT) of up to 2,000 vehicles, and BST recommended on roads of 2,000 to 5,000 ADT. This policy enables the department to stretch the performance period on these lower-volume pavements, and to stretch preservation dollars for use on higher-volume roads requiring hot-mix asphalt surfacing.

### Funding Availability

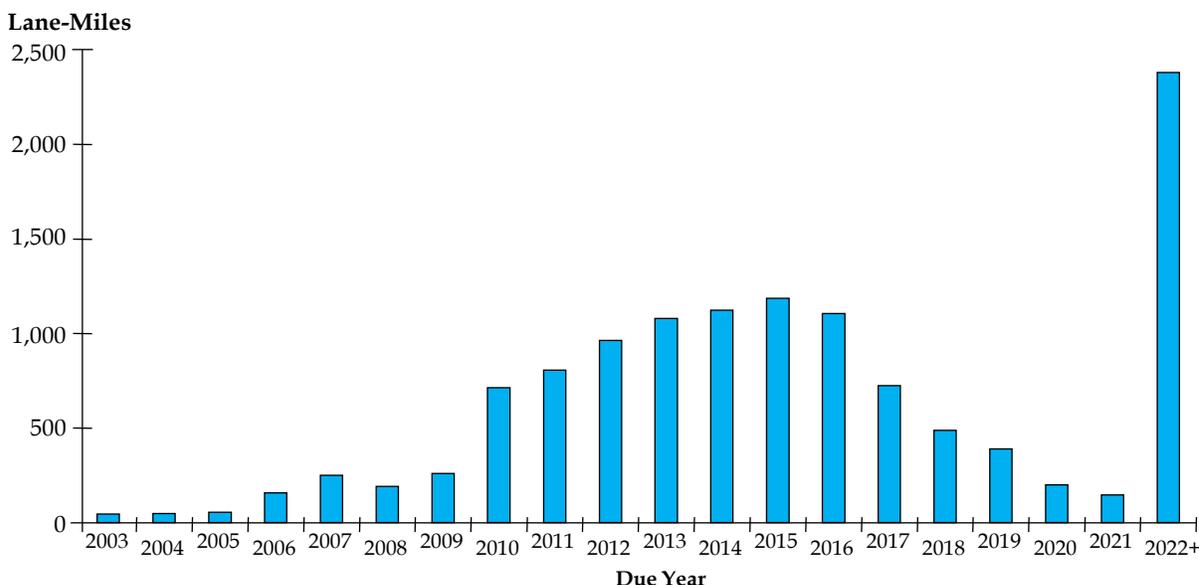
The WSDOT capital programming staff receive ballpark estimates of projected funding availability for an upcoming construction program. In turn, the planning and programming staff provide a list of Highway System Plan needs in each strategic category to WSDOT regions for project scope development. The staff work with WSDOT technical groups and regional managers to develop a list of candidate projects at a financial total that is double the projected available funding. This provides a sufficient number of candidate projects for internal review and prioritization, but avoids a wish-list approach and conserves valuable staff time.

**Figure 23. Historical trends in WSDOT Pavement Condition Statewide**  
*WSDOT Pavement Network Condition*



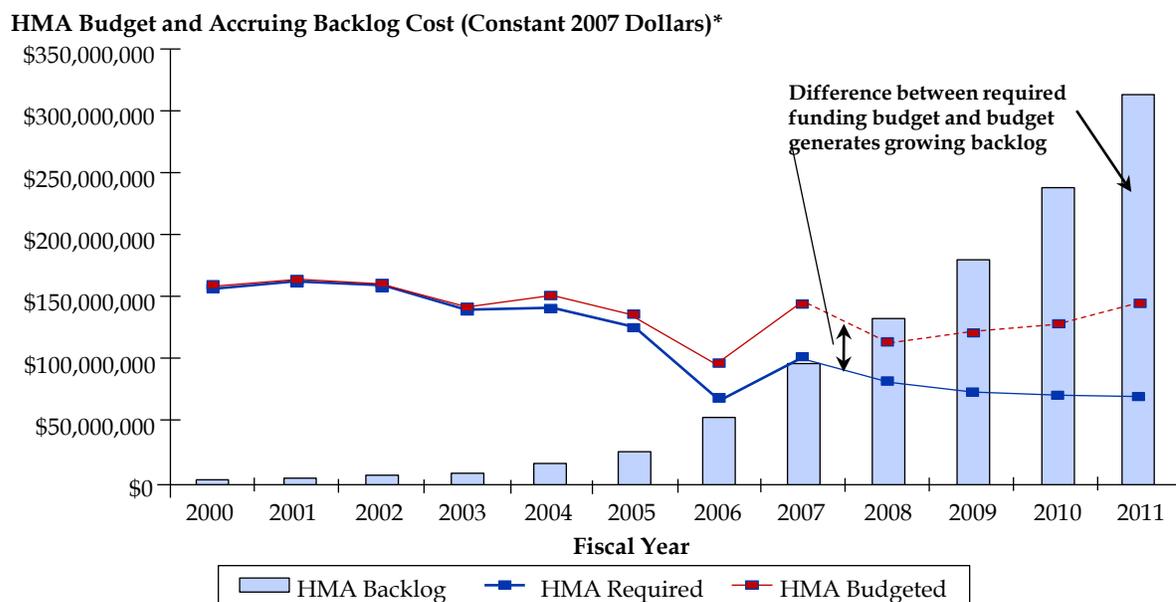
Source: WSDOT Pavement Management.

**Figure 24. Target Lane Miles of Hot-Mix Asphalt Pavement Due for Rehabilitation According to Minimum-Life-Cycle-Cost Criterion**



Source: WSDOT Pavement Management.

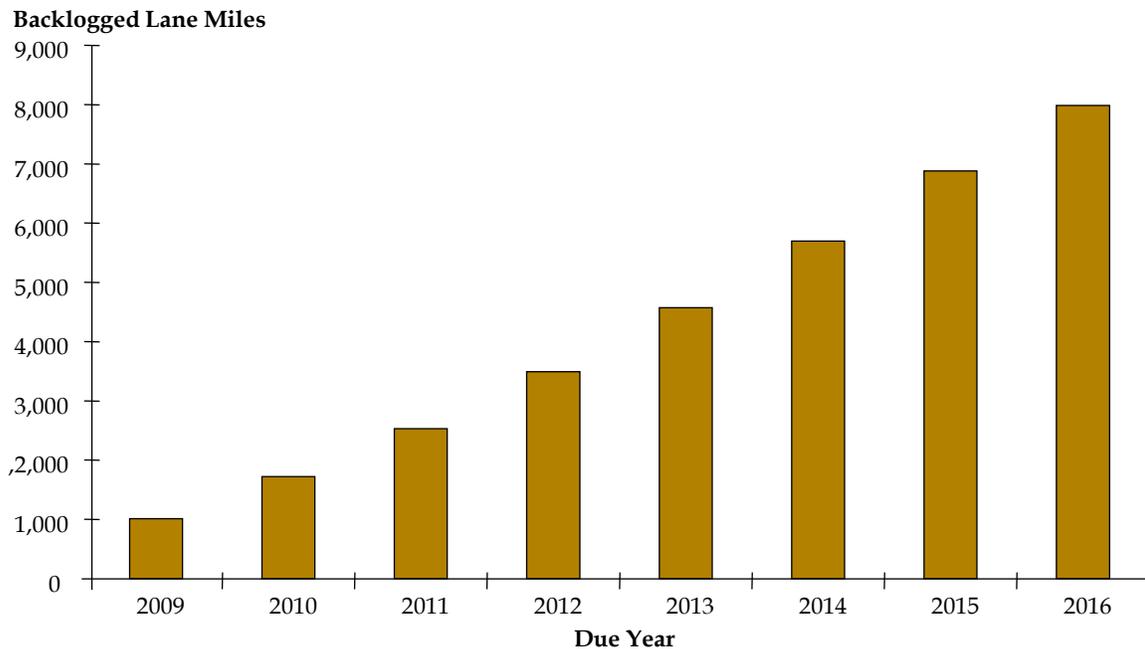
**Figure 25. Projected Budget Shortfall and Accruing Backlog Cost for Hot-Mix Asphalt Pavement Rehabilitation**



\* Note: All dollar amounts were adjusted using the Construction Cost Index (CCI)

Source: WSDOT Pavement Management.

**Figure 26. Projected Cumulative Backlog  
in Asphalt Pavement Rehabilitation**



Source: WSDOT Pavement Management.

## Scenario Analysis and Tradeoffs

While alternative solutions are considered in developing candidate projects, broad-based scenario analyses and tradeoffs are not considered in program development or performance reporting. With respect to program development, WSDOT has found that it is difficult to convince the regional managers to devote the effort needed to provide the performance-based information that would be needed to conduct these types of analyses. Gathering of the data that would be necessary to do this is part of this effort. The lesson is that the programming and budgeting process cannot be too time consuming.

## Public Input and Communication

Interactions with the Executive and Legislative branches have been described earlier. Interactions with other stakeholders vary by type of project:

- Preservation of pavements and structures tend to be routinely executed projects that generally involve little or no public involvement.
- Major improvement or replacement projects do have significant public outreach and input regarding the characteristics of the transportation corridor that will result, and environmental impacts. These matters are addressed in the route development and planning phase.

- Urban projects (including bicycle-related projects) also tend to have more public involvement as well as outreach to other public and regulatory agencies.

## Success Factors and Challenges

A performance-based approach to resource allocation and program management depends very heavily on several factors:

- Consistency in, and understanding of, the body of goals, objectives, performance measures, and targets that collectively enable a true performance-based approach.
- A strong data resource to support performance measurement broadly.
- The ability of managers, and the availability of analytic tools, to identify performance impacts of projects realistically and efficiently.
- An ability to communicate the fact that a project needs to improve performance to be considered meritorious.
- The ability to use performance information wisely to inform as well as control expectations among the political leadership, stakeholders, and the public.

## Data Support Systems

### General Relationships

The relationships between data systems, targets and performance measures at the Washington State Department of Transportation (WSDOT), are similar to the relationships and dependencies at many state DOTs. What drives the relationships between these systems at WSDOT is primarily the development of the Long-Range Planning process.

This case study specifically examines how these relationships function at the Office of Program Development. While the staff at this office dedicate significant time and effort to develop data systems which support targets and performance measures, it is acknowledged that some of the measures also are set by the office of the Governor. The Governor sets targets and performance measures based on past performance results, tracking the results from year to year and adjusting the targets as needed.

Within the DOT, the methods for establishing the targets and performance measures are concentrated in two areas: the Capital side, where performance measures have traditionally been used with Asset Management systems for years, and the Operations and Modal side, where the performance measures are not as clearly defined.

The Performance Measures are primarily set on a Case Study basis, using readily available data and/or identifying the minimum amount of data that should be collected in order to support

meeting established targets. Consequently, great emphasis is placed upon gathering the right kind of data to demonstrate the performance that can be achieved in the various programs for the Operations and Modal side. The more successful the DOT can be in demonstrating achieving targets to the Governor and the legislature, the more likely they will be to receive continued funding for the various programs.

The challenge is to present the data and the associated performance measures in a way that is clear and understandable to the Governor and the legislature. WSDOT’s “fish barrier removal” program is an example of how using the right kind of data to support performance measures can lead to increased efficiency in managing the migratory fish population. WSDOT funded three investigative teams of two people each, to locate culverts that were blocking the migratory fish population. The data collected from this project was then used to develop Performance Measures, which documented the increase in the amount of fish habitat that would be gained if the barriers were removed. Funds could then be spent on this program based upon detailed data and performance measures, instead of randomly distributing “blocks” of money to the program. This approach was much more appealing to the legislature who has the authority for funding the agency.

This is one of many examples which demonstrates the importance of collecting the right data and the right amount of data, to support performance measures. Performance measures can be used to monitor progress in achieving agency goals and targets, whether those targets are set internally, or externally, as is often the case within a state DOT, who has to rely on funding from the State legislature.

WSDOT has developed a lot of internal targets, but, they are somewhat reluctant to establish external targets due to political pressure. As with all state DOTs, it is advisable to demonstrate a solid performance history in a given area before attempting to develop associated targets for specific programs. The skill of setting targets is somewhat of an “art” and is not a skill readily inherent with many program managers. It takes years of experience and understanding of the programs to develop the performance measures and targets appropriately. Fortunately, the metrics used with targets are adjustable and through careful monitoring, they can be fine-tuned to meet the needs of both the DOT and the external customers, which in this case means the general public as well as the legislature and the Governor’s office.

## **Organization and Governance**

### *Data as an Asset*

There are many uses of data to support performance measures at WSDOT, especially on the capital side of the organization where data has been used with WSDOT Asset Management system for years. It is much easier to invest in data systems which support asset management. In this respect, data is considered an asset to the DOT. WSDOT acknowledged that “the management of most of their data programs is done within the IT program, with a few

independent data management programs for the Ferries, ITS and Bridge Programs.<sup>19</sup> It is becoming more prevalent for state DOTs to acknowledge that the data programs are an asset to be protected and “valued,” just as the other “physical” assets in the agency. The use of Performance Measures for target setting and resource allocation continue to enhance the value of data programs which support these measures.

### ***Data Governance Framework***

WSDOT recognizes the importance of building a sustainable data governance structure which will continue to function, beyond changes in executive leadership. One of the most important factors in making this happen is building a good working relationship between the business units and IT offices of the department. WSDOT has been on an internal mission for the last six years to create “one DOT” and this effort is still considered a “work in progress.” This effort of building partnerships between business and IT will be the foundation for supporting a more robust Data Governance framework for WSDOT.

In the mean time, in lieu of an official “Data Governance Council,” there is a set of data management practices shared throughout the department. WSDOT has a Data Stewardship Council, which was established in 1996, to address data issues across the department. They also established a Data Council in 1999, with the responsibility for setting data standards, data architecture standards, data stewardship standards, data modeling standards and a data repository. Even though this Council has been basically dormant for the last two to three years, WSDOT has been somewhat successful in mandating the use of established data collection standards, in order for other offices and divisions within WSDOT to get the necessary funds for data collection programs. Other state DOTs, without the benefit of a Data Governance Council or framework, may benefit from this approach to allocating funds based upon demonstrated compliance with established data standards and architectures.

### ***Roles and Responsibilities***

One of the outcomes of the establishment of a Data Stewardship Council at WSDOT, was the defining of two basic categories of stewardship roles: Business Stewardship and Technical Stewardship.

Many state DOTs have similar organizational structures to WSDOT, with divisions and offices that are responsible for supporting the business functions of the DOT, and also have “technical” staff to support the Information Technology (IT) operations of the department.

In the case of WSDOT, the “Business Stewards” are defined as the Executive, Managerial, and Operational stewards, while the “Technical Stewards” include the more traditional IT roles as Strategic Information and Systems Stewards, Information Architecture Stewards and Database Stewards. WSDOT also has the other extreme, where there may be just one or two people who

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<sup>19</sup> Aligning Data to Support Transportation Decision-making Peer Exchange, May, 2008.

are responsible for working with a specific data system and there is no formal “stewardship” role defined for these individuals.

While it is preferable to have a formal Data Governance council to oversee the “data operations” of the department, and to have stewardship roles defined throughout a department, many state DOTs, in lieu of this formal arrangement, may find it helpful to establish some sort of working relationship between the “business” side and the “technical” side of the organization to standardize the collection, storing, integration and reporting of data in order to meet the business needs more efficiently, ultimately addressing the concerns of both the traveling public and the state legislature.

### ***Data Standards***

WSDOT has developed data standards with a data repository, data architecture standards and common definitions which are used throughout the department. In the absence of Executive mandates to require offices and programs to start using the standards, WSDOT, as noted earlier has been successful in linking the allocation of funding for data collection programs to the requirement for collecting the data according to established standards. It would, of course, be preferable for a DOT to have a “required set of standards” which are well-known and easily accessible for all department staff in order to promote the idea of using these standards, in order to minimize costly duplication of effort in collecting and maintaining duplicate sets of data.

### ***Institutional Arrangements/Policies to Support Data Management***

The Business Stewards and the Technical Stewards at WSDOT each share in the responsibility for managing the various data programs. There is a “Data Policy” in place which is supported by senior executives and which guides the use of data and development of data systems at the DOT.

### ***Relationship to Target Setting/Decision-making***

The establishment of data standards and stewardship roles at WSDOT have made more of an impact on the quality of the data collected and used and consequently, have had a positive impact on the Target Setting/Decision-making capability of the various programs.

Through the use of established data standards, data definitions, data architectures, including the use of a relational database, WSDOT has been able to link critical information from the Pavement Management program to the Construction program, in order to reduce construction costs. Through the use of a relational database they were able to monitor and cross-check the pavement projects with the construction projects to prevent the pavement work from being completed “too early,” and then subsequently being removed due to construction work in the same area. The development of data standards and definitions facilitated the development of the relational database which is now used to monitor these and other important programs.

## **Data Sharing**

### *Institutional Arrangements/Policies to Support Data Sharing*

WSDOT does use formal “data sharing agreements” when they develop new data sources or data repositories and they always encourage “collecting the data once and using it multiple times. Data sharing agreements are an effective means for all state DOTs to minimize the added cost of collecting and maintaining duplicate data sets. Offices or divisions within a DOT can “pool funds” for projects to collect data, which can then be shared throughout the department.

### *Integration with Outside Data Sources*

Formal “data sharing agreements” also are used to some extent, for data obtained from external sources, such as other state agencies, counties and cities. Since most of the external data providers do not automatically send updates to WSDOT, there are two full-time staff dedicated to solicit data updates and to also ensure that the data is consistent with department data definitions and data modeling standards.

### *Internal/External Data Access*

Access to data internally is made available through a data warehouse, with data that is extracted from source data systems on a routine basis. A data catalog also is maintained which is open to all employees and is available through the department intranet. Metadata also is provided which contains both technical and business information about the data.

External access to data and program information is provided to the public mostly through the use of what is called the “gray notebook.” There is no public access, per se, to the data systems themselves.

## **Documentation and Reporting**

### *Enterprise Data Model*

The use of an enterprise data model is important within a DOT to document the specific data being integrated within the enterprise data warehouse and to document the relationships between the data providers in the business units and the IT staff responsible for “technical data custodianship.”

WSDOT’s Highway Construction program has been very successful in partnering staff in the business units with data analysts to build data models which link the business functions through the IT systems. A partnership such as this is key to successful maintenance of an Enterprise Data Model at any state DOT.

The IT staff at WSDOT worked with the business side to look for quick ways to model the systems, develop them where feasible and come back in two to three years to make enhancements, without having to redesign a new system. They were able to have systems

implemented within months instead of years, demonstrating the very valuable benefits of partnering IT and Business staff, in the development and maintenance of an Enterprise Data Model. While it should be noted that the actual updates to the Enterprise Data Model are traditionally done by the IT office, it cannot be completed without input from the various business units.

### ***Data Dictionaries and Metadata***

At WSDOT, the data catalog, data dictionaries and metadata is made available to all employees through the intranet. This is extremely important to ensure that all data users and data system developers are using the same information when generating reports, especially in the case of performance measures and targets, which are provided to the governor and the legislature.

### ***Change Data Tracking Methods***

In general, state DOT IT departments will have database administrators or information resource administrators who have responsibility for tracking user requested or steward requested changes to data systems and programs. These requested changes usually require approval at some level on both the business side and the IT side to ensure that department systems are not adversely affected. Tracking methods can be done through the use of a department intranet, database support applications, excel spreadsheets or other methods.

## **Technology**

### ***Data Management Systems / Business Intelligence (BI) Tools***

WSDOT has demonstrated the benefits of using BI tools, such as data warehouses, data models, and Geographic Information System (GIS) tools to minimize the cost of collection and integration of data across the various data programs. The Winter Operations application is an excellent example of how GPS technology and tools were used to collect GPS coordinate locations along a route, with a high degree of accuracy and little post processing. The data is collected by essentially “piggy-backing” on routine maintenance activities, thus, allowing the DOT to link this data to the enterprise GIS base map. Locations on the base map can then be converted between state route, milepost or x-y coordinates as needed. This makes the enterprise GIS map very flexible for supporting multiple data programs throughout WSDOT. WSDOT also is investigating using Service-Oriented Architecture (SOA) for designing and constructing future application systems, in order to make all systems more flexible for data sharing.

### **Data Systems’ Relationship to Target Setting/Resource Allocation**

While WSDOT has been successful in utilizing “data warehouse” and “enterprise data modeling” tools to support internal management processes, there is some difficulty in transferring this model for success to external performance management reporting. It is difficult for WSDOT to connect the data warehouses to performance management, and more work needs to be done to investigate how to connect the various systems to the performance

assessment and analysis side. There is still a need to have performance reporting capabilities beyond the internal processes with the ability to tie external processes to decision-making.

## Success Factors

Finally, the WSDOT Office of Program Development was able to gain support for a Data Stewardship program by starting with a smaller goal of getting support from senior executives for a “Data Policy.” This, then led to support for the Data Catalog, and through the use of the Data Catalog, they were able to implement the Data Stewardship program.

This demonstrates the value in starting with a smaller achievable goal, within a DOT, and then building on that success to achieve the greater goal of establishing a more formal Data Governance structure with formal roles and responsibilities for data stewards, stakeholders, data architects, system developers and others.

## Other

The following list summarizes key points from the WSDOT Case Study, which are applicable to other state DOTs, for the use of performance measures and targets and establishing Data Governance programs:

- Present the data and associated performance measures in a way that is clear and understandable to decision-makers.
- Collect the right data and the right amount of data to support performance measures.
- Adjust metrics as needed to assess whether targets are being met. Metrics are “changeable.”
- Build partnerships between business units and IT offices, to sustain performance measure programs and their data systems, beyond changes in executive leadership. Business stewards and Technical stewards share in the responsibility for managing the data programs.
- When possible, link the funding of various programs to the use of established data standards within the organization.
- Use Data Sharing agreements with internal and external data users, when developing new data systems to minimize the cost of data collection. “Collect the data once, use it many times.”
- Make the data dictionaries and metadata available throughout the agency for use by staff needing the information. This will help to ensure consistency in reports generated for such entities as the state legislature, who is responsible for allocating funding for the state DOTs.
- Use Business Intelligence tools for data integration, such as Geographic Information Systems, to minimize the cost of data collection and integration across multiple data systems.

- Start with a small goal to implement a Data Policy, and subsequently Data Standards. This can then lead to implementing Data Stewardship roles throughout the organization, in support of a Data Governance framework.

# Federal Performance Management Initiatives

## GASB Statement 34

### Allowed Financial Reporting Methods<sup>20</sup>

In June 1999 the Governmental Accounting Standards Board (GASB) approved Statement 34, which updated standards for state and local agencies in preparing reports of their financial condition. New provisions in GASB 34 require state and local agencies to include the value of transportation infrastructure as capital assets in these reports. For State DOTs, asset valuation and reporting are required in both a prospective sense (i.e., for assets acquired now or in the future), and in a retroactive sense (i.e., for assets acquired in the past). GASB allows two options for reporting the current financial status of transportation assets:

- A *depreciation* approach, in which annual adjustments in asset value are computed in accordance with accepted methods of depreciation based upon historical cost and service life, allowing for recapitalization of existing assets and addition of new capital stock. In applying the depreciation approach, activities that preserve the asset (i.e., that extend its useful life, but that do not provide additional capacity or efficiency) are capitalized; activities that maintain the asset but do not extend its useful life are expensed. The expenses of maintaining these assets are reported in a separate line item.
- A *modified* approach that provides an alternate method to depreciation, recognizing that most transportation infrastructure assets tend to be preserved indefinitely. The modified approach requires an agency to manage its transportation assets using a management system (such as a pavement or bridge management system) that incorporates the following capabilities: a) a current inventory of infrastructure assets, b) periodic condition assessments of these assets, and c) estimates of the amount needed to preserve these assets at a stated target condition level. The modified approach also requires that an agency

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<sup>20</sup> This section is based on material in the following sources:

Governmental Accounting Standards Board [GASB], Basic Financial Statements – and Management Discussion and Analysis – for State and Local Governments, Statement 34, GS34, June 1999.

Cambridge Systematics, Inc. et al., Phase I Report, Project SP20-24(11), Task 2 of 3: Asset Management Framework, NCHRP Web Document 41, February 2002, [http://onlinepubs.trb.org/Onlinepubs/nchrp/nchrp\\_w41\\_task2.pdf](http://onlinepubs.trb.org/Onlinepubs/nchrp/nchrp_w41_task2.pdf) [Accessed May 15, 2009].

Cambridge Systematics, Inc. et al., Transportation Asset Management Guide, RP-TAMG-1, American Association of State Highway and Transportation Officials, Washington, D.C., November 2002.

document that its assets are being maintained and preserved at or above the condition level that has been established and disclosed by the agency.

The modified approach was agreed to by GASB following discussions with AASHTO, the FHWA, and other organizations. These discussions resulted in recognition by GASB that transportation and other types of public infrastructure networks do not depreciate in the sense normally associated with equipment, for example. Rather, infrastructure systems have long, indefinite lives that are sustained through a combination of maintenance and preservation. Moreover, DOTs have for many years employed management systems that track infrastructure condition and employ decision rules to help identify needed repairs and their costs. The modified approach for infrastructure asset reporting was developed to address these characteristics of infrastructure assets and related management practices. Agencies that meet specified criteria in their asset management practices have the option of reporting eligible infrastructure assets by the modified approach, in which case these assets are not depreciated.

While GASB 34 financial reporting and performance-based infrastructure management are not synonymous, the data on transportation infrastructure assets and the reporting discipline involved in the GASB 34 financial reports can be very useful for performance-based asset management. Similarly, a good asset management approach can help develop the data needed for GASB 34 modified-approach reporting and strengthen the analytical methods needed. GASB 34 modified-approach reporting and performance-based asset management mutually reinforce each other in several areas, including creation and maintenance of an asset inventory, development of reliable cost and performance data and relationships, analytic methods such as scenario testing, performance target setting, strengthened information technology capabilities, and wider distribution and sharing of information for agency decision-making. The modified approach is the more relevant GASB reporting option for purposes of this study. The following section presumes the modified approach in its discussion of agency implementation of GASB 34.

## Status of Implementation

Comprehensive summaries of state and local government implementation of GASB 34 during the past several years are contained in *NCHRP Reports 522*<sup>21</sup> and *608*<sup>22</sup>. These reports have been reviewed for information relevant to Project 8-70, particularly the setting of performance targets and the related estimation of the cost to meet these targets, and more generally the use and value of management system information. The findings of the NCHRP studies indicate that while most agencies focus on their pavement and bridge infrastructure in developing their GASB financial reports, the performance measures and associated target values vary among DOTs. The earlier study (NCHRP Report 522, 2004) noted that different target values are used

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<sup>21</sup> PB Consult, Inc. et al., *A Review of DOT Compliance With GASB 34 Requirements*, NCHRP Report 522, Transportation Research Board, National Research Council, Washington, D.C., 2004.

<sup>22</sup> Parsons Brinckerhoff et al., *GASB 34 – Methods for Condition Assessment and Preservation*, NCHRP Report 608, Transportation Research Board, National Research Council, Washington, D.C., 2008.

for pavements and bridges respectively, and that fiscal constraints were an important factor in ensuring realistic targets (p. 7). The process of relating performance targets to required expenditures caused difficulties owing to a) management systems that were not yet mature enough to produce reliable estimates of the costs of meeting performance targets, and b) differences between an agency’s budgeting processes and management-system cost procedures versus the definitions of costs specified in GASB 34. Agencies at the time tended to focus on the first problem more than the second. They also commented that, in their view, comparisons between planned versus actual expenditures were less significant than comparisons between target versus actual infrastructure conditions (p. 8).

The later review (NCHRP Report 608, 2008) conducted workshops to understand how DOT compliance with GASB 34 had evolved and solidified, and to develop recommended practices on the basis of workshop findings. The overall findings regarding determination of condition targets were as follows (NCHRP Report 608, pages 6-7):

- Performance targets and available budget both act as drivers of decisions – they work in a reciprocal relationship in which agencies consider how performance affects cost and how available budget affects performance targets.
- In some cases legislators are involved in the target-setting process, and may enact legislation to drive the attainment of particular condition levels.
- In one instance (Ohio DOT) the achievement of condition targets is linked to managerial performance evaluations.

On the related topic of estimating the cost of achieving particular performance targets, NCHRP Report 608 found the following:

- The relationship between performance and cost was still problematic, due in part to different types of costs that are required by GASB to be compared: i.e., a project-oriented predicted cost unconstrained by fiscal year as is developed by management systems, versus an actual fiscal-year expenditure from the financial management system. “This has led many agencies simply to report the budget” (p. 8).
- The time lag between an expenditure on preservation and the period in which the benefit of this expenditure is realized creates difficulty in developing the estimate.
- Several DOTs noted that they viewed the comparison between actual versus target condition as more important than the comparison between planned and actual expenditures (repeating a finding of the earlier NCHRP study, as mentioned above).

Agencies using the modified approach observed that the need to bring together financial and technical information for the GASB reports itself caused significant interaction between asset managers and financial personnel, and was “one of the most valuable aspects of the exercise” (p. 11).

## Recommended Practices

The workshops demonstrated that calculating a performance target was a key step in implementing GASB 34 reporting. Methods of establishing targets varied among DOTs and other agencies: e.g., targets established internally by agency executive management, targets produced through an agency planning process with review by an external body such as a state transportation commission, a county board, or a city administrator, and targets set externally top-down, as by a transportation commission with subsequent enactment in state statute. Workshop findings led to the following recommended practice for setting condition targets:

*All [workshop] participants believe that condition targets are best set through a comprehensive planning process. Accordingly, a Condition Performance Measures Task Team comprising relevant agency employees should be formed to establish overall condition targets for the respective asset classes (such as pavement, bridge, etc.). Once the potential targets are established, the Task Team would propose them to the Agency's executive management, who in turn would formally present [them] to the State Transportation Commission (or County Board) for ratification. It is important for this process to be sufficiently streamlined, so that the targets once established are revisited and revised (as appropriate) on an annual or biannual basis.<sup>23</sup>*

Regarding the relationship between condition or performance targets and cost/budget/expenditures, the recommended practice was as follows:

*...most [workshop] participants believe it is imperative that the achievement of condition targets be an important agency priority. At the same time, budget realities have to be acknowledged. The key to best practice here is to have the necessary analytic tools in place to inform the process...<sup>24</sup>*

Some agencies have, or are planning to, incorporate measures of customer satisfaction within their performance measures and targets. Various techniques are used: e.g., telephone surveys, questionnaires at rest areas, and interactive web sites. The recommended practice is as follows:

*As public agencies have become more business oriented, most have felt the need to be more in tune with and responsive to their customers, the traveling public. These customers have become much more demanding in the level of service they expect from the agencies and in having their views meaningfully taken into account in decisions ranging from program priorities to project design to maintenance standards. Regarding maintenance standards, the traveling public is interested in ride quality, both for comfort and for the surprisingly significant effect smooth pavements have on fuel consumption. Accordingly, customer/client satisfaction is an important element in setting condition targets and it is recommended that*

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<sup>23</sup> NCHRP Report 608, p. 111.

<sup>24</sup> NCHRP Report 608, p. 113.

*measures of customer satisfaction, as measured by surveys, be taken into account in the [GASB] process.*<sup>25</sup>

## **U.S. DOT Performance-Based Management, Budgeting, and Accountability**

The U.S. Department of Transportation (U.S. DOT) operates in a comprehensive performance-based framework that encompasses the following elements.<sup>26</sup>

- A multiyear Strategic Plan that outlines longer-term goals, objectives, proposed accomplishments or outcomes, and anticipated challenges. The 2006-2011 Strategic Plan identifies five goal areas with associated strategic objectives: safety, reduced congestion, global connectivity, environmental stewardship, and security.
- An annual Performance Budget that relates dollars to strategic objectives in the coming fiscal year. The performance budget defines performance goals, the performance measures that will be used to track progress toward goals, and the proposed resources and effort to accomplish this work.
- An annual Performance and Accountability Report that reviews and provides agency accountability for results achieved in the completed fiscal year.
- Internal administrative mechanisms that imbue agency operational activities and culture with a “manage for performance” ethic.

Performance information is organized in a hierarchical structure that permits U.S. DOT to translate strategic goals and objectives to operational goals, objectives, and measures appropriate to each operating administration (e.g., FHWA and FTA). To provide an example, consider the goal of Reduced Congestion.

The long-term goal or end-state for Reduced Congestion as outlined in the Strategic Plan is as follows: *Reduce congestion and other impediments to using the Nation’s transportation system.* Several outcomes are envisioned as the result of this goal:

- Reduction in urban congestion.
- Increased transportation capacity resulting from public-private transportation partnerships.

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<sup>25</sup> NCHRP Report 608, p. 114.

<sup>26</sup> The USDOT Strategic Plan 2006-2011, the FY 2009 Performance Budget, and the FY 2008 Performance and Accountability Reports are available at <http://www.dot.gov/budgperfplan/archive.htm>. Discussion in this section is based upon material in these reports.

- Increased use of integrated Intelligent Transportation System (ITS) networks and new incident-management approaches.
- Reduced impediments to the efficient movement of freight over the transportation network, especially at key freight gateways.
- Meet new and growing demands for air transportation services through 2011 and beyond.
- Increased access for all Americans.
- Longer lasting, high-performance transportation infrastructure.

Congestion-related “performance areas” or objectives focus on more specific situations and modes, providing a basis for identifying and allocating resources to responsible U.S. DOT administrative agencies. The objectives are as follows, as outlined in FY 2009 Budget in Brief:

- Surface Transportation
  - Improve highway infrastructure condition and relieve congestion.
  - Restructure intercity passenger rail service.
  - Increase transit ridership, invest in transit systems, and improve access to transportation services.
- Aviation
  - Improve access to transportation service.
  - Meet new and growing demands for air transportation services.

Performance measures translate objectives into quantitative items that can be tracked and evaluated over time, and that are reported in the annual Performance and Accountability Report. The congestion-related performance measures are as follows:

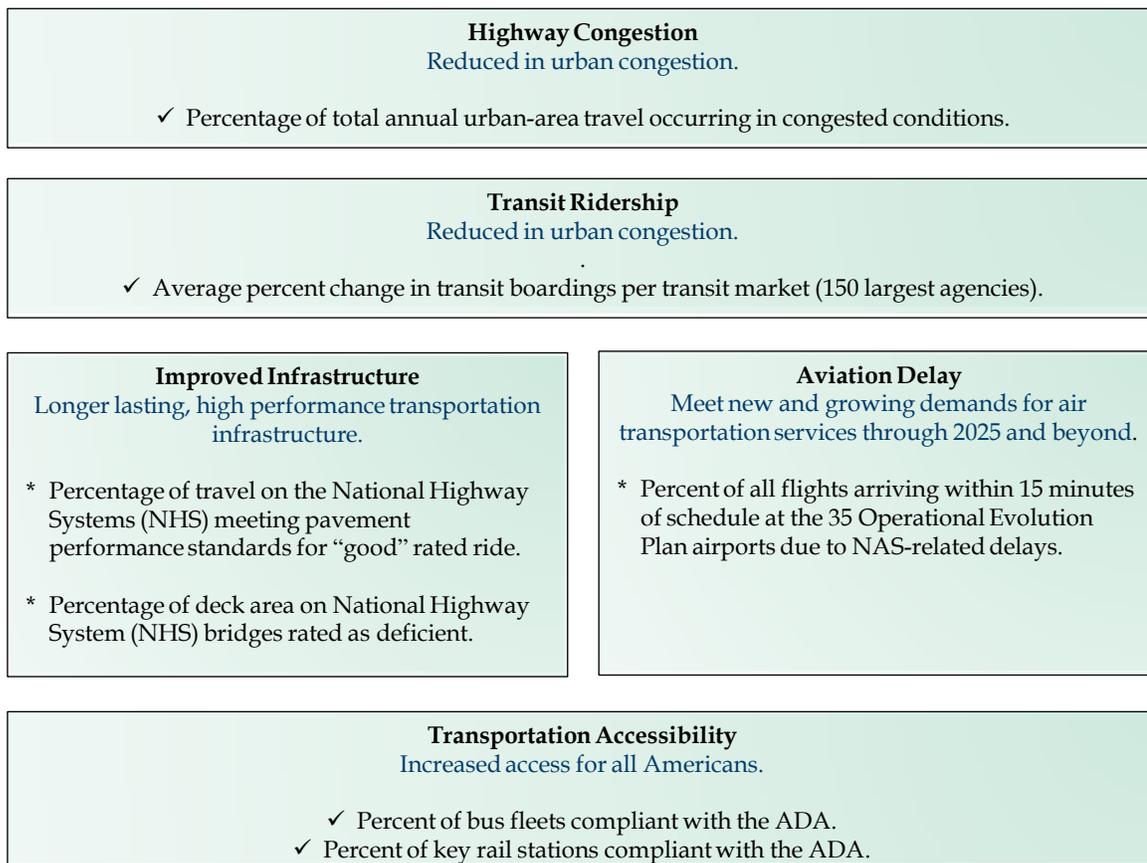
- Percentage of travel on the National Highway System (NHS) meeting pavement performance standards for “good” rated ride.
- Percentage of deck area on National Highway System (NHS) bridges rated as deficient, adjusted for average daily traffic.
- Percentage of total annual urban-area travel occurring in congested conditions.
- Average percent change in transit boardings per transit market (150 largest transit agencies).
- Percent of bus fleets compliant with the ADA.
- Percent of key rail stations compliant with the ADA.

- Percent of all flights arriving within 15 minutes of schedule at the 35 Operational Evolution Plan airports due to National Airspace System (NAS)-related delays.

These hierarchical elements are integrated among the U.S. DOT Strategic Plan, Performance Budget, and Performance and Accountability documents to provide a performance budget that can be related to actual and planned accomplishments. For example, the Strategic Plan relates performance measures and milestones (e.g., implementation of partnership agreements, state passage of enabling legislation) to the long-term outcomes identified above, and quantifies a long-term target or desired end-state for each performance measure. The Performance and Accountability Report relates, for each goal, the key performance areas to both the strategic outcomes and the performance measures (Figure 27). This figure also indicates whether or not the performance measure has met the fiscal year target. Progress on goals, objectives, and performance measures are discussed in a narrative within the Performance and Accountability Report to provide a clearer picture of external effects, cumulative effects of prior investments and activities, and commentary on current activities and outcomes. The performance areas help to identify the cognizant organizational unit responsibility within U.S. DOT, and therefore are a key basis of resource allocation in budgeting. The funding request related for Reduced Congestion in FY 2009, for example, addresses primarily the FHWA, FTA, and FAA to meet the respective highway, transit, and aviation performance objectives cited above, but also includes funding for the FRA (for rail programs) and other administrative units within U.S. DOT.

**Figure 27. Structuring of Performance Information for the U.S. DOT  
 Reduced Congestion Goal**

Strategic outcomes from the DOT Strategic Plan are indicated in blue and FY 2008 results for key DOT performance measures are marked to indicate MET Target (✓) and Did Not Meet Target (\*)



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# Appendix A

**Table A.1 Summary of State DOT Profiles in the AASHTO Primer**

State	Policy Development, Long-Range Planning	Programming and Budgeting	Program, Project, and Service Delivery	System Operations	Monitoring and Reporting Results
California	<p>The California Transportation Plan (CTP) defines goals, policies, and strategies to guide decisions toward an integrated, multimodal, sustainable transportation system. System performance measures relate to mobility, accessibility, preservation, economic vitality, safety and security, equity, and environmental quality. Regional Transportation Plan (RTP) Guidelines assist MPOs in developing RTPs consistent with Federal requirements and the CTP.</p>	<p>STIP guidelines set a framework for selecting funded, deliverable state and regional projects. Both state and regional agencies quantify performance measures to link project performance to goals in the CTP.</p>	<p>Key project delivery milestones are reported internally and externally (e.g., to the California Transportation Commission). Contracts for Delivery between the Caltrans Director and district directors solidify project delivery commitments. Contracts for Performance and Innovation with each deputy director include key performance objectives and measures that align with strategic goals.</p>	<p>A prototype analytic tool based upon Asset Manager NT is being tested to guide investments in Caltrans' State Highway Operations and Protection Program (SHOPP). The tool is based upon system maintenance and operations needs, the cost of addressing these needs, and anticipated outcomes (performance improvements). The tool supports SHOPP decision-making, complements existing Caltrans models, and supports Caltrans' performance measurement and systems management initiatives.</p>	<p>Caltrans monitors performance measures quarterly or annually to assess progress toward stated objectives. Satisfaction of targets and efficiency of resource use are tracked to judge whether adjustments in targets, resource allocations, or priorities need to be made. These methods inform management of issues and options, drive budget decisions, and help meet organizational goals. The methods are relatively new and evolving. Caltrans also tracks measures for project delivery, maintenance and operations, and programming and budgeting.</p>

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# Appendix B

# Sample Questionnaires

## QUESTIONNAIRE – PUBLIC SECTOR CASE STUDIES FOR NCHRP 8-70

### ■ INTRODUCTION

In support of the National Cooperative Highway Research Program (NCHRP) Project 08-70, our team is studying the process by which public sector agencies allocate resources using performance measures and targets. This business practice is referred to as performance-based resource allocation (PBRA). As a leader in this practice, we would appreciate a description of your agency's performance management process, especially how performance targets are set, and how data support systems are managed

### ■ BACKGROUND/CONTEXT

1. General information
  - a. Name of public sector agency
  - b. Name, title, department of person interviewed
  - c. Phone
  - d. E-mail
  - e. Date
  - f. Interviewer
2. Range of organization/department functions/responsibility, including
  - a. Range of "customers served," (i.e., transportation stakeholders)
  - b. What type of transportation is the core function (if applicable) (e.g., on-road, air, freight)?
3. Total annual budget and transportation-specific budget:

## ■ RESOURCE ALLOCATION

Performance Management is a business process that links organization goals and objectives to resources and results. Performance measures and their attendant targets are the lynchpin in this process. They are the link connecting goals to specific investments. The methods, including underlying data support systems, by which measures and targets are established, play a critical role in the overall success of a public agency or private company. Performance-based resource allocation takes place within an overall performance management framework which contains five basic elements: 1) goals and objectives; 2) performance measures; 3) targets; 4) resource allocation; and 5) monitoring results.

1. Is performance-based management a key goal for your agency or department? How and why did it become a key goal?
4. Describe your agency's performance-based resource allocation process. To what extent does it have the five elements inherent in the performance management framework? Describe the process/methods used in each element.
  - a. Goals and objectives
  - b. Performance measures (what are some key metrics?)
  - c. Targets
  - d. Resource allocations
  - e. Monitoring results
5. Are there different levels of importance for different measures? For example, are measures weighted differently in either the technical process or in the decision-making/resource allocation process? Are there measures that are considered more heavily by senior management in policy discussions?
6. Is your performance-based resource allocation process used internally only, or is it used by other organizations (to include state legislature, planning partners, etc.)?
7. Target setting is one of the focuses of this study. Which measures currently have associated "targets," and what are those targets? How were those targets selected? What is the process for updating targets? To what extent does your agency employ the following steps for resource allocation and target-setting:
  - a. Define contexts and time horizons
  - b. Develop long-term goals
  - c. Select scope of measures for targets
  - d. Consider funding availability
  - e. Analyze resource allocation scenarios and tradeoffs
  - f. Consider policy and public input
  - g. Establish targets and track progress

8. What happens if those targets are not met? Conversely, what happens if those targets are consistently met without difficulty or are exceeded? Resulting changes could be related to:
  - a. Organization
  - b. Process
  - c. Finance/Budgeting
  - d. Strategy
9. What components of this performance-based system have worked the best? Where have you had issues? In your view, what is "best practice" performance-based management?

## ■ DATA SUPPORT SYSTEMS

Data is the foundation of performance management. Effective decision-making in each element of the performance management framework requires that data be collected, cleared, accessed, analyzed, and displayed. The organizational functions that produce these requirements are called data management systems.

There are two key dimensions to creating and sustaining these systems. The two areas are equally important and must be synchronized within an organization to ensure the generation and use of accurate, timely, and appropriate data. The first area centers on the technical challenges associated with data systems, including development and maintenance of hardware and software, and the specifications for data collection, analysis, archiving, and reporting. The second area focuses on the institutional issues associated with data stewardship and data governance.

1. Where does data governance reside in your organization – business areas or IT? Are there any organizational structures to support data management?
2. Does your agency have effective institutional arrangements to ensure optimum data sharing and use of data for managing information programs?
3. Does your agency consider data management an asset which is adequately supported?
4. What are the typical performance measure-related needs for data? For example, data to support measures such as reliability, timeliness, and accessibility.
5. Who is responsible for data quality?
6. Does your agency have definitions for data standards?
7. Do you use data stewardship models? Please define any relationships, roles, responsibilities of data owners, stewards, and stakeholders.
8. Are there data models associated with performance-based resource allocation data? Do the data models have data dictionaries and metadata associated with them?
9. Do you use specialized data tools?

10. Do you use data architectures to make data more shareable and interoperable?
11. What technologies and databases are used to store and extract data?
12. Do the users and technology professionals collaborate on ensuring easy access to different levels of reports and other access to data?
13. Are there easy mechanisms for executives to run reports and obtain information, such as simple desktop icon options?
14. What type of change management system is in place within the agency?
15. What is the process and frequency of refreshing data?

## QUESTIONNAIRE – PRIVATE SECTOR CASE STUDIES FOR NCHRP 8-70

### ■ INTRODUCTION

In support of the National Cooperative Highway Research Program (NCHRP) project 08-70, our team is studying the process by which private sector companies allocate resources using performance measures and targets, and how that can be applied to public sector transportation agencies. This business practice is referred to as performance-based resource allocation (PBRA). As a leader in this practice, we would appreciate a description of your company's performance management process, especially how performance targets are set, and how data support systems are managed. We may anonymously use your company as a case study in the research with your permission.

### ■ BACKGROUND/CONTEXT

1. General information
  - a. Name of private sector company
  - b. Name, title, department of person interviewed
  - c. Phone
  - d. E-mail
  - e. Date
  - f. Interviewer
2. Range of company/department functions/responsibility, including
  1. Range of customers, industries, and market segments that your company serves.
  2. Is transportation the core function of your company? If so, which mode(s) does your company use or provide (i.e., road, rail, air)? Which aspects are done in-house and which are outsourced? What types of transportation assets do you deploy (i.e., truck, marine, other)?
3. Company revenues and total annual transportation budget.

### ■ PERFORMANCE FEEDBACK AND MANAGEMENT PROCESS

Performance Management is a business process that links organization goals and objectives to resources and results. Performance measures and their attendant targets are the lynchpin in this process. They are the link connecting goals to specific investments.

The methods, including underlying data support systems, by which measures and targets are established, play a critical role in the overall success of a public agency or private company. Performance-based resource allocation takes place within an overall performance management framework which contains five basic elements: 1) goals and objectives; 2) performance measures; 3) targets; 4) resource allocation; and 5) monitoring results.

1. What incentives are there in your company or department to work toward goals and targets? How and why did performance management become a key goal?
2. Describe your company's performance management process. To what extent does it have the five elements inherent in the performance management framework? Describe the process/methods used in each element.
  - a. Goals and objectives
  - b. Performance measures (what are some key metrics?)
    - i. Results
    - ii. Process
    - iii. Others
  - b. Targets
  - c. Resource allocations (budget, staff, systems, equipment, etc.)
  - d. Monitoring results
3. Is your performance management process used internally only, or is it used by other departments or organizations? Are there different levels of importance for different measures? Which ones are monitored by senior staff?
4. Target setting is one of the focuses of this study. Which measures currently have associated "targets," and what are those targets or ranges of performance? How and why were those measures and corresponding targets selected? What happens if those targets are not met? Conversely, what happens if those targets are consistently met without difficulty or are exceeded? Resulting changes could be related to:
  - a. Organization
  - b. Process
  - c. Finance/Budgeting
  - d. Strategy
5. Please describe in detail the method/process used to set performance measure targets. To what extent does your company employ the following steps for resource allocation and target-setting:
  - a. Define contexts and time horizons
  - b. Develop long term goals
  - c. Select scope of measures for targets
  - d. Consider funding availability
  - e. Analyze resource allocation scenarios and tradeoffs
  - f. Consider policy and public input
  - g. Establish targets and track progress
  - h. Modify targets as necessary

6. What components of this performance-based system with targets have worked the best? Where have you had issues? How would you or your company change or refine this methodology in the future? In your view, what should companies measure, and what is "best practice" performance-based management?

## ■ DATA SUPPORT SYSTEMS

Data is the foundation of performance management. Effective decision-making in each element of the performance management framework requires that data be collected, cleared, accessed, analyzed, and displayed. The organizational functions that produce these requirements are called data management systems.

There are two key dimensions to creating and sustaining these systems. The first is the technical aspect of development and maintenance of hardware and software, and the specifications for data collection, analysis, archiving, and reporting. The second is the institutional issues associated with data stewardship and data governance.

1. Where does data governance reside in your organization – business areas or IT? Or is it split between the two? Are there any organizational structures to support data management?
2. Does your company/department have effective institutional arrangements to ensure optimum data sharing and use of data for managing information programs?
3. Does your company consider data management an asset which is supported by senior management?
4. What are the typical performance measure-related needs for data within your company? For example, what data do you use to support measures such as reliability and timeliness? Example measures could include tracking daily delivery of product "x" by 3:00 p.m. or number of service calls received daily and the number of calls responded to within one hour of the request.
5. Who is responsible for data quality?
6. Does your company have definitions for data standards?
7. Do you use data stewardship models? Please define any relationships, roles, and responsibilities of data owners, stewards, and stakeholders.
8. Are there enterprise data models (charts, graphs) which depict performance-based resource allocation data? For instance, the number of employees or trucks needed to ensure timely delivery of product "x" each day? Do the data models have data dictionaries and metadata (descriptions of the data) associated with them?
9. Do you use specialized data tools, such as GPS for data collection, on-line query tools or graphs and charts for reports, or other tools?

10. Do you use data architectures (such as Open Database Connectivity (ODBC)) to make data more shareable and interoperable?
11. What technologies and databases are used to store and extract data?
12. Do the users and technology professionals collaborate on ensuring easy access to different levels of reports and other access to data?
13. Are there easy mechanisms for executives to run reports and obtain information, such as simple desktop icon options?
14. What type of change management system for data is in place within the company/department?
15. What is the process and frequency of refreshing data?

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# Appendix C

# Hennepin County External References

## ■ Hennepin County Balanced Scorecard

The following information is excerpted from documents provided by Hennepin County for the purposes of research project NCHRP 8-70. These documents are the following:

- Balanced Scorecard, The Basics, Turning Strategy into Results, Dec., 2002 [1]
- Balanced Scorecard, Getting Started Guide, Feb., 2003 [2]
- Hennepin County Strategy Map [3]
- Focusing on Results: From Measurement to Management in Hennepin County Government, Dec., 2001 [4]
- Focusing on Results: From Measurement to Management in Hennepin County Government, Dec., 2001 [5]

Hennepin County uses the “Balanced Scorecard (BSC) as a management and measurement tool to support ongoing results-based decision making, planning and budgeting at all levels of the organization. Performance measurement, in the Balanced Scorecard, or any other system, is like a warning light on the dashboard of a car. The light tells you that something is going on, but it doesn’t tell you why it’s happening. To learn why the warning light is on and fix the problem, you need to look further.” [1] The Balanced Scorecard identifies the “warning lights” for county managers, directors, and administrators in order to highlight the programs needing attention.

The Balanced Scorecard helps the county to align their daily work with the county Vision and strategic goals. The vision for the county is as follows:

“We envision a future where residents are healthy and successful and where our communities are safe and vibrant. We will strive to meet and exceed expectations by engaging people and communities in developing innovative solutions to challenges. We will be a diverse learning organization. We will partner with others to enhance the quality of life in Hennepin County and the region.” [3]

The Balanced Scorecard translates an organization’s mission, vision, and strategies into a comprehensive set of performance measures and an effective measurement and

management system. It is a tool for decision making that builds on cross-functional cause and effect relationships.

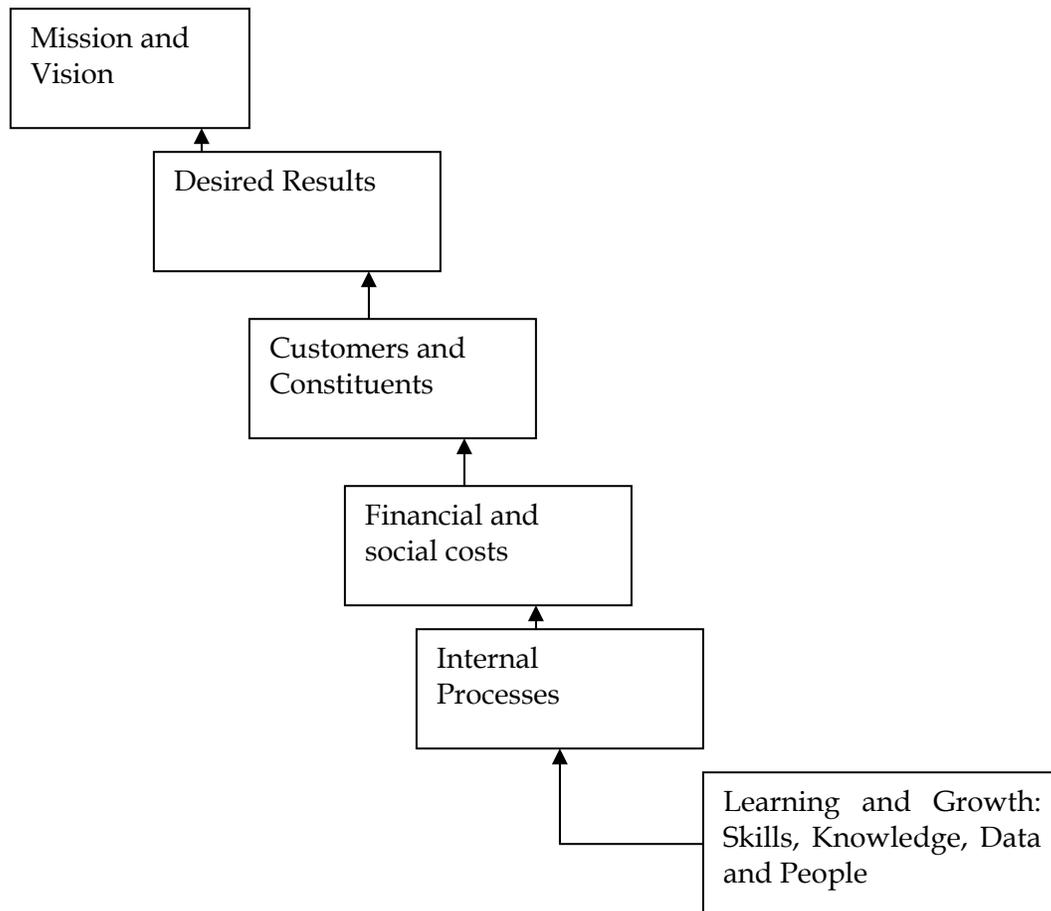
The BSC in Hennepin County is viewed from four perspectives:

1. Customer – What results do we need to produce for our customers to fulfill our mission and achieve our vision?
2. Finance – What financial objectives must we meet in order to produce the desired results for our customers?
3. Internal Process – What processes must we excel at in order to attain the financial objectives and desired results for the customer?
4. Learning and Growth – How do we develop our internal resources to refine the necessary processes that will allow us to attain our financial objectives and desired results for the customer?

The efficiency of the Internal Processes contributes to the financial well-being which, in turn, contributes to achieving the desired results for the Customer. How well they are doing in Learning and Growth drives how well their processes will work in the future. This provides one of the key strengths of the Balanced Scorecard method: it allows the county to look at the past, present and future at the same time.

Figure 1.1 below illustrates the relationship between the four perspectives and the agency Mission and Vision. [5]

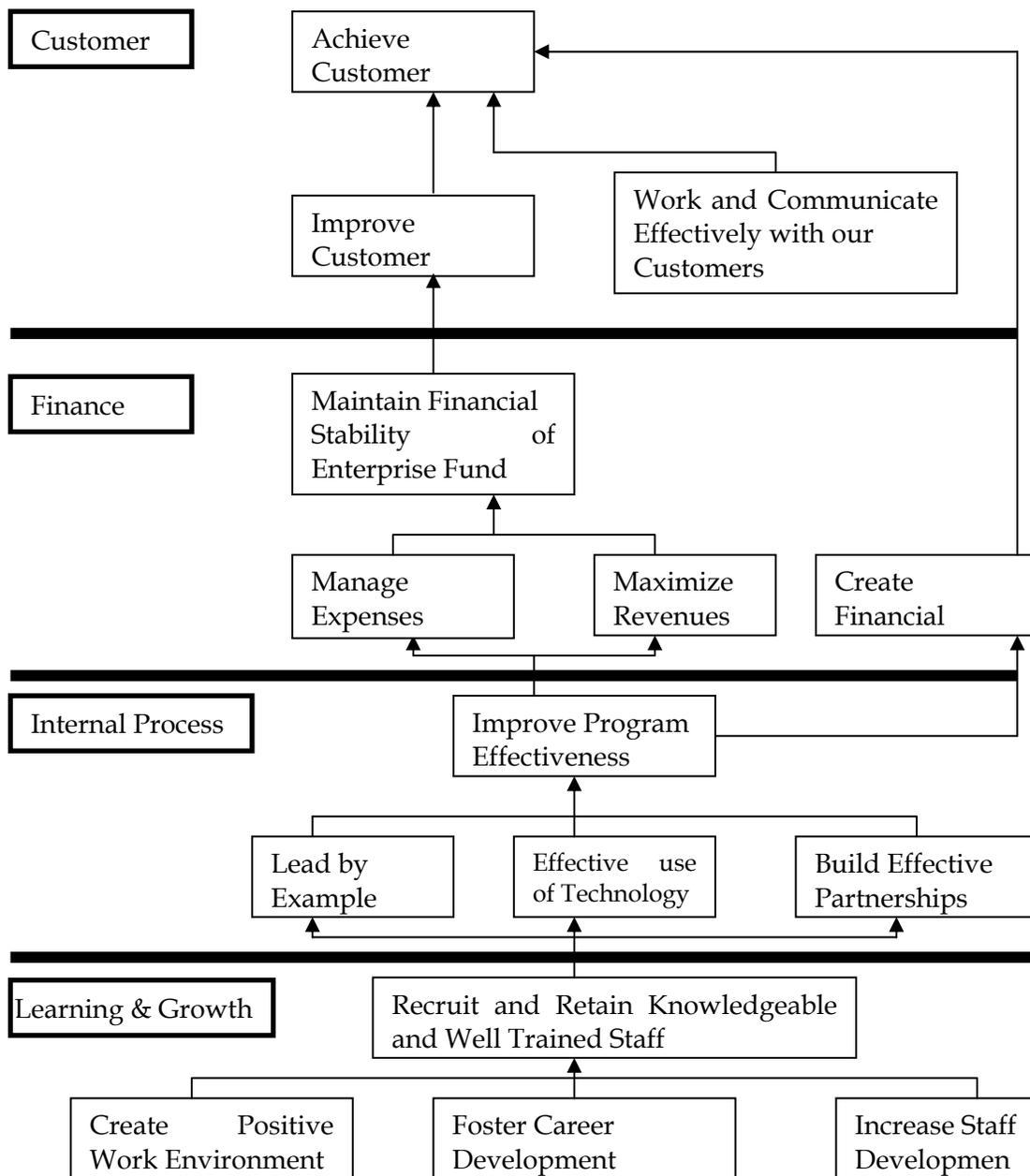
**Figure 1.1. The Balanced Scorecard Approach**



■ **The Balanced Scorecard consists of three components:**

1. **The Strategy Map** – A visual representation of the most important strategic objectives in each of the four perspective areas (Customer, Finance, Internal Process, Learning and Growth) that work together to form a strategy for accomplishing the desired results.

Figure 1.2. A Sample Strategy Map



## The Scorecard

**The Balanced Scorecard** - Once the Strategy Map is developed, identify measures and targets for each of the strategic objectives. The BSC shows at a glance strategic objectives, measures, targets and progress to date. The Scorecard usually contains three to five strategic objectives for each of the four perspectives and no more than 20-25 measures total.

The BSC forms the basis for discussion between supervisors and managers, managers and directors, directors and administration, and administration and the board about progress towards achieving desired results. (See comment column of Sample Scorecard below [2])

**Figure 1.3. Sample Balanced Scored [2]**

Perspective	Strategic Objective	Measure	Target	Actual	Comment
Customer	Achieve customer outcomes	Number of high priority issues resolved	60	30	Need improvement, investigate process for resolving high priority issues
	Improve customer satisfaction	Percent of customers rating service very good or excellent	80%	80%	Right on target
Finance	Manage expenses	Percent increase/decrease in annual budget	1.5%	5%	Reduced expenses due to budget cuts
	Maximize revenue	Percent increase/decrease revenue derived from grants	5%	13%	Good progress
Internal Process	Build effective partnerships	Number of projects involving one or more partners	25	10	Need to monitor
Learning and Growth	Retain knowledgeable staff	Employee retention rate	95%	75%	Need to monitor

A Measurement Page for each measure – The measurement page, one per measure, provides essential information about each of the measures, including baseline data

**Figure 1.4. A Sample Measurement Page [1]**

<b>Balanced Scorecard Perspective:</b>	<b>Customer</b>			
<b>Balanced Scorecard Category:</b>	Achieve Customer Outcomes			
<b>Measure:</b>	Percentage of “high-priority” issues resolved			
<b>Definition:</b> “High-priority” issues affect multiple communities within the county and have the potential to require additional county resources to resolve if not addressed immediately.				
<b>Data:</b> On an annual basis our department will track and report on the total number of issues that have been identified as “high priority” that are resolved.				
<b>Appearing on Balanced Scorecard:</b> Number of issues with a rating of “High priority” that are resolved in a calendar year.				
<b>Example:</b> Issues resolved 2002 issues resolved that receive a rating of “high priority” = XX%				
<b>Baseline:</b>	1998	1999	2000	2001
Percentage of “high priority” Issues resolved =	XX%	XX%	XX%	X%
By resolving issues that are determined to be “high priority,” the county is reducing the risk that these “high-priority” issues will develop into long-term problems requiring additional county resources to resolve.				

The Balanced Scorecard is used to communicate results so that employees, residents and elected officials have a clear understanding of what the county is working to accomplish, how they are going about it, and how they are progressing. The purpose of using the measurement tool is continuous improvement, where the county can recognize staff who are making positive changes which produce successful results. The BSC also helps the county to identify ways to improve results as needed.

One of the major advantages to using a system such as the Balanced Scorecard is that it allows an organization to be proactive, rather than reactive in addressing the most important issues, and to determine the resources and budget needs to support program areas.

The scorecards are deployed on Hennepin County's Intranet and they are viewed and managed through the Cognos Metric Studio Business Intelligence software tool.

The software tool is "meant to support fact-based decision-making and to supplement management conversation about operational and strategic results." [4]

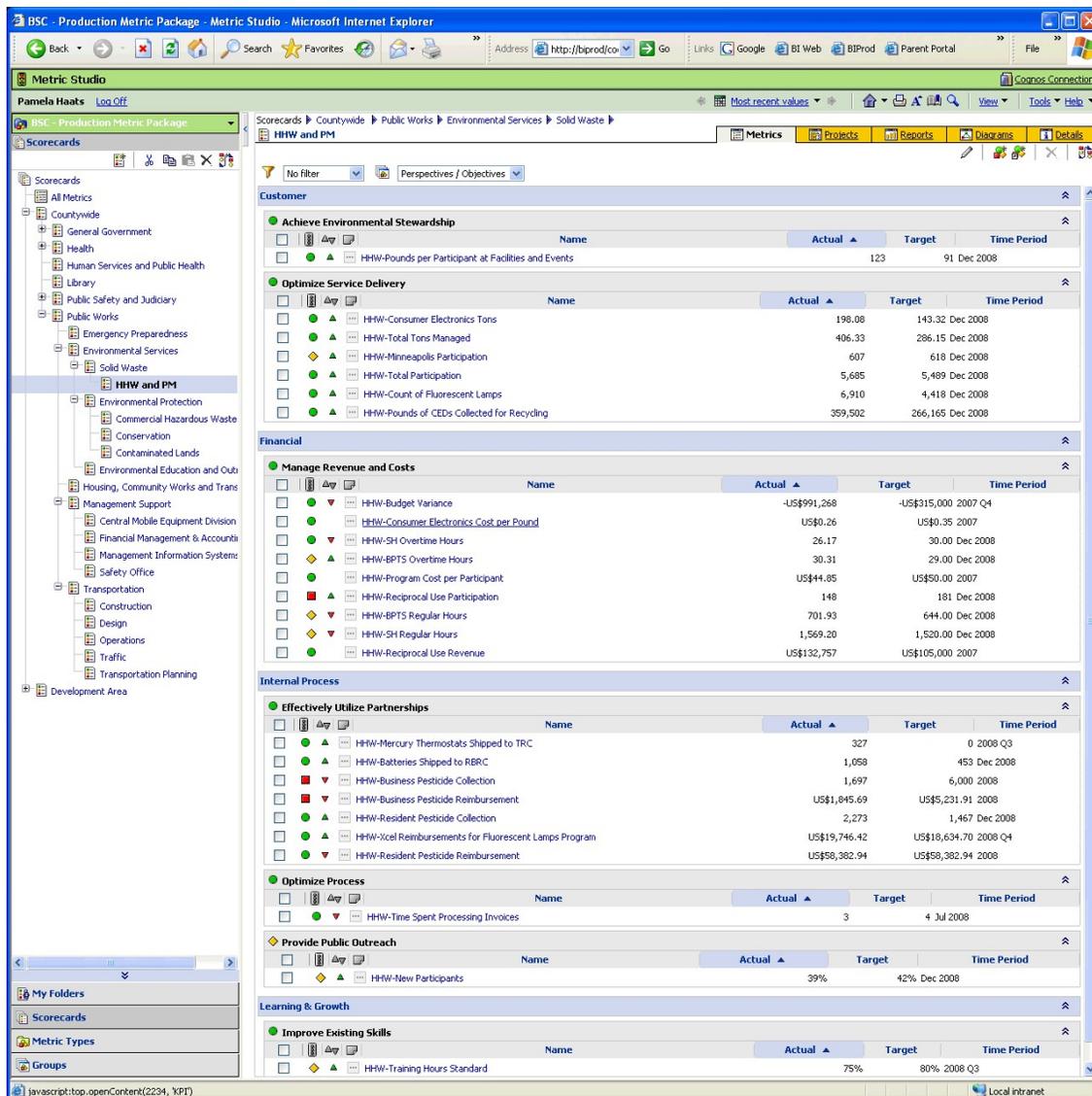
The standard display elements on Metric Studio include:

- Metrics – shows the traditional BSC view
- Report – to view Cognos and non-Cognos reports
- Diagrams – shows the Strategy Map(s)

See Figure 1.5 for an example of the Metric Studio, Metrics page from the Public Works Department of Hennepin County, representing the Environmental Services, Solid Waste Program.

This example shows one of the strategic objectives specifically for the Public Works Department, "Achieve Environmental Stewardship", in addition to the measures (targets and actual) from each of the four perspective categories: Customer, Financial, Internal Process and Learning and Growth.

Figure 1.5. Environmental Services Metrics page from Public Works Department



In summary, the benefits of using the BSC include the following:

- The county has developed expertise in performance measurement using the BSC.
- Results are regularly communicated, both internally and externally.
- Results are used to measure progress and provide feedback for continuous improvement on an ongoing basis.
- Systems are in place for identifying, measuring and progress on key goals and objectives on an ongoing basis.
- Steps to creating a scorecard for your organization include the following, which are summarized by the acronym CARD [2]:
  - **C** - Chart the Strategic Direction and identify the most important things the department (or business unit) needs to do to achieve its overarching goals.
  - **A** - Analyze Measurement Opportunities - Identify key performance measures for each strategic objective and create a measurement page for each measure, including a baseline measure, identify possible targets to improve the baseline.
  - **R** - Create a Draft Scorecard - Create a draft scorecard and review/revise as necessary to ensure that the targets, measures and strategic objectives lead to the achievement of the overarching goals.
  - **D** - Deploy Scorecards for the department area or business unit. Begin data collection and analysis. Use the scorecard to create results-based budget. Allocate resources for ongoing measurement. Use BSC for decision-making, planning, budgeting and continuous improvement.

## Hennepin County Information Technology Governance Board Charter Statement May 2007

### *Purpose*

The Information Technology Governance Board (ITGB) will align information technology investments with the Hennepin County Strategic Framework and Business Line objectives to ensure that funds for IT are being directed towards enterprise-wide priorities.

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### Membership

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Deputy County Administrator, Chair

Assistant County Administrator

#### **Human Services**

Assistant County Administrator

#### **Public Works**

Assistant County Administrator

#### **Criminal Justice**

County Sheriff

County Attorney

County Public Defender

County Director of the Library

County Director of Human Resources

County Chief Financial Officer

County Chief Information Officer

County Director of Taxpayer Services

Executive Director of Metropolitan

Health Plan

County Director of Internal Audit

Ex Officio

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### **Responsibilities:**

- 1) Ensure that all projects within his/her department or line of business that meet *any* of the agreed upon criteria below, are presented to the ITGB.
- 2) Ensure that that all projects within his/her department or line of business that meet *any* of the agreed upon criteria below, are included in the Enterprise Project Portfolio.
- 3) Ensure that business representatives, with the support of their Business Information Officer, present proposals for projects that meet *any* of the criteria for ITGB approval.
- 4) Every 12 to 18 months review progress made on the Information Technology Strategic Plan. Recommend changes and additions.
- 5) Through review and approval of IT projects, ensure the appropriate investment of funds and resources is distributed throughout the county for purposes that align with county business goals. Recommend redirection of IT investments to the county board if deemed necessary.
- 6) Review the status of current projects underway using the project portfolio structure, to determine if a project should be extended, if it should be cancelled or put on hold and reprioritized.
- 7) Review any reports related to IT Governance prior to presentation to the County Board.
- 8) Ensure the county has the appropriate technology to continue to support the business goals of county departments and lines of business.
- 9) Review and approve major Information Technology policies.

### **Expectations:**

ITGB will meet at least six times annually. Additional meetings may be called by the Chair or upon the request of a majority of the members.

ITGB will review new projects for their value to the organization, Return on Investment and adherence to technology standards documented in the Enterprise Technical Architecture.

ITGB is an executive board whose members actively participate in the high-level decision-making at each meeting. Members may delegate one *business* representative as his/her permanent delegate, who can attend a meeting and vote in place of the member if he/she is absent. Others who are present at a meeting will not have a vote.

A majority of the members, including any permanent delegate, present at a meeting will constitute a quorum. A majority vote with a valid quorum will be required for a final decision. Final votes will be recorded in the meeting minutes.

ITGB will publish meeting minutes. The minutes will include the decisions made and a list of accepted proposals. If a proposal is rejected, the minutes will include the reason for its rejection.

### **Criteria for projects that will be presented to the ITGB:**

**Note:** If a proposed project meets *any* of the below criteria, it must be presented to ITGB.

- The project will cost over one million dollars
- Costs will include hardware, software, consultant fees and staff time.
- The project will take more than one-year to complete
- The sponsor is requesting IT Incentive Funds to be used
- The resulting product will cross business lines
- The resulting product will be used throughout the enterprise
- The County Board or ITGB are interested in the outcome
- The project has high visibility or aligns with county strategic goals
- Changes extend a project that is already underway, so that it meets *any* of the above criteria.

### **Criteria ITGB will use to approve and prioritize projects:**

- The resulting system can be used elsewhere in the county
- The system meets the county's strategic goals
- If the project is deemed mandatory, the repercussions of not following the mandate
- The magnitude of the business change required to implement the system, including citizens, vendors, business partners, employees and other systems.
- Degree in which the resulting system will fit within the county's IT enterprise architecture and infrastructure
- The Return on Investment (ROI) is clearly understood
- The impact on the staffing in Central Information Technology
- The project is being completed by a consulting firm

## Hennepin County BI Program/Project Roles Definitions

Role	Responsibility
Project Sponsor	Provides clarity of the project vision, and directs the high-level activities of the project team. Allocates funding and resources to the project. Provides executive authority necessary to overcome organizational obstacles and barriers. Serves as the guardian of the business case, and ultimately responsible for project success.
Project Owner	Responsibility is assigned to a key stakeholder (i.e., is dependent on the system to deliver bottom-line business results for which he/she has direct responsibility) and "owns" the system requirements for the long-haul -- that is, is involved in the ongoing decision making about what does and doesn't go into the system, and is present in the same capacity when the system requires modification/upgrades over time.
Data Steward	The data steward acts as the conduit between the BI Program and the business partners and users with both decision support and operational help. The data steward has the challenge of guaranteeing that the data is used to its fullest capacity and appropriate access is granted to users.
Program Manager	Responsible for identifying the vision and direction of the BI Program. The BI Program will manage multiple ongoing inter-dependent BI projects. Program Manager will market the BI vision, direction, products and services to the business partners and users to capture the interest of future utilization of the BI Program's products and services. In an organization or enterprise, Program Management also reflects the emphasis on coordinating and prioritizing projects and entities to ensure that resource contention is managed from a global focus.
Technical Manager/ Chief Data Architect	Responsible for owning the support and maintenance of the BI environment and the management of the technical resources. Technically supports the vision and direction of the BI Program.
Business Liaison	Responsible for being the primary point of contact between the BI Program and the Business Partners and users, which includes program-related communications. Collaborate with the Business Intelligence Team regarding BI communication to Business Partners and users, ensuring the consistency of language and tone. The objectives are to develop a proactive, responsive, and strong relationship with the business partners and users. Responsibilities also include marketing the BI vision, direction, products and services to the business partners and users to capture the interest of future utilization of the BI Program's products and services. The Business Liaison will investigate and inform the business users of production issues that may impact daily business operation. Also educates the business partners and users on BI Program products and services.

Role	Responsibility
Project Manager	The Project Manager is responsible for coordinating and integrating activities for cross-functional departments and multiple business partners. Also responsible for managing stakeholder expectation and project communication for both BI related projects and resolution of production issues. The project manager accomplishes the above by managing project scope, time, cost, and quality. The project manager applies project management best practice, general management and technical skills, as well as team management, negotiation, financial and business acumen, combined with an understanding of organizational politics and project management to meet project objectives and to meet or exceed stakeholder expectations.
Business Analyst	Responsible for being the primary point of contact between the BI Project Team and the Business Partners and users, which will include all project-related communications. Collaborate with the Business Liaison regarding BI communication to Business Partners and users, ensuring the consistency of language and tone. Developing a sound knowledge of the business needs of customers and stakeholders and the effect of requested/proposed solutions. Works with business owners and end users to understand, document, and prioritize business requirements across affected lines of businesses. Works with business owners and delivery work streams to develop optimal solutions for identified business needs. Develops complete and accurate business models, including information and process. Provides detailed requirements that enable the chosen solution to be developed and tested with minimal analysis support.
QA Analyst	Responsible for developing a sound knowledge base of quality assurance throughout the life-cycle of a project. Works with the project team members to validate and assure quality of the product produced and delivered to the customer. Creates and maintains Project Test Plan, works with the team in creating use cases, manages the testing of product, manages the resolution of the defect list, creates User Acceptance Test Plan and coordinates UAT testing for the business, and ensures the quality of the delivered product to the customer.
Trainer	Responsible for the training strategy, development of training approach and materials, and facilitating training for both business users, and technical support. The training strategy consists of the functional use of the BI Reporting tools, specific BI Reports, BI environment and data, and production support workflow.

Role	Responsibility
Data Architect	<p>Responsible for making sure an organization's strategic goals are optimized through the use of enterprise data standards. This frequently involves creating and maintaining a centralized registry of metadata. Data architecture includes topics such as metadata management, business semantics, data modeling and metadata workflow management.</p> <p>A Data Architect's job frequently includes the set up a metadata registry and allows domain-specific stakeholders to maintain their own data elements. Data Architects also strictly and meticulously enforce standards and integrity within an Enterprise Data Model.</p>
ETL Developer	<p>Provides expertise in many technological areas pertaining to data warehouse technologies. Specializes in data warehouse topical areas such as ETL processes and methodologies. Participates in defining and promoting 'best practices' relating to ETL development to the organization. Works concurrently on several product development projects with development engineers to review and recommend possible optimizations for data extraction, cleansing and conformity. Performs analysis and reviews on complex data sourcing and mapping needs for global and regional projects.</p>
Informatica(ETL) Administrator	<p>Responsible for coaching team on technical standards and guidelines for application support and development. Maintains and enhances existing data extraction, cleansing, transformation, and loading processes to improve efficiency. Takes periodic backups and restores as required. Conducts maintenance request from developers. Supports existing systems and provides ETL development assistance to projects.</p>
Database Administrator (DBA)	<p>The individual responsible for the administrative functions of client-server databases. The database administrator (DBA) has privileges (permissions) for all commands and is ordinarily responsible for maintaining system security, including performing backup and restoration functions.</p>
Cognos Report Authors	<p>Business Author:                      Builds simple queries to focus on variances, sifts through large amounts of data, and investigates different areas of your business through ad hoc reports and interactive analyses.</p> <p>Professional Author:                      Builds sophisticated reports and dashboards for consumers by gathering report requirements and creating the reports for distribution. Involved in setting-up business events management activities.</p>
Cognos Modeling	<p>Responsible for importing metadata into the Cognos Framework Manager. Creating query subjects for query authors, and publishing packages. This can also include the development of OLAP models</p>
Cognos Developer	<p>Responsible for building and deployment of SDK applications.</p>
Cognos Administrator	<p>Manages the deployment of Cognos Business Intelligence, including installation, configuration, maintenance, content management, security and system optimization.</p>

Role	Responsibility
Technical SME (Subject Matter Expert)	Contributes technical knowledge and experience for the success of the project effort.
Business SME (Subject Matter Expert)	Contributes business knowledge and experience for the success of the project effort.
Internal Audit	Safeguards the interests of Hennepin County Prevents exposure for Hennepin County and its data Upholds mandates, laws, and standards within the project.
Business Intelligence Center (BIC)	Receives BI requests Governs and oversees BI projects within Hennepin County Provides BI specific resources Approving body for project checkpoints Implements and enables continuous improvement for the BI Request/Delivery process, BI capabilities, and resources. Approver of Project Change Request

# **Mn/DOT Performance Vs. Targets**



# Snapshot – Mn/DOT Performance vs. Targets

## July 23, 2008

### Sheet 1

Data Trend Improved	↑
Data Trend Same	→
Data Trend Worsened	↓

KEY: ● Green: At or above target ▲ Yellow: Below target ● Red: Needs intervention

Ivory-shaded cells report Customer Rating from Omnibus Survey

Budget Activity/ Service	Measure	2004	2005	2006	Status Current 2007	State Data Trend Last 3 Years	2008 Forecast	State	Districts Current Status										Targets
									1	2	3	4	6	7	8	M			
									Greater Minnesota Rating in 2006 = 6.1										
State Roads Investment	Pavement – Ride Quality Good - RQI - Principal Arterials	63.4%	66.8%	68.9%	66.3%	Improved from 2004	Decline 65.4% '08	66.3%	1	2	3	4	6	7	8	M	68 / 70		
	Pavement – Ride Quality Poor - RQI - Principal Arterials PA %	36.6%	33.2%	31.1%	33.7%	Flat	Decline 3.9% '08	2.6%	1	2	3	4	6	7	8	M	2 / 5		
	Pavement – Ride Quality Good - RQI – Non-Principal Arterials % of miles	2.7%	2.6%	2.3%	2.6%	Improved from 2004	Decline 56.4% '08	59.1%	1	2	3	4	6	7	8	M	55 / 65		
	Pavement – Ride Quality Poor - RQI – Non-Principal Arterials % of miles	55.9%	60.1%	61.1%	59.1%	Deteriorated regularly since 2004	Decline 7.2% '08	6.5%	1	2	3	4	6	7	8	M	3 / 5		
	Pavement Preventive Maintenance, Spending vs. Plan	4.9%	4.8%	5.2%	6.5%	Met variable target last 2 years (spending in \$ millions vs. plan)	Decline	6.5%	1	2	3	4	6	7	8	M	Target: Spend 100% of plan		
	Pavement – Average (Yrs) Remaining Service Life- ARSL – Principal Arterials	11.4	11.6	12.3	9.2	Deteriorated	Decline	9.2	1	2	3	4	6	7	8	M	NO TARGET High # Good		
	Pavement - Public Satisfaction with Smooth Ride	6.4	6.6	6.1	6.4	Deteriorated significantly	Decline	6.1	1	2	3	4	6	7	8	M	5.5 / 7.0		
	Bridge Condition - Good - Principal Arterials PA	53.3	53.3	53.9	55.2	Improved from 2005, 2006, & 2007	Decline 54.8% '08	55.2%	1	2	3	4	6	7	8	M	45 / 55		
	Bridge Condition - Poor - Principal Arterials PA	46.7	46.7	46.1	44.8	Improved each year since 2004	Decline 3.5% '08	3.1%	1	2	3	4	6	7	8	M	2 / 5		
	Bridge Condition - Fair and Poor - Principal Arterials PA % of bridge area	12.8%	11.3%	11.3%	11.1%	Improved steadily from 2005	Decline 11.5% '08	11.1%	1	2	3	4	6	7	8	M	Target = 16% or less		
	Bridge Condition - Good Non-Principal Arterials	56.6	58.4	61.1	No update	Improved greatly from 2004	Improve 56.4% '08	61.1%	1	2	3	4	6	7	8	M	40 / 50		
	Bridge Condition - Poor Non-Principal Arterials % of bridge area	4.7	4.2	4.1	No update	Improved greatly from 2004	Improve 3.8% '08	4.1%	1	2	3	4	6	7	8	M	8 / 11		
	IRC Travel Speed - % miles meeting speed targets	87% 2003	84% 2005	No update	No update	Deteriorated from 2003	Decline 80% '07-'14	84%	1	2	3	4	6	7	8	M	81 / 86		
	Congestion - % miles of Metro Urban Freeways	21.6%	21.4%	20.6%	23.5%	Deteriorated significantly in 2007	Decline. Resume congestion growth	23.5%	1	2	3	4	6	7	8	M	21.5 / 21.8		
	Fatalities- All Roads (3-Year Avg)	626	594	540	521	Improved steadily from 2004 (annual data)	Decline	521	1	2	3	4	6	7	8	M	631 / 638		
	Crash Rate - TH (3-Year Average)	1.18	1.14	1.07	1.01	Improved since 02. Target 1.5% reduction/yr.	Improve	1.01	1	2	3	4	6	7	8	M	Targets 1.2 04, 1.18 05, 1.16 06		
	High Crash Cost Locations Improved	30	31	53	50	Improved from 2004	Decline - shifting focus to preventive	50	1	2	3	4	6	7	8	M	25 / 40		

**State Target Formula**  
(*\$275 m base State fund distribution*)

# Approved Formula

## Approved Formula (Percent ATP Share) Performance-based Variables (Pavement and Bridge Needs, Fatal/A Injury Crashes and Congested VMT)

	SYS	Units	Criteria	Weight	ATP 1	ATP 2	ATP 3	ATP 4	ATP 6	ATP 7	ATP 8	METRO			
100%	PRESERVATION	\$	Average Bridge Needs	20%	2.19%	0.75%	1.26%	0.38%	2.14%	0.79%	0.32%	12.17%			
				60%	VMT	HCVMT	5%	0.41%	0.21%	0.75%	0.48%	0.49%	0.31%	0.80%	1.57%
							TH	Average Pavement Needs	35%	5.74%	3.89%	4.14%	3.95%	5.86%	3.80%
	SAFETY	crashes	Fatal/A Injury Crashes (3 year average)	10%	0.91%	0.61%	1.61%	0.70%	1.31%	0.61%	0.72%	3.52%			
				TH	20%	0.17%	0.05%	1.59%	0.10%	0.54%	0.26%	0.07%	17.21%		
	MOBILITY	VMT	Congested VMT	0%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%		
				30%	buses	Transit	10%	0.67%	0.31%	1.20%	0.45%	0.92%	0.51%	0.39%	5.56%
							All	People	Future VMT	100%	10.1%	5.8%	10.6%	6.1%	11.2%
	<b>TOTAL</b>														

Definitions	
Average Pavement Needs	2009 to 2023 Pavement Needs from the Pavement Model in January 2006.
Average Bridge Needs	2008 to 2030 Bridge Needs from the District Plans in June 2005
HCVMT	2005 Daily Heavy Commercial Vehicle Miles Traveled from TIS
Fatal/A Injury Crashes	3-Year Average of Statewide Fatal/A-Injury Crashes (2002-2004), Office of Traffic, Security and Operations
Congested VMT	2005 Congested Daily VMT for Trunk Highways using IRC definitions of congestion for moderate and above level of congestion as defined by facility type. December 2005. (Office of Investment Management)
Transit	2004 Minnesota Transit Report
Future VMT	2015 Population, State Demographic Office, 2004

**State Target Formula**  
(*\$275 m base State fund distribution*)

# Approved Formula

<b>Approved Formula</b>													
<b>Performance-based Variables (Pavement and Bridge Needs, Fatal/A Injury Crashes and Congested VMT)</b>													
	SYS	Units	Factors	Weight	ATP 1	ATP 2	ATP 3	ATP 4	ATP 6	ATP 7	ATP 8	METRO	
100%	PRESERVATION	60%	Average Pavement Needs	20%	\$6.0	\$2.1	\$3.5	\$1.1	\$5.9	\$2.2	\$0.9	\$33.5	
				5%	\$1.1	\$0.6	\$2.1	\$1.3	\$1.3	\$0.8	\$2.2	\$4.3	
				35%	\$15.8	\$10.7	\$11.4	\$10.9	\$16.1	\$10.4	\$8.8	\$12.2	
	SAFETY	10%	Fatal/A Injury Crashes (3 year average)	10%	\$2.5	\$1.7	\$4.4	\$1.9	\$3.6	\$1.7	\$2.0	\$9.7	
				20%	\$0.5	\$0.1	\$4.4	\$0.3	\$1.5	\$0.7	\$0.2	\$47.3	
	MOBILITY	30%	Congested VMT	10%	\$1.8	\$0.8	\$3.3	\$1.2	\$2.5	\$1.4	\$1.1	\$15.3	
				100%	\$275	\$27.8	\$16.0	\$29.0	\$16.7	\$30.9	\$17.3	\$15.2	\$122.2
	<b>TOTAL BASE DISTRIBUTION</b>				100%	10.1%	5.8%	10.6%	6.1%	11.2%	6.3%	5.5%	44.4%
	Additional State Funds to hold ATP harmless				\$9	\$0.0	\$0.0	\$2.4	\$1.5	\$0.0	\$3.3	\$1.4	\$0.0
	<b>TOTAL STATE FUNDS DISTRIBUTED BY FORMULA</b>				<b>\$284</b>	<b>\$27.8</b>	<b>\$16.0</b>	<b>\$31.4</b>	<b>\$18.2</b>	<b>\$30.9</b>	<b>\$20.6</b>	<b>\$16.6</b>	<b>\$122.2</b>
				100%	9.8%	5.6%	11.1%	6.4%	10.9%	7.3%	5.9%	43.1%	

<b>Definitions</b>	
Average Pavement Needs	2009 to 2023 Pavement Needs from the Pavement Model in January 2006.
Average Bridge Needs	2008 to 2030 Bridge Needs from the District Plans in June 2005
HCVMT	2005 Daily Heavy Commercial Vehicle Miles Traveled from TIS
Fatal/A Injury Crashes	3-Year Average of Statewide Fatal/A-Injury Crashes (2002-2004), Office of Traffic, Security and Operations
Congested VMT	2005 Congested Daily VMT for Trunk Highways using IRC definitions of congestion for moderate and above level of congestion as defined by facility type, December 2005. (Office of Investment Management)
Transit	Transit variable eliminated because Transit not eligible for State Trunk Highway funds
Future VMT	2015 Population, State Demographic Office, 2004

# The Data Governance Maturity Model, by Martha Dember, 2008

*The following is an excerpt from a White Paper entitled “The Data Governance Maturity Model” by Martha Dember, CBIP, Director Business Intelligence, RCG Information Technology (2008), and is used with permission.*

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## The Data Governance Maturity Model

Just as there is a capability maturity model for software development processes, there is also a maturity model for data governance. In this model, seven layers of maturity define the growth cycle and associated benefits that can be attained by organizations as they embrace the principles, policies, procedures, and standards of a well defined data governance program. (Each stage is described in detail in the following paragraphs, and illustrated in Figure 2.)

The first three layers take an average of two years to fully implement, while the remaining four layers are totally dependant on the organization. Factors such as mergers and acquisitions, changes in executive management which affect a company's culture, and the willingness of management to embrace governance, play a determining role in the length of time required to progress from stage four to stage five and from stage five to stage six.

Reaching the top tier — stage seven — does not rely on tasks or procedures that are put in place as in prior stages, but is more of an overall organizational adaptation or acclimation to data governance.

### Stage 1: Strategy and Framework

#### STRATEGY

A data governance strategy aligns the goals and objectives of the governance program by defining how the guidelines, principles, and procedures will ensure that the organization has a way to identify the cause

and effect of data issues, and a way to determine a solution to resolve these issues. The strategy includes a charter stating how the data governance team will develop and deploy integrated business and technical support policies, guidelines, and standards to manage the organization's data assets. The charter further defines the roles and organizational structure that responsively and proactively focus on ensuring data integrity, including IT development of standards for technical blueprints (models), databases, and automated procedures that standardize data collection and distribution.

#### FRAMEWORK

The framework defines the roles and responsibilities of the Leadership Committee, Data Governance Manager(s), and the Stewards, which together comprise the data governance team. The framework also defines the relationships and dependencies between the data governance team and data architecture.

#### ORGANIZATIONAL BENEFITS

Until the strategy and framework are implemented, there are no realized organizational benefits from stage one.

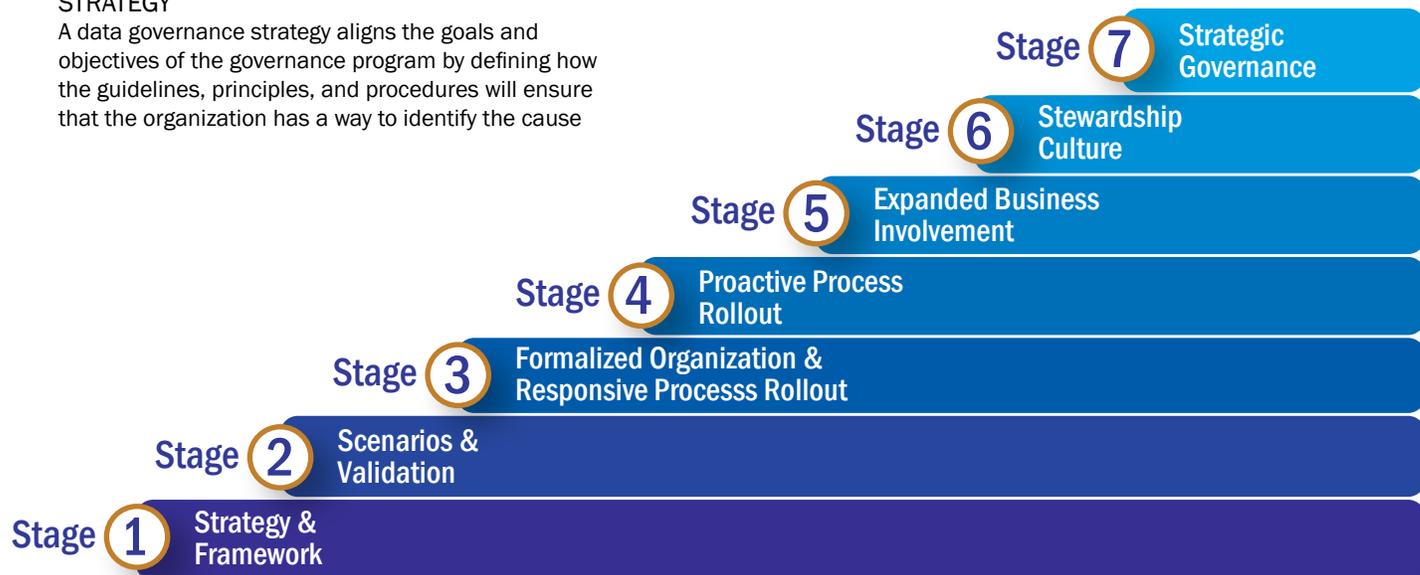


Figure 2: The Seven-Stage Data Governance Maturity Model

## Stage 2: Scenarios & Validation

To test its data governance strategy and framework, an organization will typically take an existing data issue and follow the reactive process to determine the cause and effect of the issue, and then propose a solution. In conducting this exercise, associates of the organization act out the roles as defined in the framework to see how well the process fits the organization's culture. The results of the exercise provide a means to refine the processes and framework to best fit how the organization operates in its day-to-day functions. In addition, associates will learn the variances in the roles of governance and stewardship, as well as the communications steps involved, and how best to formulate those steps (e.g., via e-mail or telephone). The exercise helps the organization determine the appropriate individuals to play these roles moving forward.

### ORGANIZATIONAL BENEFITS

Stage two offers a proof-of-concept approach that provides the opportunity to leverage industry best practices while adapting to the nuances of the organization. Individuals begin the learning curve while applying the processes to real issues. In conducting the exercise, some value in resolving data issues can be attained.

## Stage 3: Formalized Organization and Responsive Process Rollout

As the responsive process is being played out, the roles of data governance (e.g., data governance manager or business steward) are formally defined within Human Resources, where appropriate new positions within the organization are created and filled. We recommend that these roles be filled with internal resources having the required skills and aptitude to carry out the responsibilities as defined in the framework. As these roles are filled, the responsive process can then be rolled out enterprise-wide in full force.

### ORGANIZATIONAL BENEFITS

The company now has a structured approach to bridge business and IT through a common goal, providing accountability for establishing and maintaining data quality. In addition, as the roles of stewards, data architects, and data analysts are incorporated into development/enhancement projects, companies typically experience project improvements in meeting deadlines and budgets, as well as enjoying higher satisfaction rates with the application's usability.

## Stage 4: Proactive Process Rollout

As the governance team members become proficient in **identifying the causes** of data issues, they also become more aware of the things that can be done to **prevent data issues from occurring** in the first place. As this happens, the proactive process becomes invoked to do just that – stop the data issue from occurring before it happens. At this stage, stewards take on the responsibility to identify business events or activities that trigger the process.

### ORGANIZATIONAL BENEFITS

Organizational process improvements and enhanced communication between business units and IT are some of the benefits noted as organizations advance to the proactive data governance model. Identifying the things that interact when a transaction occurs enables business people to collaboratively manage data in a workflow-driven environment.

## Stage 5: Expanded Business Involvement

Reaching this stage is marked by the explicit buy-in from key stakeholders and executive management in the data governance program. Priorities have been established to aid in difficult decisions such as those involving trade-offs between security, utility, and cost in resolving data issues. Standards compliance monitoring is established and reported as part of performance measurement. The alignment of data-specific technology, processes, and organizational components with the company's most important business objectives is developed, as well.

### ORGANIZATIONAL BENEFITS

Continuous improvement efforts are enabled by the establishment of measurable metrics that are monitored and reported on a timely basis. Companies that utilize project management offices (PMO) incorporate data governance activities and work products to enhance their SDLC methodology, resulting in improved project performance. The organization now has reusable information/documentation, which effectively reduces future project efforts and reduces the cycle time of the reactive and proactive resolution processes, making data governance more efficient.

## Stage 6: Stewardship Culture

Governance protocols include procedures across divisions and departments that explicitly reconcile priorities, expedite conflict resolution, and build cooperation in support of data quality as a common

objective shared at every level of the enterprise. Data quality education and awareness programs are an integral part of the organization's in-house on-going employee training programs.

#### ORGANIZATIONAL BENEFITS

There is a common focus and delivery throughout the organization that empowers the workforce. Every corporate associate considers himself/herself a data steward, and this perspective carries beyond the boundaries of the organization and extends to the organization's partners in data sharing, data integration, and enabling of service-oriented architecture.

### Stage 7: Strategic Governance

At this stage, the organization transforms data governance and compliance from time-based audits to real-time, change-driven, on-demand business processes that continually assess risks, update policies, and manage resources across the enterprise. Ultimately it is the organization's people, processes, and technology working together organically and autonomically that result in an effective data governance program.

#### ORGANIZATIONAL BENEFITS

Utility of information can now drive flexibility and agility of the organization.

### Conclusion

There is a tendency in organizations to be complacent about data quality and integrity issues, as though these issues are things one just has to deal with. This is at odds with the increasing demands of government regulations such as Sarbanes-Oxley and Basel II, which dictate that data management must address any quality / integrity issues that could compromise credibility of the organization's information.

Enterprises must employ a cross-company control model to govern how information is used, to promote the security and integrity of all data, and to protect privacy on both the individual and the corporate level. An organization's data governance policies and procedures must also balance effective information access with appropriate use of the information. However, a data governance program is not an application that can be purchased, installed, and implemented. It is not a project that has a timeline for completion. It is a program that, over time, affects the culture and the way an organization conducts business.

#### About the Author

**Martha Dember** is an IT consultant with CIBER, Inc., specializing in the areas of business intelligence and data governance, risk, and compliance. She is a Certified Business Intelligence Practitioner in the area of leadership and is a member of the Balanced Scorecard Collaboration. Having over 20 years experience in IT and change management, she has helped many organizations successfully implement governance programs and move through the stages of the data governance maturity model. Ms. Dember recently spoke at the Trillium User Group Conference and is a member of the Executive Women's Group, a national organization of female executives.

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# **Cognos 8 Query Studio, Technical Standards**





**Hennepin County**  
Business Intelligence Standards

# Cognos 8 Query Studio

Technical Standards

Revision date: 4/4/2007

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**1. REVISION HISTORY**

<b>Change #</b>	<b>Revision Description</b>	<b>Version Number</b>	<b>Date Revised</b>	<b>Section Revised</b>
N/A	Initial document created.	Version 1.0	10/24/06	All
1	Revised Order and Priority	Version 1.1	11/15/2006	TOC
2	Major Revision	Version 1.5	02/07/07	All
3	Editing fine points	Version 1.5	2/10/07	All
4	Edits	3.1	04.02.07	All
5	Edits	3.2	04.05.07 jjl	All
6				
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14				

## **2. OVERVIEW**

**Project Information:** Cognos 8 Query Studio Technical Standards  
**Project Sponsor:** Troy Weigold  
**Cognos Admin(s):** Robert Ervasti  
**Reviewers:** Troy Weigold

**Approval Date:** xx  
**Start (dev) Date:** October 2006  
**Original End Date:** December 2006

### **Document Purpose**

This document contains Cognos 8 Query Studio standards at Hennepin County. These standards are to be used by all C8 developers both in the Business Intelligence (BI) team and within the business units.

These standards outline the criteria used when performing peer reviews of C8 Query Studio work.

### **Document Focus**

The focus of this document is Standards for Cognos 8 Query Studio. A similar document outlining Cognos 8 Framework Manager standards and a Frequently Asked Questions document are also available from the Business Intelligence Center (BIC).

These standards apply to queries and reports in the Public Domain. Standards are not strictly dictated for users developing in their personal "My Folder" space. All users, (whether developing in the public domain or in the "My Folder" space), need to understand they are developing in a shared resource environment. All users are using the same environment, so a poorly designed query can impact performance for other users. For example, do not build an adhoc query that returns so many rows that you stall performance.

### **Document Assumptions**

The reader knows the difference between Query Studio (QS), Report Studio (RS) and Framework Manager (FM) roles and responsibilities. The reader has attended Query Studio training.

### **Document Organization**

Sections are organized in the same order a user normally works (choosing a package first, then naming a query, then saving a query etc).

1. Section Title
2. Standard definition
3. The Cognos standard or best practice
4. Background on whether or not Hennepin County (HC) follows the Cognos standard (and the reasons behind the decision)
5. Standard status: is the standard is required, preferred or optional

Supplemental information is at the end of the document (e.g. checklists, Query Studio, User Tips, etc).

### **Current Situation**

The BIC is creating standards used by a limited "test group" of Query Studio users using a package specifically designed for this purpose out of the greater HR/Payroll data.

### 3. CHOOSE CORRECT PACKAGE 🙋



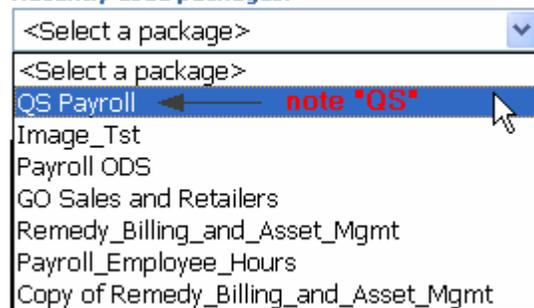
#### **Defined Standard: Use “QS” as a prefix**

The standard is to use a package with a “QS” as prefix. Please DO NOT use packages that are not prefixed this way. The Framework Manager (FM) for a project creates the packages. FM standards are covered in the Framework Manager Standards documentation.

You do not need to be concerned about the package development or contents; these standards are covered in a separate document, you just need to make sure that you are using the correct package.

Example of Standard:

#### **Recently used packages:**



#### **Cognos Standard: Separate Packages for QS Use.**

Cognos recommends publishing and using separate “packages” for Query Studio use.

#### **Does HC follow the Cognos standard? Yes.**

Yes, Hennepin County requires separate packages for QS use.

#### **Standard Status: Required** 🙋

The standard is required. If you use a package that was not built specifically for Query Studio use (without the “QS” prefix) you do so at your own risk. You may get unpredictable results.

#### 4. QUERY STUDIO RUN OPTIONS 🙋



##### **Defined Standard: Run with All Data**

The standard for run options is to “Run With All Data.” Every time you pull a new field or query element into the report, the request is sent to the database and all data is returned. This has performance implications. See the Tips Section of this document to learn how to change this setting.

##### **Cognos Standard: None**

There is no Cognos standard for Query Studio run behavior. The default setting on installation is to “Run With All Data”.

##### **Does HC follow the Cognos standard? N/A**

There is no Cognos standard, so there is nothing for HC to follow. The default setting is normally kept in place.

##### **Standard Status: Globally Required, Optional on Individual Basis**

The standard is required globally but optional on individual basis; users have the ability to change the run behavior, and are encouraged to do so when building large queries. Cognos administrators review audit reports periodically and determine if this standard needs to be changed.

## 5. NAMING QUERIES/REPORTS 🙋



### **Defined Standard: Naming Convention (see examples)**

There is a naming standard and a peer review process for queries prior to migration into public folders in Development, Test, or Production environments (aka: Dev, Test, Prod).

Use a standard similar to Framework Manager Projects and Packages names.

The naming convention is:

**[Dept or Project]-[Subcategory]-[Second Subcategory-if needed]-by [Dimension if applicable]**

Examples:



<u>Do:</u>	<u>Don't Do</u>
1.FARS-Contracts-IT-by Quarter	1.Robert'sHRReport
2.HRPayroll-Hours-IT-by Employee	2.RSE_123_022107
3.IT-BSC-Measures-by Month	3.Troy Weigold's Test Report

You can do whatever you want in your own personal "My Folders" space. This naming only matters for items moved into the public domain regardless of the environment. (dev, test or prod)

Details such as using all upper case, all lower case, department abbreviations or not etc., could be debated. Let's not get too hung up on such details. Just be mindful of other users when naming and make sure that you are not naming in a cryptic or mysterious way.

Anyone should be able to read a query/report name to get a general idea of the content without knowing much about the report. Whether you spell out Human Resources or use "HR" is up to you; please use common industry/business abbreviations. If in doubt contact the Standards Steward in the BIC.

### **Cognos Standard: None**

There is no Cognos standard for naming queries. There are definitely reams of "best practices" information to be found. Again, I think as long as WE decide on a relatively consistent approach we will be in good shape.

### **Does HC follow the Cognos standard? N/A**

There is no Cognos Standard, so HC has created its own standard.

### **Standard Status: Required**

The naming standard is required, for items to be moved into the Public space. These items would be subject to the standard and a peer review before movement. It does not matter what you do in your "My Folders" space.

## 6. SAVING QUERIES/REPORTS 🙋



### **Defined Standard: Peer Review prior to moving item to Public Location**

The standard dictates a peer review before queries/reports get saved to a “public” location (anything not in your personal “My Folder” space). The peer review must include walking through the “Query Studio Peer Review Checklist,” (also located in this document).

There are no controls over what queries/reports users save into their personal “My Folders” space. Users are free to do whatever they would like in this area, provided there is no negative performance impact. Please see the “Shared Environment Issues” section of this document.

Other than saving to a user’s My Folders space, queries must be retained as follows:

- Enterprise-wide queries saved in Public Folders are required to have a peer review.
- Department-wide queries saved in Department folders (under Public Folders) and meant for use beyond the query author are required to have a peer review.
- Temporary folder queries created for query authors to share and review queries are purged of any queries over 30 days old.

The following types of queries are considered for Report Studio development:

- Frequently used
- Require more options
- Require custom formatting

### **Cognos Standard: None**

Cognos has no standard for saving queries.

### **Does HC follow the Cognos standard? N/A**

Cognos does not have a standard, but industry best practices documentation support the HC standard.

### **Standard Status: Required**

Peer review prior to publication is required.

## 7. QUERY/REPORT AUTHOR IDENTIFIED 🙋



### **Defined Standard: Author identified in Properties Section**

The standard is for the query/report developer to be identified in the properties section (in Cognos Connection) of the query itself. This happens by default and is shown below:

### **Cognos Standard: None.**

Cognos has no official standard for this but. As a default, the properties section populates with the identity of the person signed-into the system.

### **Does HC follow the Cognos standard? N/A**

There is no Cognos standard. However, we are using the Cognos default functionality.

### **Standard Status: Required**

This standard is required, but the default happens automatically. It should not create extra work.

**8. MAJOR SELECTION CRITERIA/PERIOD OF DATA IN TITLE** 🙋



**Defined Standard: Insert Major Selection Criteria in Report Title**

The Standard is for the query/report title to accurately reflect the contents of the report as much as possible and where column titles are not immediately evident. There is no way to put a cover page onto a Query Studio Report, so a well titled report is essential. (As Shown Below)

Employee by Department Cost Center Name by Business Line Name				
Employee Name: ERVASTI, ROBERT S				
Business Line Id	Business Line Name	Department Cost Center Id	Department Cost Center Name	Employee Name
600000	GENERAL GOVERNMENT	630000	INFORMATION TECHNOLOGY	ERVASTI, ROBERT S

**Cognos Standard: None.**

Cognos has no official standard for this subject.

**Does HC follow the Cognos standard? N/A**

We are developing this standard to accommodate lack of the ability to insert a cover page. Cover pages with accompanying Report Descriptions are required on Report Studio reports.

**Standard Status: Required**

A clear report title including major selection criteria is a required standard. However, this is rather subjective. Examples shown below:



**Well Named Titles**

1. Hours by Business Line by Month
2. Employee Overtime by Department
3. Employees with average <80 hours in a pay period

**Not Well Named Titles**

1. Larry's Payroll Report
2. Susan's Special IT Report
3. Who doesn't work much?

## **9. FREQUENTLY USED QUERIES MADE INTO REPORTS IN QS/RS**

### **Defined Standard: Reuse or Build in Report Studio**

The standard is to reuse code as much as possible. Consider reusability for the following scenarios:

- Queries/reports that are recreated or pulled often
- Frequently used field combinations
- High traffic queries or reports
- High level of complexity

In the cases outlined above, a request should be initiated to either have the report built in a reusable prompted Query Studio version. If analysis indicates a high level of complexity, reports should be built in Report Studio.

### **Cognos Standard: None**

Cognos has no official standard for this subject.

### **Does HC follow the Cognos standard? N/A**

While there is no "Cognos" standard for this subject, it is in line with industry best practices to follow the rules outlined in the defined standard section.

### **Standard Status: Optional and highly recommended**

This standard is optional, but highly recommended.

10.  
MANAGER) 🙋

**SECURITY (RESIDES IN FRAMEWORK**



**Defined Standard: Security set in FM, QS User is Aware of Security**

The standard dictates that all column and row level security is established by the Framework Manager Developer. The Query Studio User should have knowledge of what they do and do not have access to before attempting to develop a query.

**Cognos Standard: No**

Cognos has no official standard for this subject.

**Does HC follow the Cognos standard? N/A**

While there is no "Cognos" standard for this subject, it is in line with industry best practices to follow the HC standard.

**Standard: Required**

It is required that Query Studio users understand the security and access for each data element.

## 11. ISSUES

## SHARED ENVIRONMENT RESOURCE

### Defined Standard: Be Aware and Use Common Sense

While not a standard, it is important for everyone to understand what a shared environment is and how it impacts development. Several teams, FARS, IT-BSC, HR Payroll, PW, CC, HSPHD, share the same resources to accomplish our Cognos 8 tasks.

Cognos 8 is installed on machines with a finite amount of memory, space and processing power.

When building queries/reports, regardless of the tool within the Cognos 8 BI Suite, be aware that every query/report can impact everyone else in the shared resource area, (a.k.a. "the sandbox").

So if a Report Studio query returns 10 million rows, there is an obvious performance issue for other users: performance for all users would be slow until the query completed. One way to alleviate this would be to filter for one or two records while developing; once a user knows that a query/report is clean and optimized, the user can then run the query/report unfiltered. More of these examples will be covered in the "User Tips" sections of the individual standards documents.

The BI Team is tasked with monitoring performance as well as working with people to ensure best use of the resources. If we find queries not working well – or if you find queries not working well – please bring them to our attention. We can then look at resolving the issues together as a team, and getting the sandbox back to a healthy place.

12.

**SUPPLEMENTAL INFORMATION** 🙋



**Peer Review Checklist**

- It is required that Query Studio users understand
- Correct package chosen when opening Query Studio
- Query Studio run options
- Naming queries/reports
- Saving queries/reports
- Query/report author is identified
- Major selection criteria and time period of the data are in the title
- Queries used often should be made into production reports in QS/RS
- Security (Resides in Framework Manager)
- Shared environment issues reviewed
- Query Studio Peer Review Checklist

### 13.

## QUERY STUDIO USER TIPS

### How to change from “Run With All Data” to the Preview Options

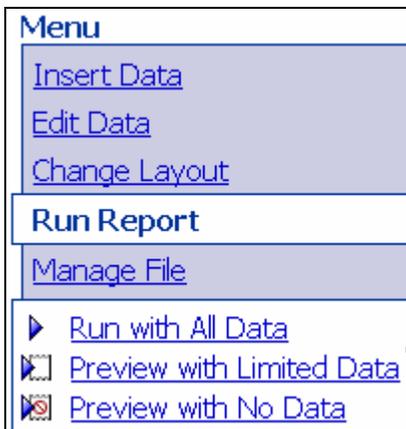
The default behavior when creating queries/reports is “Run With All Data”. If you consistently regularly see the hourglass icon (at right) while doing this, it is likely that your query is attempting to pull exceptionally large amounts of data. To avoid this, change the run behavior of the query to “**Preview with Limited Data**” or “**Preview with No Data.**” This allows formatting and stylistic changes to appear in the report without pulling the data (or while pulling only limited amounts of data) with each change.



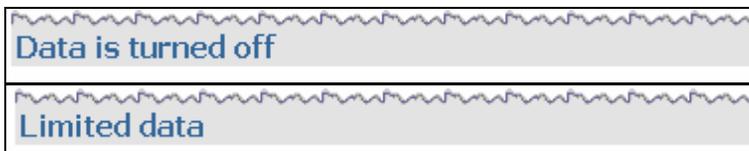
How to change the run behavior for an individual query:

From the Query Studio menu:

1. Select “Run Report”
2. Choose “Preview with Limited Data” or “Preview with No Data.”



The results area shows your selection.



When you feel confident your Query is filtered sufficiently to perform efficiently, click the **Run with All Data (and re-prompt)** button on the toolbar.



**Kansas State Department of  
Education, Data Governance  
Program**





# **Kansas State Department of Education**

# **DATA GOVERNANCE PROGRAM**

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## Revision history

<b>Date</b>	<b>Name</b>	<b>Description</b>
1/28/08	Charlotte Bogner	Initial draft version 2.0 (ver 1.0 only consisted of data steward group info. Ver 2.0 expands on the first document to include data governance and data requests.)
2/23/08	Charlotte Bogner	Changes made based on feedback from Kathy Gosa.
3/5/08	Kathy Gosa	Updates based on review.
4/8/08	Kathy Gosa	Updates to Data Governance Handbook section based on input from DGB.
5/29/08	Charlotte Bogner	Updated some names on the KSDE Data Governance Participants page.
7/15/08	Charlotte Bogner	Updated some names on the KSDE Data Governance Participants page.
8/6/08	Charlotte Bogner	Updated some names on the KSDE Data Governance Participants page.
8/7/08	Charlotte Bogner	Add mission & scope for data request review board handbook section.
11/4/08	Charlotte Bogner	Updated some names on the KSDE Data Governance Participants page.

## RELATED DOCUMENTS

<b>Name</b>	<b>Date</b>	<b>Document Title</b>	<b>Comments</b>
Connie Torres		IT Security Policies - V2.0	

# ABOUT THIS DOCUMENT

This document is designed to be used as a reference guide to help KSDE employees become familiar with Data Governance as implemented by KSDE and to inform them of associated responsibilities and processes. This includes the Data Governance Board, the Data Request Review Board, and Data Stewardship.

This document outlines the structure of the Data Governance Program including critical roles and responsibilities. In addition to an overview of the KSDE Data Governance Program, this document includes handbooks for each of the major roles: Data Governance Board member; Data Request Review Board member; Data Steward.

Extra space is included on each page of this document to allow you to make notes. Notes and tidbits of information that are designed to highlight important topics are also included.

**TIDBITS:** *This box will include useful bits of information regarding data governance and data steward programs.*

## IMPORTANT TERMS

A number of terms will be used throughout this document that may be unfamiliar. Below is a list of terms and their definitions for your reference.

<b>Term</b>	<b>Meaning</b>
<b>Business Rule</b>	A statement expressing a policy or condition that governs business actions and establishes data integrity guidelines. Example: Grade level Business Rule - To be considered eligible for Kindergarten the student must be five years old by a specific date that is determined by the state.
<b>Data Definition</b>	The description or meaning for a data field. Example: Grade level Definition - A level of academic development to which a particular student is assigned.
<b>Data Element Name</b>	Name of a distinct piece of data. Example: Grade Level data element name = GradeLevel.
<b>Data Owner</b>	The KSDE director of the team that has requested collection of a particular set of data or is assigned responsibility for a particular set of data. Responsibilities of the Data Owner are set forth in the IT Security Handbook.
<b>Data Request</b>	A request from an internal or external customer for data to be supplied in a specified format for a specific reason such as a report, analysis, comparison, research, etc.
<b>Data Steward</b>	The KSDE employee, assigned by the Data Owner, to be responsible for the data related to a specific program area. A business subject matter expert designated and accountable for assisting with analysis, quality, and use of the data as well as documentation of appropriate metadata.
<b>EDEN</b>	Education Data Exchange Network. The online portal used to submit data files for the EDFacts initiative.
<b>EDFacts</b>	EDFacts is a U. S. Department of Education initiative to put performance data at the center of policy, management and budget decisions for all K-12 educational programs. EDFacts centralizes performance data supplied by K-12 state education agencies (SEAs) with other data assets, such as financial grant information, within the Department to enable better analysis and use in policy development, planning and management.
<b>Enterprise Data System</b>	System for effective capture, cleansing, transformation, storage, definition, and use of data.

<b>Term</b>	<b>Meaning</b>
<b>Metadata</b>	A term used for data that describes a specific element or set of data. The term refers to all of the characteristics that need to be known about data in order to build databases and applications, and to effectively use data for policy and decision making.
<b>NCLB</b>	The No Child Left Behind federal legislation signed into law on January 8, 2002.
<b>Permitted Value</b>	Specific values that may be contained in a field. Example: Grade Level Permitted Values - K, 01, 02, 04, 05, 06, 07, 08, 09, 10, 11, 12.
<b>Subject Matter Expert</b>	A business person who has significant experience, responsibility, and knowledge of a given business subject or function.
<b>Transformation</b>	The process for changing data values from one form on the source system to another form in the target systems. <u>Example</u> KIDS Permitted Value for Kindergarten grade level = K EDEN Permitted Value for Kindergarten grade level = 00 Transformation - K → 00
<b>USDE</b>	United States Department of Education
	EXAMPLES USED IN THESE TERM DEFINITIONS ARE FOR DEMONSTRATION PURPOSES ONLY (i.e.: EDEN kindergarten grade level may not actually be 00.)

# OVERVIEW

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## Introduction

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### Definition of a Data Governance Program:

The individuals and process with responsibility for establishing and enforcing policies and guidance involving data.

### Definition of a Data Steward Program:

The formalizing of accountability for the management of data resources.

Organizations have long had processes in place for managing financial and physical assets including equipment, money, land, personnel, etc. However, more and more organizations are recognizing the importance of managing data and information as an asset. KSDE has implemented this Data Governance Program in recognition of the critical nature that data plays in the “business” of education.

**TIDBITS:** *Organizations often spend too much money managing data because there are too many “versions of the truth”.*

**TIDBITS:** *Governance = authority over data  
Steward = relationship between people & data*

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## Relationship and Roles of Data Governance

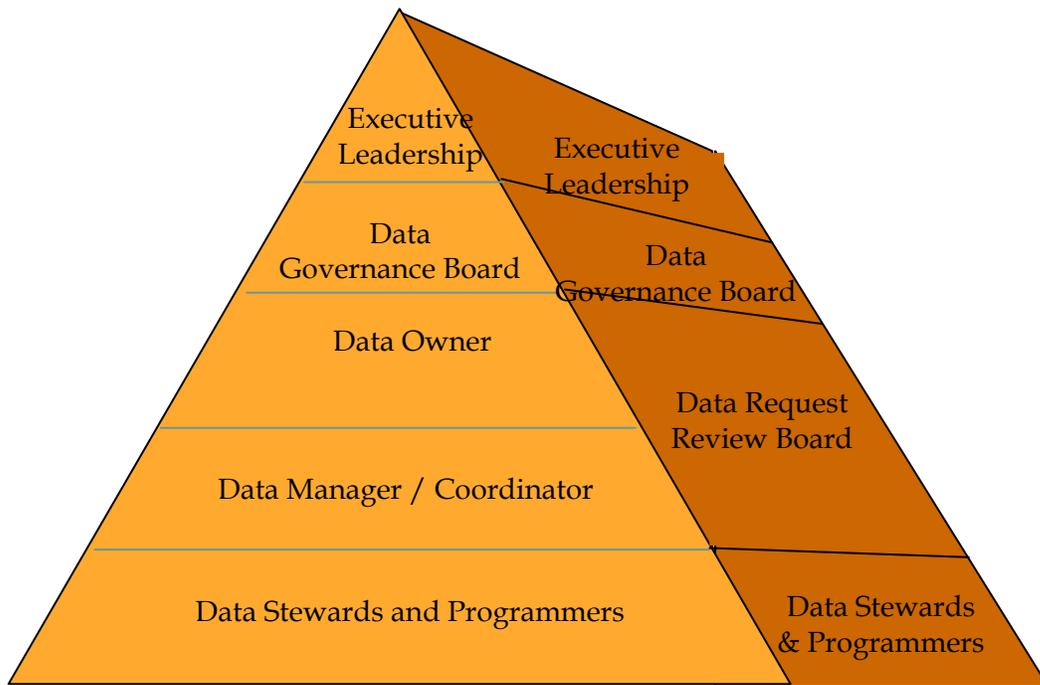
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Below is a visual representation of how communication and issue resolution regarding data flows within KSDE.

### Escalation:

Data Stewards and Programmers have day-to-day responsibilities regarding data. Issues that may arise related to these responsibilities are escalated to the Data Manager or Data Coordinator. If this individual cannot resolve the issue, then it is escalated to the appropriate Data Owner. If the Data Owner is unable to resolve the issue, it is escalated to the Data Governance Board. The Data Governance Board may escalate issues to Executive Leadership which has ultimate responsibility for resolution.

Alternatively, for issues that may arise regarding a data request, escalation is to the Data Request Review Board, then the Data Governance Board, and finally, to Executive Leadership, if necessary.



Area of Responsibility:

Executive Leadership has overall responsibility for all areas, subjects, and requests for data at KSDE. This responsibility is delegated to the Data Governance Board for action, execution, and management. The Data Governance Board is made up of Data Owners each with responsibility for the data within his/her area of responsibility at KSDE. The Data Owner’s responsibility is delegated to Data Stewards and Programmer, with assistance from the Data Manager or Data Coordinator, for action, execution, and management.

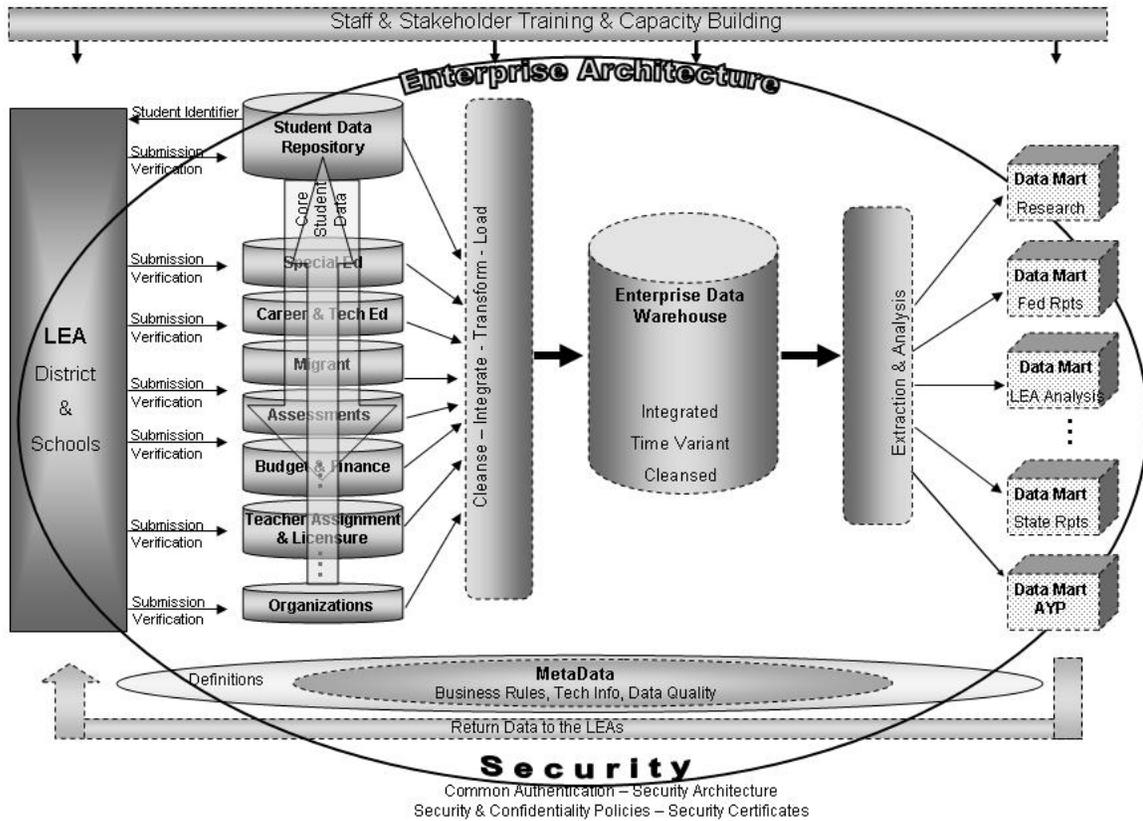
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**KSDE Enterprise Data System (EDS)**

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KSDE has implemented a system for data collection and management which includes data collection in source systems, integration and loading into the Enterprise Data Warehouse for historical archiving, and extraction into data marts for use by various stakeholders. Master Data Management for source data and centralized metadata management are also key components of the KSDE EDS.

The following diagram illustrates key components and processes of KSDE’s EDS:



## KSDE DATA GOVERNANCE PARTICIPANTS

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### KSDE Data Governance Participants

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<u>KSDE TEAM</u>	<u>DATA OWNERS (DIRECTORS)</u>	<u>DATA GOVERNANCE BOARD</u>	<u>DATA STEWARD</u>	<u>STEWARD BACKUP</u>
Information Technology	Kathy Gosa	Kathy Gosa Charlotte Bogner Ted Carter Charlotte Zeller	Julie Cook (KIDS)	Ted Carter (KIDS)
Title Programs & Services	Julie Ford	Judi Miller Norma Cregan	Judi Miller (NCLB) Laura Jones (Discipline)	Nicole Clark (NCLB) Judi Miller (Discipline)
Innovation & Improvement	Bill Hagerman	Bill Hagerman Robin Harris Sarah Thomas	Sharon Ketter (CATE) Pat Scrivner (QPA)	Robin Harris (CATE) TBD (QPA)
Special Education	Colleen Riley	Patty Gray	Mason Vosburgh	Patty Gray
Standards & Assessment	Tom Foster	Tom Foster Scott Smith Jeannette Nobo	Beth Fultz (AYP)	David Barnes & Tony Moss (AYP)
Teacher Education & Licensure	Pam Coleman	Pam Coleman Susan Helbert	Mark Frehe	Susan Helbert
Research & Evaluation		Phyllis Clay		
School Finance	Brad Neuenswander	Brad Neuenswander Sara Barnes	Kevin Mercer (CCD & ORG)	Sara Barnes (CCD & ORG)
Nutrition Services	Jodi Mackey	Jodi Mackey	TBD	
Fiscal Auditing		Mike Murphy		
Legal Services	Dea Lieber	Dea Lieber		

# DATA GOVERNANCE BOARD HANDBOOK

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## Mission of the Data Governance Board

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The mission of the KSDE Data Governance Board is to establish and enforce policies related to agency data management.

Guiding Principals:

- Ethics and security will be a part of every decision the group makes.
- Members have the authority and commitment to make policy recommendations and decisions.

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## Scope & Responsibilities of the Data Governance Board Members

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The scope of responsibilities for the Data Governance Board includes all data across the agency. This includes:

- source data collections;
- KSDE Enterprise Data Warehouse
- reporting access including federal and legislative, local, and research requests;
- security of data;
- data verification;
- deadlines;
- communication regarding data and policy; and
- establishing certification requirements.

KSDE's Data Governance Board is made up of Data Owners as well as others at KSDE with a high level of responsibility regarding data. Data Owners have specific responsibility regarding data as outlined in the KSDE IT Security Policies Handbook.

**Data Owners** – Directors of teams which are responsible for applications and their associated data.

Data owners are the individuals responsible for ensuring protection of, and authorizing access to, applications and their associated data.

The data owner is responsible for and authorized to:

- define and approve all access to information and computing assets under his or her responsibility;
- judge the value of the data assets and identify the data classification;
- regularly review each application's data access and classification;

- communicate each application’s data access requirements and data classification to the custodian; and
- safeguard the confidentiality, privacy, and security of any information that has been entrusted to his/her team for business purposes.

All members of the Data Governance Board are responsible to:

- Attend and participate in scheduled Data Governance Board meetings. If the individual is unable to attend it is his/her responsibility to send a representative so that the program area is represented.
- Report to the DGB regarding data issues, new data regulations, and new policies affecting data;
- Communicate with their program area teams regarding activities and decisions of the DGB; and
- Support and advocate data management and governance practices to agency staff.

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#### Goals & Objectives of the Data Governance Board

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- Achieve consistency in collecting and reporting data across various Agency teams and source systems;
- Achieve high quality data in our collection, analysis, and reporting; and
- Respond in a timely manner to data issues that are escalated to the DGB.

**TIDBITS:** *Knowledge Management – Need to get knowledge (unstructured data) “out of people’s heads” and documented for sharing with all stakeholders.*

# DATA REQUEST REVIEW BOARD HANDBOOK

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## Mission of the Data Request Review Board

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The mission of the Data Request Review Board (DRRB) is to implement processes for the provision of accurate, timely data and information to our internal and external customers while protecting personally identifiable student information and other confidential information.

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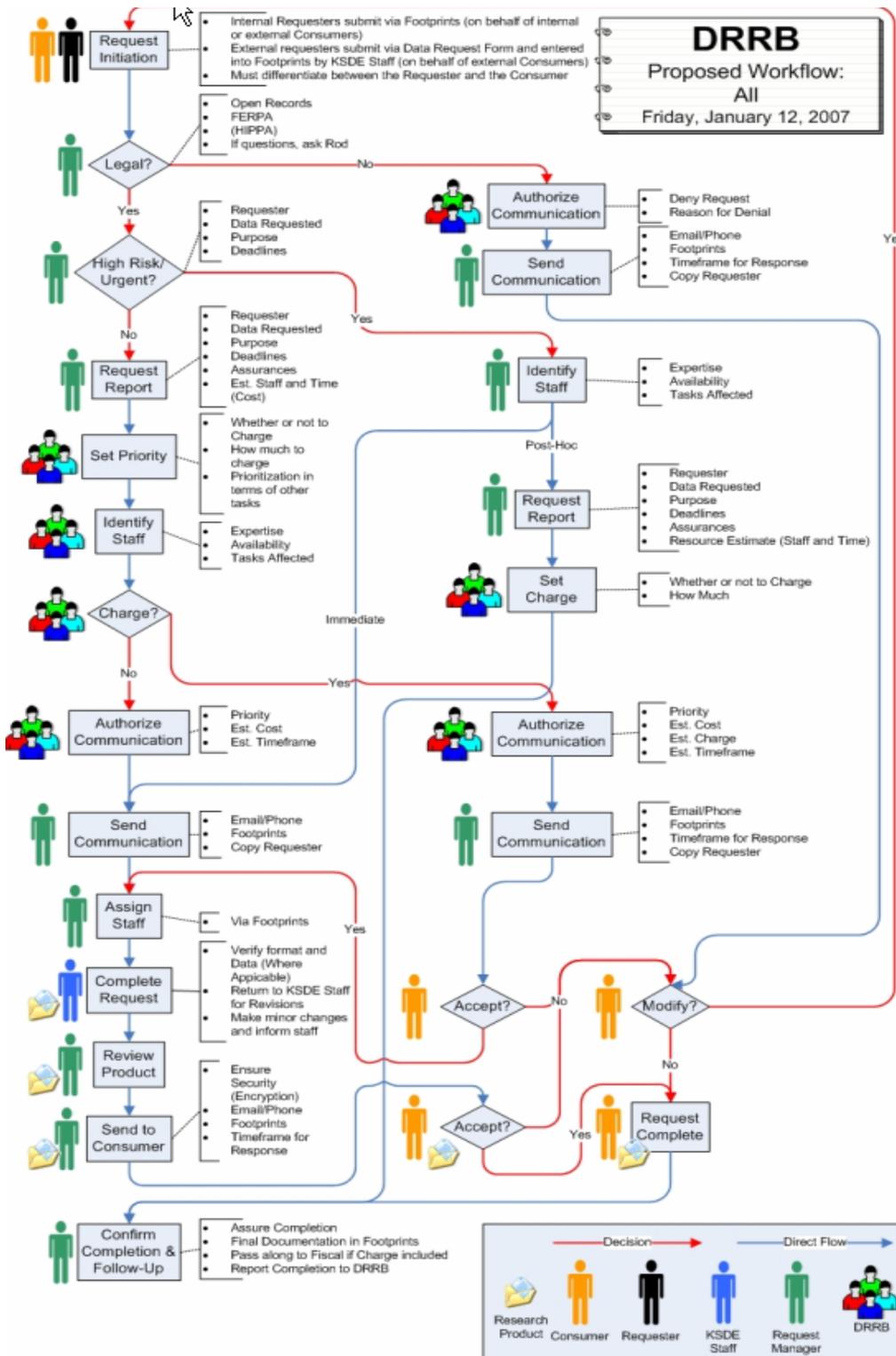
## Scope/Responsibilities and Goals/ Objectives of the Data Request Review Board

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The DRRB was established to support the flow of data and information requests.

- Establish, encourage, and enforce policies and procedures for responding to data and information requests.
- Provide and continually improve standard procedures for entering, prioritizing, and responding to data and information requests.
- Provide for training of KSDE staff to initiate and manage data requests.
- Prioritize requests as needed.
- Assignments of requests as needed.
- Review and determine the legality of responding to the request as needed.
- Report and escalate issues to the Data Governance Board as needed.
- Report denials by the DRRB to fulfill requests to the Data Governance Board.
- Review the flow and completion of requests.

# Data Request Flow Chart



# DATA STEWARD HANDBOOK

Data Stewards are designated by the Data Owner to carry out day-to-day responsibilities, actions, and management regarding the data within his/her area of responsibility. The Data Steward Workgroup is a collaboration of all KSDE Data Stewards and is managed and coordinated by the IT Data Manager and the ED Facts Coordinator.

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## Mission of the Data Steward Workgroup

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Support data stewards within KSDE –

- Act as a source of knowledge and advocacy for data initiatives.
- Ensure data projects maintain focus and meet deadlines.
- Bring issues to the group that need to be addressed and help propose resolutions.
- Escalate issues, as necessary, to the appropriate entity.
- Ensure data quality and data timeliness through collaboration with the workgroup and others throughout the Agency.
- Foster an environment of learning and sharing expertise in relation to data stewardship.
- Share tools and resources.
- Track federal and state legislation involving data elements and translate this impact for the Agency.
- The data owner is accountable for making sure responsibilities are carried out by the designated data stewards.

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## Scope & Responsibilities of the Data Steward Workgroup

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The Data Steward Program currently has four main areas of focus:

- EDEN (Education Data Exchange Network) –submitting data to the US Department of Education (ED) in an electronic format.
- Data Requests – internal and external.
- Enterprise Data System – (ie: data warehouse, data marts, metadata documentation).
- Source Collection Systems.

Overall data steward responsibilities include:

- A data steward is an existing employee that, as part of their every day job, is accountable for managing the definition, production, accountability, and usage of data.
- The time commitment of the data steward will vary depending on the maturity of the data domains & projects (“ramp up” phases will take longer than after a program is

established), and the number of data management activities in which they are involved. It also will depend on the reporting cycle for the data.

- Being a data steward will require a commitment to focus on maximizing data quality and efficiently managing the data.
- In many cases, the work load of a data steward will not increase, but rather the focus of the work will change.
- Data stewardship will become a part of everyday work processes.
- Provide data analysis related to individuals specific program area.
- Regularly evaluate the quality of the data.
- Identify opportunities to share and re-use data.
- Enforce data quality standards.
- Identify & resolve data quality issues -
  - integrity, timeliness, accuracy, completeness, etc.
- Communicate data quality issues & problems to individuals that can influence change, if necessary.
- Communicate new & changed data requirements to necessary individuals.
- Communicate business needs for data security.
- Communicate criteria for archiving data.
- Track federal and state legislation involving data elements and translate this impact for the agency.
- Receive and review emails related to Federal Register Notices. Act upon the Notices as necessary.
- Attend monthly Data Steward Workgroup meetings.

The data steward responsibilities related to the EDEN project includes the following:

- Identify & record EDEN metadata documentation such as business rules, transformations, and source information.
- Confirm that source data is ready for extract to EDEN repository.
- Spot check data transformations in EDEN repository.
- Verify data accuracy of EDEN files.
- Work with EDEN Coordinator and programmer to resolve any data quality issues.
- Give approval to submit data to EDEN.

The data steward responsibilities related to Data Requests (internal and external) include the following:

- Act as a resource for the Data Request Review Board (DRRB).
- Assist in determining the best source to fulfill data requests.
- Assist in determining if data / report already exists and can be utilized.
- Refer DRRB to already existing published data whenever possible.
- Determine if data is ready for public consumption. Review data before it goes out to public to assure accuracy and consistency in reporting. This will depend on requester (ie:

is the requester a student working on a thesis or the Governor wanting some specific data).

- If request goes directly to the steward, then the steward puts the data request into Footprints and either fulfills the request themselves (if appropriate) or lets the DRRB chair assign the request to the appropriate staff.
- Data steward should use their discretion to ensure that the Data Owner is aware of data that is being sent outside of the Agency, as necessary (depending on customer and data).

The data steward responsibilities related to the Enterprise Data System includes the following:

- Identify and record Enterprise metadata such as business rules, transformations, and source information.
- Confirm that source data is ready for ETL (extract, transform, & load) to the data warehouse.
- Participate in the Quality Validation of transformations to the data warehouse for historical and ongoing data loads.
- Participate in the establishment and validation of quality metrics for warehouse data.
- Provide input as requested for the development and use of data marts.
- Be aware of any data marts utilizing the specific program area data.

The data steward responsibilities related to Source Collection Systems includes the following:

- Assist in evaluation of source system enhancements based on data quality issues.
- Monitor functionality of system to ensure needs of team are being met.
- Escalate issues to owner when necessary.
- Act as subject matter expert for enhancement and development projects.

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## Goals & Objectives of the Data Steward Workgroup

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The goals and objectives of the data steward program are listed below:

- In most cases, the people identified for these roles are staff that are already working closely with the data and have reporting responsibilities. These responsibilities will be more formalized and recognized through the Data Steward Program.
- Data stewards are provided the knowledge, tools, forums, and processes to become effective and efficient in this role.
- To improve accountability for data accuracy.
- To attain a “single point of truth” for data (identify the “master” source of data, who is the true “owner” of data, and to minimize redundancy in data collection).
- To improve productivity. By having a central electronic data reporting process in place, we can reduce duplication of effort and redundancy.
- To improve reusability of data.

- To improve understanding of data.
- To improve reporting capability and timeliness of reporting.
- To improve data quality.
- Improved data quality will reduce the cost of work efforts in relation to data clean up and analysis.
- To understand and communicate with necessary staff any federal and state legislation that will impact KSDE data.
- Monthly data steward workgroup meetings will facilitate a connection between the stewards in the agency, help stewards to build capacity, and have the opportunity to discuss current issues.

**TIDBITS:** *“Data Steward” is not a job title; it is a responsibility within the job. Stewards also should not be “hired in”; they should be identified from within the organization. The steward should be a staff person who already has extensive knowledge of the data and is using the data on a regular basis.*

**TIDBITS:** *There is a difference between a data user and a data steward. Everyone is a data user but a data steward is the eyes and ears of the data within the organization.*

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## Integrating Data Stewards into System Development

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KSDE will integrate and involve data stewards into the system development project framework as subject matter experts. This will enable the data stewards' expertise to be used right from the beginning planning stages. The system development framework phases are listed below:

- Planning (identify roles, time commitments, tasks, etc).
- Develop requirements documentation.
- Analysis of business requirements.
- Design of the new system.
- Develop the new system.
- Test the new system.
- Implement the new system.
- Provide ongoing maintenance.
- Perform any necessary enhancements to the system.

**TIDBITS:** *The number one reason a data warehouse project fails is that people do not understand the data.*

**TIDBITS:** *Data stewards can be advocates to the entire agency for the data steward program and what it represents.*

# APPENDIX A

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## Appendix A - Sources

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Source for some of the term definitions: *Improving Data Warehouse and Business Information Quality* – Larry P English (modified for KSDE use)

Source for some of the concepts used in this document from: *How to Build and Implement Data Governance & Data Stewardship Programs* – Public 2-day course by Robert S Seiner of KIK Consulting & Educational Services, Pittsburgh, Pennsylvania.