

Research for Customer-Driven Benchmarking of Maintenance Activities

Prepared for:
National Cooperative Highway Research Program
TRANSPORTATION RESEARCH BOARD
OF THE NATIONAL ACADEMIES

Submitted by:
Booz Allen Hamilton
McLean, Virginia

November 2003

ACKNOWLEDGMENT

This work was sponsored by the American Association of State Highway and Transportation Officials (AASHTO), in cooperation with the Federal Highway Administration, and was conducted in the National Cooperative Highway Research Program (NCHRP), which is administered by the Transportation Research Board (TRB) of the National Academies.

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ACKNOWLEDGMENTS

This report and its principal products, the Guide and the Primer, were prepared under National Cooperative Highway Research Program Project 14-13. The prime contractor was Booz Allen Hamilton. The subcontractor was CompassUSA. The Principal Investigator was William A. Hyman, Senior Associate, Booz Allen Hamilton, and the Co-Principal Investigator was Thomas M. Heffner, President, CompassUSA. Three state transportation departments—California, Minnesota, and Ohio—participated in a field test of the Guide. Particularly helpful were Gary Niemi, Al Bailey, and Keith Swearingen. John Ruggerio provided methodological expertise on data envelopment analysis and contributed a technical memorandum. A large number of individuals in state and local agencies provided input by completing survey questions and/or reviewing a draft of the Guide and the Primer. Max Kalhammer, Perrin French, and Valerie Kalhammer summarized and analyzed the survey responses. Tricia Rosenthal and Luisa Medrano respectively played a key role in the editing and production of this report. Finally, the input and guidance of Chris Hedges, the Senior Program Officer, and the NCHRP Project 14-13 Panel are gratefully acknowledged.

SUMMARY

Transportation agencies have recognized that continuous improvement is essential to managing a maintenance organization effectively in the face of growing demand, increasing traffic, tight budgets, and limited staff. Agencies need to improve the **effectiveness** and **efficiency** with which they deliver maintenance products and services to customers. Effectiveness refers to the ability of maintenance organizations to deliver products and services that customers want. Efficiency refers to the extent to which resources are minimized in delivering such products and services.

In response to the need for continuous improvement, the National Cooperative Highway Research Program (NCHRP) funded NCHRP Project 14-13 – with the objective of developing a **primer** and a **guide** on customer-driven benchmarking (CDB).

The purpose of the Primer developed for this project is to promote customer-driven benchmarking and educate top management and other managers on the main ideas and benefits. The purpose of the Guide is to provide a "how to" manual. The study has also involved preparing a Final Report, which describes the research project, key findings, conclusions, and recommendations.

The Primer was developed as a draft and shared with managers from various agencies including counties, states, and tollway authorities. Their feedback was incorporated into the final version of the Primer. The Primer was developed to be shared widely among and within agencies to provide knowledge of a benchmarking process and encourage managers to investigate and initiate CDB.

The Guide was developed through a similar draft and review process. In addition, preparation of the Guide included field-testing in three states (California, Minnesota, and Ohio) most the procedures. Results of the field test were then used to revise the Guide and produce a document that is practical and easy to use.

Benchmarking is widely used in both the public and private sectors. It has widespread applicability within maintenance organizations because of the large number of agencies (over 19,000 cities, 3,000 counties, 50 states, toll/ thruway authorities, and a growing number of private contractors) all attempting to provide similar products and services. Benchmarking provides a method for agencies to move from an internal to an external organizational focus to find the best maintenance practices.

Benchmarking is a rigorous discipline that involves the use of accurate, agreed-upon measures. The basic steps of benchmarking are forming a partnership, reaching agreement on a set of common measures, taking measurements, identifying best performers and corresponding best practices, and following through with agency implementation and continuous improvement. In customer-driven benchmarking, the measures used focus on the results important to customers. In the past, maintenance organizations have used measures that tend to be internally focused, for example, the quantity of production and resource utilization (labor, equipment, and materials). Today, maintenance organizations are becoming increasingly focused on customer-oriented measures such as smoothness of roads, legibility of signs at night, sight distance at

intersections, attractiveness of roadsides, and the speed with which roads covered with ice and snow are returned to bare pavement.

Four types of measures are used in CDB:

1. **Outcomes** – These are the results of performing maintenance activities that are important to customers. Examples of outcomes are smooth roads, edge markings that are easy to see in poor weather, and traffic signals that are reliable and work almost continuously.
2. **Outputs** – These are measures of accomplishment or production. Examples of outputs are linear feet of ditches cleaned, number of bags of litter collected, and acres of grass mowed.
3. **Resources** – These are labor, equipment, materials, and financial costs.
4. **Hardship factors** – These are factors outside the control of the maintenance organization that make it more difficult to satisfy customer desires and needs. Examples of hardship factors are weather, terrain, and population density.

CDB combines all of these measures to give analysts and managers a broad perspective on how well organizations are achieving outcomes that matter to customers, in a manner that uses the least possible resources and takes into account the level of production and uncontrollable factors such as weather. Organizations that do this best, as determined through measurement, are sources of practices that other agencies should consider adopting.

The Guide is divided into two parts. Part I, Introduction and Getting Started, consists of three chapters and is mainly intended to educate the reader regarding key concepts. Chapter 1 introduces the reader to the concepts of CDB, discusses important prerequisites that must be satisfied (such as obtaining strong leadership commitment to the effort), communicates the time required to benchmark for the first time (at least two years), dispels a number of benchmarking myths, and lists critical success factors. Chapter 2 examines key issues in forming a benchmarking partnership including important elements of a benchmarking agreement. Chapter 3 discusses important issues of measurement, including various types of measures, key characteristics of measures such as statistical validity, the need for each benchmarking unit to use the same measures, and sources of candidate measures, for example the proceedings of the National Workshop on Commonly Recognized Measures for Maintenance.

Part II, Steps of Customer-Driven Benchmarking, is the "how to" portion of the Guide and is organized by the five main steps of CDB:

1. Select partners
2. Establish customer-oriented measures
3. Measure performance
4. Identify best performances and practices
5. Implement and continuously improve.

The Guide also contains several appendixes that are useful for working through the benchmarking process. Particularly useful are examples of survey questions that various organizations have used and a compendium of customer-oriented measures.

The Guide and the Primer are very useful tools for initiating CDB as a new management practice within the maintenance community. However, early implementers recognize that conducting CDB across agencies is not easy. This is true for two primary reasons. First, the data for measures (especially outcome measures) is not as accurate or statistically valid as needed and agencies do not use the same measures. Therefore, no sound basis exists for comparing performances or for identifying best performances and corresponding best practices. Agencies will have to work to develop and use common measures in the future. Second, many agencies have virtually no experience combining customer-driven outcome measures, resource measures, and output and hardship measures in order to obtain a full and meaningful picture of benchmarking units. This picture is required to identify the units that perform best. If agencies used customer-driven outcome measures for resource allocation and to make management decisions at the tactical level, it would not be as difficult to make the jump to using these types of measures for benchmarking.

Today, largely because of the lack of agreed-upon measures that can be used to compare performance across agencies, benchmarking is challenging and time-consuming. Agencies benchmarking for the first time can expect the effort to take at least two years to obtain initial results. If they plan to participate in a multi-year effort aimed at continuous improvement, they could be working together for as many as five years. Internal benchmarking is much less demanding since it is relatively easy to impose a common set of measures on the benchmarking units within an agency.

CHAPTER I. INTRODUCTION AND RESEARCH APPROACH

In the late 1980s, companies such as General Motors, Xerox, and Zenith Corporation realized that they were losing significant market share to Japanese manufacturers, largely because the Japanese had adopted quality improvement techniques invented in the United States prior to World War II. This loss caused extraordinary consternation within the U.S. manufacturing industry. In response, to give just one example, Motorola Corporation began a nearly fanatical pursuit of its now famous 6-sigma program to combat the Japanese threat to its market position. In 1987, the U.S. Department of Commerce established the Malcolm Baldrige National Quality Award to increase awareness throughout the commercial sector of the importance of quality, and to identify the quality leaders that others might emulate (See www.quality.nisc.gov).

In 1992, the Federal Highway Administration, the American Association of State Highway and Transportation Officials, and several industry associations adopted the National Quality Initiative for transportation. Its purpose was to promote improvement of highway product quality as a key component of national competitiveness. An important aspect of highway quality that can benefit from continuous quality improvement is highway maintenance management. Customer-oriented maintenance quality has become a priority of many states, provinces, cities, counties, and toll authorities, as well as national governments in North America and around the world.

Research on maintenance quality sponsored by the Strategic Highway Research Program, state and provincial contract research programs, and the National Cooperative Highway Research Program has provided important practical benefits to transportation agencies. One example of such research is NCHRP Project 14-12 on Maintenance Quality Assurance. This project, performed by ERES Consultants, focused on the utility of measuring maintenance performance in terms of levels of service for roadway features for randomly selected segments of a highway network. The quality assurance technique explored in NCHRP Project 14-12 is but one method in a tool kit of important approaches to continuous quality improvement.

Thousands of organizations, public and private, are providing highway maintenance to over 4 million miles of roads in the United States. A significant issue is how to tap that knowledge and experience, as well as customer reaction, to identify practices that will better satisfy the demands of the driving public for good roads and services and the demands of taxpayers for spending as little as possible.

What process can an agency use to identify practices that might improve the performance of highway maintenance? The answer is **benchmarking**. The American Productivity and Quality Center defines benchmarking as “the process of identifying, understanding, and adapting outstanding practices from organizations anywhere in the world to help your organization improve its performance.”

Two significant concepts come together in NCHRP Project 14-13; (1) measuring maintenance in a way that is sensitive to the customer; and (2) benchmarking or identifying, understanding,

and adapting outstanding practices from anywhere. The name given to these concepts for highway maintenance is customer-driven benchmarking (CDB).

RESEARCH OBJECTIVES

The primary objectives of Project 14-13 were to develop a Primer that illustrates the benefits and promotes the use of CDB and to develop a Guide that assists in implementing CDB in the highway maintenance community.

RESEARCH APPROACH

The approach to this project included completing the tasks described here.

Task 1 - Learn from existing and accessible research what is applicable for benchmarking in highway maintenance - Conduct a Literature Review

The objective of the literature search was to identify material relevant to CDB for highway maintenance activities that would be useful in developing a suitable methodology for NCHRP Project 14-13 and to provide input in the preparation of the Guide and the Primer.

Because there exists a vast literature on benchmarking, performance measurement, customer surveys, best practices, and maintenance management, we narrowed the scope of the literature search to focus primarily on literature that simultaneously addressed four key words:

1. Customer-driven
2. Benchmarking
3. Best practices
4. Maintenance.

We augmented this focused search by selectively examining the broader literature concerning benchmarking, and by compiling bibliographic material to explore further as required during the project.

The literature search involved the following activities:

- A search of the Transportation Research Information System database, performed by the TRB Library staff
- An Internet search
- A search of Booz Allen Hamilton's intellectual capital database Knowledge On Line (KOL)
- A search of professional, academic, trade, and industry journals to identify benchmarking and business-related journals
- An examination of the holdings in the Booz Allen Hamilton library
- An examination of the materials owned by project team members
- Visits to technical bookstores.

Task 2 – Based upon surveys conducted by state and local agencies, identify the performance measures that are important to measuring what highway maintenance customers want.

Surveys were administered to maintenance agencies in the United States and Canada. The survey asked about agency usage of:

- Customer surveys
- Public opinion monitoring
- Benchmarking
- Performance measurement.

Surveys were administered to five survey groups: U.S. states; Canadian provinces; cities; counties; and bridge, tunnel, and turnpike authorities (BTTAs). Surveys were sent by mail to agency executives. Table 1 lists the number of surveys sent and returned for each survey group.

Table 1. Administration and Response Rates for Maintenance Agency Survey

Survey Group	Surveys Sent	Surveys Received	Rate of Return
U.S. States	49	31	76%
Canadian Provinces	7	3	43%
Cities	150	20	13%
Counties	290	44	15%
BTTAs	23	3	13%
Total	519	101	19%

Task 3 – Recommend a practical methodology for benchmarking highway maintenance activities and illustrate the methodology with specific maintenance activities.

Benchmarking was defined in the problem statement for NCHRP 14-13 as:

...the process of identifying, understanding, and adapting outstanding practices from organizations anywhere in the world to help [an] organization improve its performance.

Benchmarking can be used to improve any activity performed by an organization, including highway maintenance activities. This project has focused on the “customer-driven” aspect of the benchmarking process. When customer preferences drive benchmarking, potential improvements to the business process become more evident. In other words, CDB is not just looking for a way to perform some activity at a lower cost, it is also looking for a way to better meet customer demands and desires.

Task 4 – Prepare an Interim Report.

Based on the results of Task 1 through 3 the researchers prepared an Interim Report and met with the Panel to discuss the recommendations regarding how to proceed.

Task 5 – Develop a *guide* or “how to” workbook for maintenance agencies that wish to engage in the methodology of customer-driven benchmarking; and

Task 6 – Develop a *primer*, suitable for all levels of maintenance management, that explains in plain language the concept of benchmarking and how it fits into continuous quality improvement.

After selecting a CDB technique, the Guide and the Primer were prepared and reviewed by agency maintenance personnel in states, counties, municipalities, and BTTAs.

Task 7 – Test the utility of the guide and the primer with transportation agencies for implementing customer-driven benchmarking. Rewrite and Finalize the Guide and Primer.

After changes were made to the initial drafts of the Guide and Primer, agencies that had previously been solicited to participate in a field test of the CDB process were recruited to commit to a field test of the draft documents by working through the CDB procedures. Upon completion of the field test, the Guide, and Primer were finalized.

Task 8 – Document the entire research process in a final report.

The concluding task was to prepare a research report documenting the entire effort for the NCHRP Project 14-13.

CHAPTER II. FINDINGS

This section presents the results of the study by task. Tables and figures contain specific data collected during the project.

TASK 1 - LITERATURE REVIEW

There is considerable literature on benchmarking, including well-known books on the subject. The core benchmarking processes presented in these books typically include the following steps:

1. Obtain support of top management
2. Determine what to benchmark
3. Determine what and how to measure
4. Develop a data collection plan
5. Identify what internal and external organizations and processes to compare
6. Collect information
7. Use quantitative measures to identify best performance
8. Identify the gap in one's own performance relative to the best performance
9. Examine the root causes of the performance gap
10. Develop an action plan for improvement to close or leap-frog the gap
11. Gain support for the action plan
12. Implement the plan
13. Monitor the plan.

The literature review revealed that benchmarking has evolved through six different generations. Although the quality movement has always had a strong customer orientation, benchmarking in the past has tended to have a process orientation. The literature suggests that sometime in the early to mid-1990s, the latest generation of benchmarking evolved into a focus on total customer satisfaction.

TASK 2 - SURVEY OF MAINTENANCE AGENCIES

This section presents results compiled across all survey groups. Compiled results from each survey group are in Appendix A.

Because of the small number of data points for the Canadian province agencies and the BTTAs, survey results may not accurately represent these populations, thus, they are not broken out in the figures in this chapter. The responses from these agencies, however, are included in the total survey results.

It can be assumed that survey responses may be skewed to over-represent populations that participate in customer surveying, benchmarking, and performance measurement. These populations are more likely to return a survey of this nature due to interest in the subject.

Customer Surveys

The following paragraphs present details on agencies' use of surveys to obtain information from their customers.

Customer Survey Usage

Nearly 40 percent of respondents and half of city respondents have used customer surveys to periodically assess customer satisfaction, preferences, or expectations regarding the levels of service of roadway maintenance activities, products, and/or services (see Figure 1). However, only 13 percent of respondents use statistically valid sampling procedures.

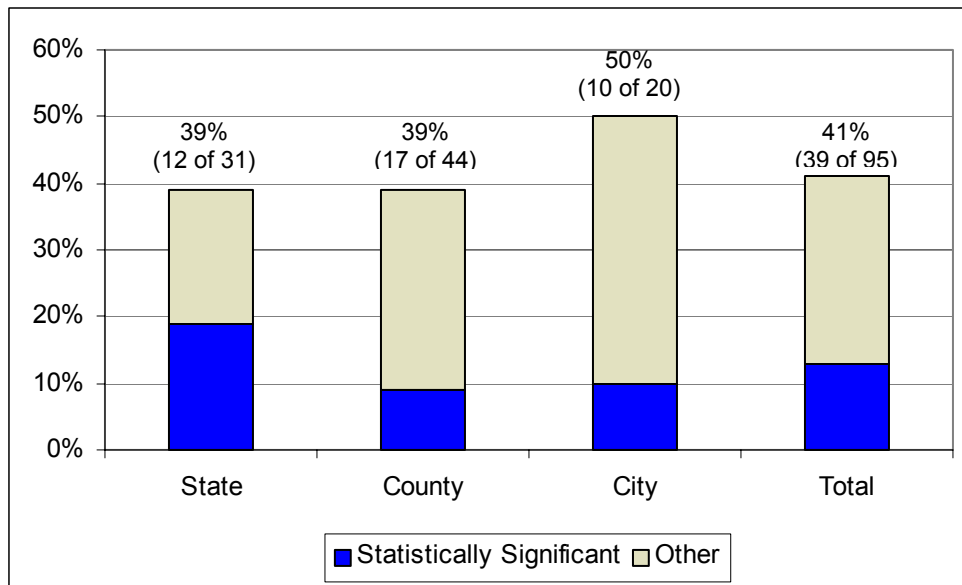


Figure 1. Percent of Respondents Using Customer Surveys

Customer Survey Methods

Telephone and direct mail are the most commonly used survey methods. Other methods used include customer comment cards at special events and rest stops, and the Internet or e-mail. Surveys often target specific audiences. These types of surveys include job completion surveys after a service is rendered and surveys of community officials and municipal advisory groups.

Customer Survey Frequency

Survey frequency depends on the type of survey. Surveys at rest stops, events, and fairs, and upon job completion, are conducted on an ongoing basis. Some jurisdictions use these in addition to other types of surveys. Approximately 40 percent of respondents conduct surveys on a regular annual basis; another 25 percent do them less frequently.

Customer Survey Purposes

Nearly one-third of respondents use ratings of customer satisfaction or preferences as a measure of the effectiveness of different parts of their maintenance programs. Significantly fewer (8 and

14 percent respectively) use customer survey results as direct input into annual or seasonal work plans or as input to reallocating budget resources among maintenance activities, products, and services, or to different geographic areas (see Figure 2). Only five percent of respondents indicated that they use surveys to assess the economic value that customers place on different attributes of road maintenance.

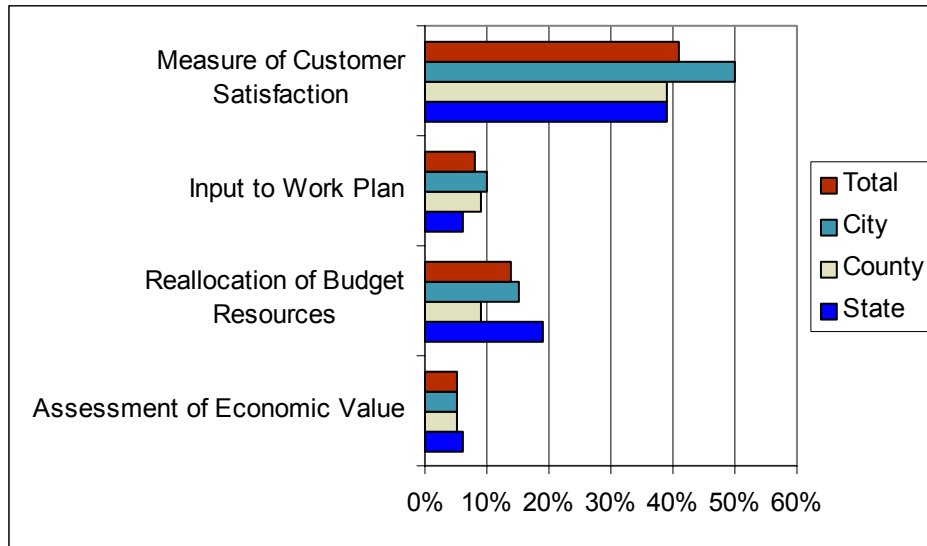


Figure 2. Purposes of Customer Surveys

Benchmarking

The following paragraphs present details on agencies' use of benchmarking for gauging performance of maintenance operations.

Benchmarking Practices

About 30 percent of respondents benchmark maintenance operations in some form; less than half of those benchmark on a continuing or periodic basis (see Figure 3).

About 14 percent of respondents, roughly half of those benchmarking, use the process to compare their agencies' performance against that of other organizations. Most benchmark against other agencies of similar type, although some (seven) compare their performance to that of contractors. Table 2 provides additional detail on how responding agencies use benchmarking or related practices to compare performance.

Only six respondents claim to be using customer surveys as a tool for benchmarking. Two state respondents compare agency survey results to the National Quality Initiative survey. Other respondents use surveys for less-formal benchmarking comparisons to other jurisdictions or for measuring progress against internal goals.

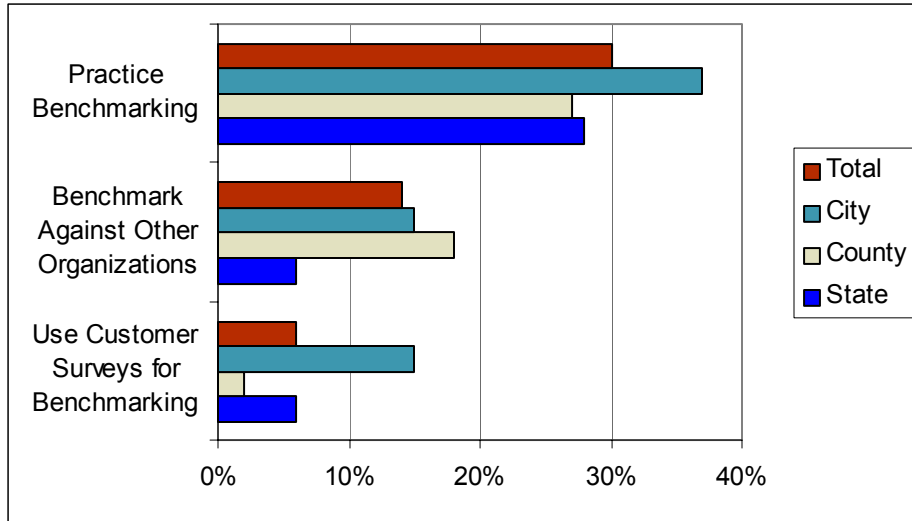


Figure 3. Respondents' Benchmarking Practices

Table 2. Percent of Respondents Using Performance Comparison Practices

PERFORMANCE COMPARISON PRACTICES	State	County	City	Total
Exchange information in a variety of ways regarding current practices but do not formally measure and compare performance among organizational units.	52%	57%	70%	58%
Compare the performance of organizational units based on information obtained from a random sample of highway sections regarding the attainment of level of service goals.	29%	75%	0%	44%
Compare performance based upon unit costs and productivity measures in a maintenance management system.	61%	9%	40%	35%
The performance information for all organizational units at a certain level (e.g., county) is available to every manager, and managers are encouraged to investigate the practices of the best performers.	45%	23%	5%	26%
Comparison of performance occurs at the initiative of individual managers and occurs for a relatively small number of organizational units.	19%	23%	25%	22%
Compare performance at the headquarters level but do not share these comparisons with lower levels of the organization.	16%	20%	0%	15%
Compare performance based on customer-oriented outcome and/or value-added measures.	19%	2%	20%	11%
Compare performance at the district or lower level based on the results of a statistically valid survey of customer satisfaction, preferences, and/or expectations.	3%	2%	5%	3%

From these results, it is clear that virtually no jurisdictions practice true CDB. Very few organizations compare performance based on customer-oriented outcome or value-added measures, and almost none use statistically valid surveys as a basis for service comparison.

Activities, products, and services that agencies benchmark include

- Roadside maintenance (mowing, landscaping, drainage, curb, sidewalk, street cleaning)
- Pavement condition maintenance (pothole filling, crack sealing, patching, overlays, grading)
- Bridge maintenance
- Traffic control and safety features maintenance (signs, signals, road markings, guardrails)
- Snow and ice maintenance
- Fleet care.

Best Practices Implementation

Of the respondents, 20 percent identify, document, and share among organizational units the business processes (activities and sequences) associated with best practices; however, only 9 percent (or fewer) track the implementation of best practices within their agencies. Of those claiming to track implementation of best practices, few describe formal processes for doing so.

Responsibility for Benchmarking

Responsibility for the benchmarking process and for evaluating related performance results varies across responding agencies. Most commonly, each organizational unit is responsible for benchmarking relevant activities. In some cases, the administrative unit performs a role in compiling or tracking results. Some respondents also indicate that ultimate responsibility for overseeing benchmarking results is elevated to a senior management or executive director level.

Information Exchange

Respondents identified numerous processes, programs, and forums for information exchange about maintenance practices. These include:

- Internal meetings
- Technical systems and analysis (e.g., work management, maintenance management, performance measurement, activity-based costing and accounting)
- Seminars and training
- Industry meetings and conferences
- Networking with area agencies
- Peer group meetings.

Industry associations most commonly identified as forums for information exchange include:

- State and regional maintenance supervisor and superintendents' associations
- American Association of State Highway and Transportation Officials (AASHTO)
- American Public Works Association (APWA).

Benchmarking Goals

Survey participants were asked to indicate the aspects and related outcomes of a CDB process that their agencies most need or desire. Responses varied by survey group, although many of the highest-rated responses are the same. Highest-rated responses for each survey group are indicated in Table 3.

Table 3. Agency Needs and Desires Related to Benchmarking

Survey Group	Benchmarking Results of Greatest Interest
States	<ul style="list-style-type: none"> • Achieve better results with fewer resources • Satisfy customers and taxpayers • Increase accountability to the public, motorists, and elected officials • Stimulate a culture of striving to be the best • Compare physical conditions of maintenance assets across organizational units
Counties	<ul style="list-style-type: none"> • Satisfy customers and taxpayers • Stimulate a culture of striving to be the best • Increase accountability to the public, motorists, and elected officials • Achieve better results with fewer resources
Cities	<ul style="list-style-type: none"> • Compare physical conditions of maintenance assets across organizational units • Stimulate a culture of striving to be the best • Increase accountability to the public, motorists, and elected officials
Canadian Provinces	<ul style="list-style-type: none"> • Empower field organizations • Compare performance of various levels within the organization • Assess information about “best” practices • Benchmark performance against other highway organizations • Benchmark performance against “world class” practices and other highway organizations • Increase accountability to the public, motorists, and elected officials
BTTA	<ul style="list-style-type: none"> • Create a learning network within the organization • Identify cost savings and improvements achieved by adopting “best” practices • Measure customer satisfaction and compare across organizational units

Performance Measurement

Most respondents (over 75 percent) measure performance via output (production) and input measures. In addition, more than 50 percent use outcome measures, and a few, primarily at the county level, measure other factors such as economic value added (e.g., avoidable costs) or factors external to maintenance operations (e.g., weather, traffic). Approximately 25 percent of those surveyed (including over 40 percent of states) have a maintenance quality assurance program that defines conditions or levels of service for maintenance activities or products (see Figure 4).

It is important to reiterate that less than 4 percent (as shown in Table 2) have statistically valid surveys of customers’ assessments of roadway and/or driving experiences at a district or lower organizational level to use for performance measurement. Even fewer of these organizations have routine (e.g., annual) assessments.

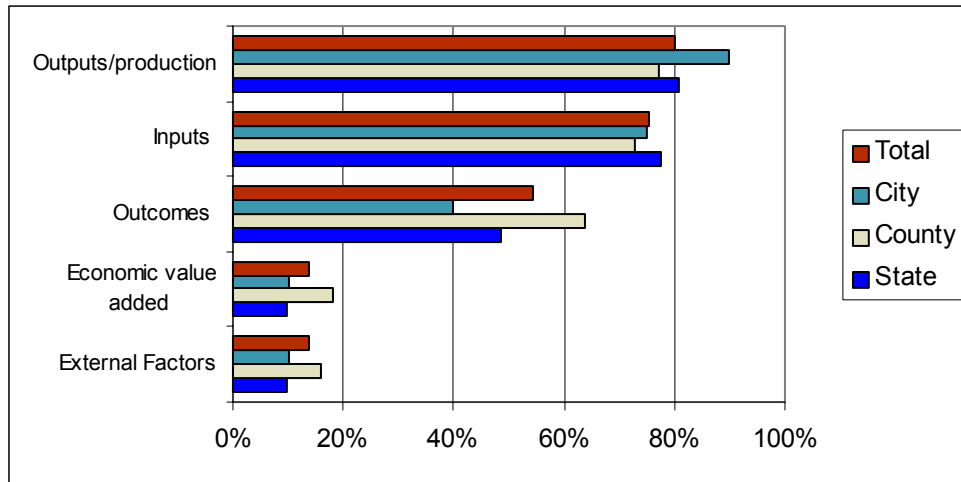


Figure 4. Respondents' Use of Performance Measures

Further review of the surveys that 12 state agencies have used to gather customer feedback clarified and underscored the kind of survey question measures that these agencies used for determining what highway customers want. Customer feedback was gathered primarily to assess:

- Satisfaction with maintenance activities (e.g. pothole repairs, maintenance of shoulders and turnouts)
- Satisfaction with outcomes (e.g. sign visibility, pavement smoothness)
- Perception of the level of service being provided and desired (e.g. paved roadway surfaces, landscaping).

The measurement scale used by agencies varies substantially, from a binary (yes or no) scale to a 10-point scale. In addition, agencies that qualitatively assess their maintenance assets (typically referred to as a level-of-service measurement, or LOS) have developed individual agency measures, which tend to differ from those of other agencies.

TASK 3 - RECOMMEND A METHODOLOGY FOR BENCHMARKING

Most identified “benchmarking” activities in maintenance are not really benchmarking – they are simple comparisons of activities and procedures. Comparing practices is good but is not necessarily benchmarking. Benchmarking involves measurement to identify best performances. Benchmarking is primarily a process of identifying and implementing practices associated with better or best performance and not with lower levels of performance.

Issues for Benchmarking of Maintenance Operations

Benchmarking in maintenance has been considered difficult for a number of reasons including:

- Differences in climate or other environmental conditions have a significant effect on what an agency can accomplish and on the costs to achieve a certain result; therefore comparisons are difficult.

- Different history and differing environmental conditions can significantly affect the expectations and/or the demands of the customer; consequently organizations have different objectives.
- Across states or cities, different laws may force agencies to perform in one way or another and may restrict the available options.
- Performance measure definitions are not the same for some activities within a state or across states, making comparisons difficult if not nearly impossible.
- Transportation organizations are in still in the early stages in terms of their experience with effectiveness measures – such as those of customer satisfaction, quality assurance, or economic value. In some cases, the maintenance organizations do not know exactly what practices affect the effectiveness measure.

Another issue surrounding benchmarking is conflict in the use of the measurements. Benchmarking measures and evaluates performance to identify the best performances. Identifying best performances then helps lead to identifying best practices and encouraging sharing of good ideas. At the same time, it is human nature to want to look good in comparison to others; therefore, we tend to look down on performances that are not the best, and to be critical of poor performers. This negative focus can create an atmosphere that prevents openness and a desire to share, and is counterproductive to benchmarking. However, maintenance managers believe that significant learning and improvements can occur if methods can be established and implemented for benchmarking that overcome or minimize these obstacles.

Benchmarking methodologies in the commercial environment tend to be driven by organizations that want to improve and not by an organizational hierarchy or information system that already exists across benchmarking participants. In private firms, benchmarking studies or projects typically support change in strategy and often result in a requirement for major operational or structural changes brought about through reengineering.

Within the maintenance environment for roadway infrastructure, this is not the situation. This environment consists of many local organizations or agencies that perform essentially the same functions. They are attempting to accomplish essentially the same goals of protecting or preserving the infrastructure and simultaneously being responsive to the demands of the infrastructure users and those otherwise affected by the existence of the roadway and roadway users. In this environment, benchmarking is not just strategic – that is, leading to major re-engineering – but is a continuing process and thereby a way to monitor changes in practices that lead to improved performances.

During the Task 2 survey, very few maintenance organizations said that they are doing benchmarking. Some organizations are not exactly benchmarking, but they are comparing practices. They are not measuring and identifying superior performance as a basis for comparing practices. Even the agencies that compare performance tend to be comparing performance with respect to a single dimension or ratio.

Statistically valid customer surveys are just beginning to become a tool used by maintenance managers to compare performance, set priorities, set targets, or reallocate resources. Consequently, few agencies have integrated customer feedback as a measure of performance. We believe that this is partially a result of the rate of change in transportation and other government agencies, as they begin to view and evaluate themselves as providers of products and services. Many state agencies, however, have been conducting surveys and focus groups and gaining a perspective of what the customer views as important, needing improvement, and even how the customer would prioritize expenditures. On a very limited basis, maintenance organizations have begun to calculate a customer-based economic value for providing a product or service at a certain level.

Customer Desires for Transportation Infrastructure

Many existing but different customer surveys that are assessing desires, priorities, and conditions of the highway infrastructure indicate that customer desires for use of the infrastructure can be grouped into four categories of service and ranked in descending order (although individual subcomponents may be ranked differently):

1. Mobility
2. Safety
3. Preservation
4. Environmental protection.

Mobility

Mobility relates to the ability and ease of getting from point A to point B and includes:

- Access to roadways and bridges (meaning “up time” or time available)
- Free of delays related to work, weather, temporary hazards, or congestion from overcapacity (can travel A to B at speed limit)
- Ride comfort (surface condition, roughness, traction)
- Travel amenities (clean and functional rest areas).

Safety

Safety relates to the infrastructure accessories that inform and protect the driver while traveling and includes:

- Signage (presents desired information and visible)
- Signals (functioning properly and visible)
- Pavement markings (useful and visible)
- Guard rails, ramps, etc. (present where needed and functional).

Preservation

Preservation relates to infrastructure asset management and optimization of its economic life and includes:

- Road condition (level of deterioration or remaining life)

- Shoulder condition (level of deterioration or remaining life)
- Bridge condition (level of deterioration or remaining life)
- Drainage (present and functioning as intended).

Environmental Protection

Environmental protection relates to activities performed to protect and enhance the environment of the right-of-way (and surrounding property) and includes:

- Weed control (degree weeds present)
- Mowing grass (line of sight clear, attractive)
- Noise control (present where needed and functional)
- Planting, maintaining trees, shrubs, flowers (attractive)
- Litter and graffiti removal (attractive)
- Cleaning catch basins (water quality).

Factors Affecting Measures of Efficiency and Effectiveness

CDB may be conducted on the aggregate category or on any subcomponent. This is customer-driven because the resulting measures are either based on direct feedback from customers regarding their satisfaction with the category or subcomponent product or service, and/or outcome-based measures that are surrogates for customers' evaluations. Such measures may be considered as effectiveness measures.

Simultaneously, the public desires that the agencies providing these services use the fewest possible resources (which equate to dollars) to provide the quality of service that they desire. Best performances are those that are simultaneously effective (they produce a high or good level of results) and efficient (spend little money for the work they perform) in producing the results.

Agencies that provide these maintenance services, however, are operating in very diverse environments. Weather, terrain, population density, legal requirements, type of traffic, type of roadway, and funding levels may have a significant effect on overall performance. Furthermore, customers do not all have the same expectations and do not evaluate the service delivery the same way. In addition, their evaluations may change over time as their expectations change, even if the same quality of service is delivered.

All of this is to say that serving the customer is quite different from designing the best techniques for filling potholes or establishing standards for overlay activities. Customers want the highest quality service for the lowest price, given the hardship (environmental) conditions within which they experience roadways. Performance is what is actually achieved – i.e., outcomes from service delivery.

CDB can utilize mathematical programming techniques in order to combine several types of measures and to be able to adequately contrast performances in different operating circumstances. These techniques provide a real breakthrough in simplifying and evaluating the complexity of service delivery performance. However for each local entity that is involved in the benchmarking process (e.g. county operation, city operation, crew, etc.), standard measures of performance are required.

This task concluded by recommending an approach to CDB, which is called data envelopment analysis, a powerful tool for identifying best performers when there are more than 30 benchmarking units. However, the field test ultimately resulted in an evaluation of only 12 benchmarking units and so a simplified method was used.

TASK 4 – INTERIM REPORT

The Interim Report summarized the results of Task 1 through 3, and provided options and recommendation for the Panel to consider regarding what type of benchmarking method to use for the rest of the project. The options included:

- Quality Assurance Procedures used in NCHRP Project 14-12
- ICMA Center for Performance Measurement Method
- Kansas City Model
- Customer-Driven Benchmarking using Data Envelopment Analysis (DEA)

The last method was recommended, but DEA was dropped when the members of the benchmarking partnership were unable to produce data that warrants the use of DEA. Instead we used graphical techniques where the last performer could be identified by visual inspection. This method is appropriate only if the number of benchmarking units is quite small.

TASKS 5 AND 6 – PREPARE GUIDE AND PRIMER DOCUMENTS

Through discussions with agencies that responded to the agency survey (101 agencies) and those that were interested in participating in a test of CDB (58 of 101, or 57 percent), we did not find agencies that were routinely performing CDB. They did not conduct CDB with an expectation that they would find alternative practices that would help them (in absolute terms) improve maintenance performance.

Guide and Primer documents were created that acknowledge this current situation. Maintenance personnel from state, county, toll agency, and private contractor agencies reviewed these documents. Of these reviewers, 16 reviewed the Guide and 36 reviewed the Primer. The documents were further edited as a result of demonstrating the CDB technique with agencies (Task 6). The Guide and Primer are the final products of NCHRP Project 14-13 and should accompany this report or be available to readers of this report.

TASK 7 – TEST THE UTILITY OF THE GUIDE AND THE PRIMER

Many significant findings resulted from testing the Guide with maintenance organizations. Agencies expressing an interest in testing the Guide and Primer through a demonstration CBD project were contacted. Agreements to participate in the demonstration project initially included three state agencies, a toll agency, a private contractor, and a county agency. As the project progressed, participants dropped out, leaving three state agencies – California, Minnesota, and Ohio – as participants. Of these, Minnesota’s commitment and participation was the most significant.

Agencies had underestimated what they would need to do to test the Guide and the Primer. To truly test the Guide they needed to bring together data that often did not exist and they were not prepared to create data through new measurement systems for this purpose. One county considered implementing customer surveys but for political reasons decided not to implement the survey and capture customer feedback.

All maintenance agencies perform basically the same or similar work activities or functions that could be the basis for benchmarking comparisons. The organization or structure of activities varies from one agency to another and, in some agencies, the measurements are not as formalized as in others. The focus or orientation tends to be toward work activities and the internal organization, and is based on their experience and history of work activities.

CHAPTER III. INTERPRETATION, APPRAISAL, AND APPLICATIONS

The paragraphs that follow summarize the implications of the study regarding the use of CBD for assessing and improving the performance of maintenance operations.

Only one transportation agency (Minnesota) had defined or oriented its maintenance function toward providing goods and services to meet the needs and expectations of its true customers: the roadway users. To define or orient a function means to identify products and services that customers want, organize work functions or activities correspondingly, and evaluate how well you do in providing these products and services to the customer. Any change in an agency to create this orientation will come only if led by the leadership of the agency and its primary functions. No others have the authority to change the Vision and or Mission of the organization.

Even with our team guiding the process, it was difficult for the members of an internal maintenance organization to change their view of their work and identify what they do in terms of customer-oriented products and services. We changed the section of the Guide that focuses on this activity to simplify and provide more structure to lead agency personnel as they went through this process.

Although many agencies at the state or county level have conducted customer research, virtually no agencies were routinely (at least annually) performing customer research to assess maintenance performance at an organizational level below the agency level (or below the district level if a state agency). This means that if they did perform customer research to assess performance, the research was not statistically valid at a level below the agency or district.

Agencies are developing outcome measures such as the International Roughness Index (IRI) or using such measures more frequently to measure the effectiveness of maintenance work. Even more popular outcome measures are qualitative assessments of maintenance assets, known as quality assurance measures. These are statistically valid measures for assessing a roadway or grouping of roadways. For benchmarking, however, these are difficult to use because agencies use different measures to evaluate basically the same asset (e.g. pavement markings, road surface conditions, signage conditions, etc.).

Agency personnel do not have a history of working with many different types of performance data. Performance measurement has not typically been a significant part of agency work. The terms input, output, outcome, and environmental or hardship factor are not familiar to agency staff. (When explained, however, staff had a reasonable level of understanding of the concepts.) Agencies tend to focus on efficiency or cost per unit of production or on an outcome but not both. Even so, many agencies are not accustomed to using outcome measures to determine management practices (including resource allocations), or to establish budgets and targets.

We originally anticipated CDB to be a tool for maintenance workers or for the team or crew performing the maintenance work. **We quickly learned that although the crews or work teams**

will benefit from CDB, it is a management process that is implemented at senior management levels down through levels of management who allocate resources and determine work methods. The reasons for this include:

- The work area that can be evaluated (i.e., where the customer can detect a difference in the service provided over a time period, typically a year) is not the block, street, or road, but rather is a larger area that is affected by different maintenance practices (planning, scheduling, material and equipment selection and utilization, labor training and configuration, and execution quality). This may be sections of a city or county, a county within a state, or districts. Typically, results are evaluated on the basis of direct customer feedback through surveys and/or from quality assurance measures that are often not statistically valid at lower levels (i.e., at the crew level).
- Even if the measures existed or were practical at the crew level, crews often change and do not provide service to exactly the same area for long periods of time (noted exceptions might be the signage or pavement-marking crews); therefore, performance would not really be useful for determining practices.
- Although crews vary in their execution of work, they do not typically control the practices (e.g., material types and usage procedures, equipment types, labor skills and configurations, training, scheduling, or sequencing of work types) that significantly affect performance and that customers detect over time. These are the practices that CDB is attempting to identify that will serve as models for improving performance.

To perform CDB, most agencies will need to develop additional measures of performance, which requires senior management involvement and agreement. A section of the Guide is designed to help maintenance management understand and communicate to personnel the cost implications of new measures and be judicious in choosing new measures.

Agencies are not accustomed to creating accurate databases of performance information, sharing the information internally, or making management decisions based on this data. One agency that we considered good at using data found that when they scrutinized their cost data and compared it across the agency, there were discrepancies that they could not rectify. They also discovered that measurement protocols, even within the same agency, were not the same across sub-units and therefore measures with the same name were not exactly the same, making comparisons difficult. Different measurements and protocols or inconsistent use of protocols make comparisons across agencies even more difficult – if not impossible.

It was difficult getting different agencies to follow the data protocol of the worksheets in the Guide and provide exactly the same type data in the same exact format, which made comparisons and evaluations of performance extremely difficult. Following the worksheets in the Guide requires careful adherence to protocol.

Difficulty in following the worksheet protocol was partly caused by each agency having to collect performance data from different internal sources. Agencies do not appear to have a central repository for performance data and a manager who is responsible for the quality and application of the performance data. More typically, customer feedback data is maintained in one place, production data in another, outcome data in another, cost data in another, etc., which makes it difficult to assemble performance information for evaluation and comparison.

Good documentation of current business practices by each sub-unit of an agency is lacking and staffs are not familiar with processes for documenting such practices. Sub-units are more accustomed to following standards established by higher levels of the organization, and deviations are not always adequately recognized or sometimes even valued. This made it difficult to get questionnaires completed by different sub-units.

There is much interest in CDB, as evidenced by the response to the survey, but real leadership is essential. CDB is a long-term activity that may require agencies to commit to work together for two or more years. We found that other priorities (typically short-term crises or urgent activities) delayed or postponed benchmarking activities, stopping any cross-agency activity. We experienced this firsthand as some agencies dropped out of the demonstration project to test the Guide when they realized the commitment involved.

As stressed in the Guide, having an internal champion and a backup champion in each agency proved essential. In one agency, the lead person doing or coordinating the work left the agency. No one else was ready to take over that role, resulting in delays and, eventually, withdrawal from the project.

CHAPTER IV. CONCLUSIONS AND RECOMMENDATIONS

Although many of the study findings have a negative dimension, they also reflect much positive opportunity. As the benchmarking survey of agencies has demonstrated, there is much interest in this topic – TRB has formed a performance measurement committee and AASHTO has held a conference to begin to identify common performance measures across agencies. As a result of this project, we can now offer a Primer to promote the idea of CDB, and a workbook – the Guide – to lead agencies through the steps of this new approach.

Specific conclusions resulting from this project are listed here.

CONCLUSIONS

1. Few maintenance organizations have adopted a perspective of themselves as providers of products and services designed to satisfy the real customer: the driving public.

The absence of such perspective hinders or slows the development of customer-oriented outcome measures, especially statistically valid customer feedback that is solicited routinely at levels at which the customer can differentiate the service provided. Such levels would be sections within a city, county, thruway, or a county – or organizational levels in a state, such as a district, county, or garage. Consequently, performance is not evaluated on the basis of customer satisfaction and resources and management processes are not aimed primarily at this objective.

2. Most agencies are not prepared to implement CDB quickly for maintenance practices.

CDB is based upon performance that is defined as being both efficient and effective. Most agencies do not have routine effectiveness measures that are statistically valid at an organizational level below the agency level and that support performance comparisons. However, most agencies do have data to create common resource measures and common production measures across agencies. Typically, agencies are neither using routine nor common measures to evaluate their maintenance performance. Across agencies, very few (if any) outcome measures exist that are generic and can be implemented easily in additional agencies. The International Roughness Index (IRI) is a noted exception. Quality assurance measures are becoming more common in agencies and are now used by 75 percent of counties and 29 percent of states (according to the CDB study). These outcome measures (measures of effectiveness, also known as LOS measures) assess the resulting conditions of maintenance assets; however, each agency has unique definitions for its measures, which makes it difficult to use them to make comparisons.

3. Even within agencies, there is difficulty obtaining accurate data for common measures of performance.

Measurements are often taken by the people performing the work, which can produce results that are not necessarily objective. The more subjective the measurements, the more likely there will be bias. Because routine procedures for using measurements of performance are not available to guide management decisions such as resource allocation, there has been no significant emphasis on accuracy of measurement. Most agencies seem to have large amounts of

data, often collected for a project that is no longer active or a routine that is no longer used. The people or organizations providing the data do not receive regular feedback or know how the data is used, which then leads to a lack of consistently high-quality data for measurements. In addition, protocols for measurements are often not sufficiently detailed; consequently, within the same agency, a measurement with a common name may really be different across sub-units.

4. Even though maintenance organizations do some comparison of performances and practices, they do not routinely document their practices (from planning through execution) with the idea of looking for differences among internal organizations.

The more common routine is to have standards for work practices within an agency and expect that every work group will follow the standards. The standards may be altered from time to time. Because measures of performance and performance evaluations of resulting asset conditions or customer satisfaction have not been routinely used to hold organizations accountable, management has used standard practices as a means to maintain control and accountability. Even though organizations realize that different practices and techniques are used, the mainstream attitude has not supported the idea that different practices are alright, it is what is produced (resulting conditions or customer satisfaction) that is important.

5. Agencies are becoming interested in CDB even though they have not historically been prepared to initiate the activity.

Of the agencies that responded to our survey, 44 percent are comparing performances internally based upon quality assurance measures and 11 percent are comparing performances using a customer outcome measure. Of the respondents to the CDB survey, 57 percent expressed interest in working further on a project to test CDB techniques.

6. CDB requires strong leadership.

One agency needs to take the lead to generate interest and commitment from additional agencies to participate in what is a relatively long-term activity. Coordination among partners is also needed to ensure that required activities are taking place and that good performance data is collected in one database that will support analysis of performance and dissemination of the results of the analysis to all partners and their benchmarking units. Agencies will need to work together to agree upon common measures of performance, especially outcome measures, and then to begin to collect the data. This must occur before identifying different performances and comparing practices. This process could take 2 years. Without strong leadership to maintain the course, the process will expire from lack of attention. Because of the time required to produce results, agencies as role models or leaders need to collaborate. They need to show other agencies what to do and help them gain confidence in their own commitment to implement CDB.

7. CDB currently is more easily implemented internally than externally (across political boundaries). Consequently state agencies can implement CDB more easily than can counties, municipalities, turnpike or thruway authorities, or private contractors.

A. CDB provides a greater opportunity for identifying better practices as the number of organizational units participating increases. State agencies have a large number of sub-agency organizations that perform maintenance, use the same or similar measures, and can share information through a common system. Management decisions and coordination of activities

can more easily be accomplished within one organization than across many organizations. In addition, data issues will be more easily resolved within one agency; they will have the structure and the management to resolve issues more quickly regarding protocols and even new measures. Once common measures become more predominant in the industry, this issue will be less significant.

8. The accuracy of performance evaluations is a two-edged sword. Although accuracy is important, CDB is about better practices, not about audit-level performance analysis.

On one hand, accurate data is important to creating good measures of performance to use for performance evaluation and comparisons. Performance analysis is used to differentiate performance levels and segregate better performances from the rest. On the other hand, too much emphasis on precision can lead to “analysis paralysis” where organizational units become overly worried about their specific level of performance and lose sight of the idea that finding and implementing practices that lead to better performance is the real challenge.

9. The lead agency will need personnel with strong mathematical analysis and statistical skills.

CDB defines performance as being effective in an efficient way. Combining outcomes, outputs, resource usage, and hardship factors is not common practice in maintenance organizations and requires personnel with mathematical skills to evaluate and compare performances. Secondary analysis will likely be helpful for identifying and/or assessing practices that make a difference. Use of root cause analysis and regression analysis require a degree of skill not typically found in maintenance organization sub-units. Such skill may exist at headquarters; if not, it can be acquired on a project basis from external consultants. As agencies gain experience, they will want to do additional analysis separate from the initial benchmarking analysis, which will require partner agencies to use their own analysis talent—either internal or external.

RECOMMENDATIONS

CDB needs considerable promotion from many organizations before it will become commonplace. The Primer and Guide provide help to early adopters, but much industry advancement is necessary to reorient agencies toward a customer focus, common measures of maintenance performance, and documenting of business processes. The idea of looking outside one’s own organization for good ideas is not common—it will require strong advocates and leadership. The benefits, however, seem apparent. Thousands of agencies perform similar functions—some are bound to find better practices from time to time. The question is, which ones and how do we know that their practices lead to better performance? Performance data and a system for comparison, such as CDB, provide an answer.

Specific recommendations for achieving optimal benefits from the use of CDB in transportation maintenance agencies are presented here.

1. The autonomy of agencies around the country makes facilitation and leadership critical if agencies are going to partner to perform CDB for the first time.

Such agencies as AASHTO the National Association of County Engineers (NACE) and the American Public Works Association (APWA), should take a leadership role in bringing a group of states, selected counties, municipalities, private contractors, and turnpike authorities together to implement CDB using the Guide and the Primer and working through the process all the way to implementing new practices and measuring results.

2. Common products and services with common measures need to be defined that can be used by all agencies.

Again, AASHTO is a likely organization to continue this activity, which began in June 2000, although NACE and APWA could play a strong supporting role. Common measures will enable many agencies to work together in benchmarking as well as other related activities. A complete set of measures needs to be developed for each product or service, including outcomes, outputs, resources, and hardship factors. No real benchmarking will take place in transportation if there are no common measures of performance. It is difficult to expect independent agencies to form alliances that will determine and cause members of such an alliance to change their internal measures of performance.

3. To encourage CDB, a central database with Web site access for all participants needs to be developed. It could be operated by an association or a host provider.

An advantage to CDB is that it can leverage technology and allow agencies and their sub-units to compare performance and practices with large numbers of units that they do not personally know or may have never visited. Performance information and descriptions of business practices are at the heart of CDB, and they can be maintained in databases and communicated electronically. Specific direction and coordination will need to be provided by the first CDB partnership or another facilitating body, such as AASHTO.

4. National seminars and/or workshops should be offered to help leaders who are interested in CBD or already committed to implementing a CBD program.

CDB is a management process that typically requires an entirely new orientation of an agency (as a provider of products and services to the driving public) that will only come from an agency's leadership. Workshops or seminars sponsored by AASHTO—in cooperation with FHWA, NACO, APWA, or other associations—could be developed to attract and meet the needs of senior transportation maintenance leaders regarding understanding and implementing a CDB initiative. They could help leaders develop a plan for approaching their agency and for obtaining commitment from other agency leaders to work together. Additional seminars and workshops to help managers of agencies already committed to implementing CDB would facilitate the CDB process by providing valuable information and exercises on implementation, as well as allowing agency staff to share experiences. AASHTO or FHWA could be a catalyst for or sponsor of such events.

5. The Primer and Guide should be disseminated widely.

The Primer should be distributed to agency personnel, especially to management in maintenance organizations. Distribution should be accomplished through all the leading government associations including AASHTO; American Public Works Association; the National Association of Counties; the National League of Cities; the Conference of Mayors; and the International Bridge, Tunnel, and Turnpike Association. The Guide should be published and distributed to senior management of agencies through TRB, AASHTO, selected associations of local governments, and perhaps FHWA.

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APPENDIX A.

**NCHRP PROJECT 14-13 CUSTOMER-DRIVEN
BENCHMARKING OF MAINTENANCE
ACTIVITIES QUESTIONNAIRE**

**NCHRP PROJECT 14-13
CUSTOMER DRIVEN BENCHMARKING
OF MAINTENANCE ACTIVITIES**

QUESTIONNAIRE

Please provide the following information regarding the respondent:

Name: _____
Position: _____
Organization: _____
Address: _____

Phone: _____
Fax: _____
E-mail: _____

Contact person if different from the respondent:

Name: _____
Position: _____
Phone: _____
Fax: _____
E-mail: _____

We would like to thank you in advance for your agency's time and effort in completing this questionnaire.

We have tried to make Sections A through F quick and easy to complete. Brief responses to requests for explanations are fine, but feel free to attach additional sheets if you would like to communicate something you feel is important.

Following the survey questions, we ask for detailed information on the different types of performance measures your agency uses. Please do what you can to assemble this information. This information will allow us to understand to what extent common performance measures exist, which affects the feasibility of benchmarking. The information will be of great use to this NCHRP Project and to the highway maintenance community generally.

**NCHRP PROJECT 14-13
CUSTOMER DRIVEN BENCHMARKING
OF MAINTENANCE ACTIVITIES**

SECTION A. CUSTOMER SURVEYS OF THE MOTORING PUBLIC

1. Do you use customer surveys to periodically assess customer satisfaction, preferences and/or expectations regarding the levels of service of highway maintenance activities or products or services? Yes ___ No ___. (if no, then skip to question 3.)

(a) What type of survey techniques do you use? (e.g. telephone, focus groups, mail, booths at fairs, inserts in newspapers, internet, kiosks at events, mall intercepts, etc.)

(b) How frequently do you conduct surveys (e.g. annually, every two years, seasonally, continuously, no specific frequency, etc.)

(c) Do you use **statistically valid** procedures? Yes ___, No ___, Not Sure ___. If yes, indicate each level for which the surveys are statistically valid by checking the box(s):

- State (or entire highway system)
- District
- County
- Lower level: _____

2. If you have customer survey results, answer "Yes" or "No" regarding whether you use the results for the following purposes:

(a) Do you use ratings of customer satisfaction or preferences as a measure of the effectiveness of different parts of the maintenance program? Yes ___ No ___ If yes, check the lowest organizational level for which you do this:

- State (or entire highway system)
- District
- County
- Lower level: _____

(b) Do you use customer survey results as direct input into developing your annual or seasonal work plan? Yes ___ No ___.

(c) Have you ever used survey results as input to reallocating budget resources among maintenance activities, products and services, or different geographic areas?

Yes ___ No ___. If yes, please explain:

(d) Have you used customer surveys to assess the economic value customers place on different attributes of road maintenance? Yes ___ No ___. If yes, please explain:

SECTION B. BENCHMARKING EXPERIENCE

3. Are you benchmarking maintenance operations in your agency?
 Yes ___ No ___. If yes, please continue the questions in order. Otherwise skip to Question 12.

4. State at what level(s) of your organization benchmarking is occurring by indicating the number of organizational units being compared to the left of the name of the organizational unit below, and indicate the total number of actual organizational units at that level to the right of the name. (Example -- If only three of seventy five garages are engaged in a pilot benchmarking program, then write "3" to the left of "Garage" and "75" to the right of "Garage."):

- ___ District ___
- ___ County ___
- ___ Area ___
- ___ Garage ___
- ___ Crew ___
- ___ Road Section ___
- ___ Other: (_____) _____

5. What primary activities, products, or services do you benchmark? Please list below:

A.		G.	
B.		H.	
C.		I.	
D.		J.	
E.		K.	

6. Have you ever used the results of customer surveys for benchmarking within your organization or with other organizations? Yes ___ No ___. If yes, please explain:

7. Do you benchmark your agency's performance against other organizations?

Yes ___ No ___. If yes check each type of organization you benchmark against:

- Other state highway agencies
- City or county highway agencies
- Bridge, Tunnel and Turnpike Authorities
- Maintenance contractors
- Highway organizations outside the United States
- Maintenance organizations in other transportation sectors
- Maintenance organizations in industries other than transportation

8. Do you identify, document, and share among organizational units the business processes (activities and sequences) associated with the "best" practices? Yes ___ No ___.

9. Do you have a process for tracking the implementation of "best" practices? Yes ___ No ___. If yes Please explain:

10. Do you do benchmarking as a continuing or periodic process? Yes ___ No ___.

11. What part of the organization is responsible for the benchmarking process and evaluating the progress or change in performance resulting from benchmarking? Explain:

12. Whether or not your organization is practicing specific "benchmarking," the organization is likely to be comparing performances in some way or another. Please check each way your agency currently compares performance:

- We compare the performance of organizational units based on information obtained from a random sample of highway sections regarding the attainment of level of service goals.
- We compare performance based upon unit costs and productivity measures in our maintenance management system.
- We compare performance based on customer-oriented outcome and/or value added measures.
- We exchange information in a variety of ways regarding current practices but do not formally measure and compare performance among organizational units.
- At the headquarters level we compare performance but we do not share these comparisons with lower levels of the organization.
- Comparison of performance occurs at the initiative of individual managers and occurs for a relatively small number of organizational units.
- The performance information for all organizational units at a certain level (e.g. county) is available to every manager, and managers are encouraged to investigate the practices of the best performers.
- We compare performance at the District or lower level based on the results of a statistically valid survey of customer satisfaction, preferences, and/or expectations.

13. Please list the most important processes, programs or forums that your agency currently uses to enable maintenance managers to exchange information about maintenance practices within your agency or with other agencies so that managers may gain ideas for change and improvement:

- _____
- _____
- _____
- _____
- _____

SECTION C. BENCHMARKING NEEDS AND DESIRES

14. What aspects of a customer-driven benchmarking process do you think your agency needs or desires. Please rate the importance on a scale of 1 (not important) to 5 (extremely important):

Rate Importance (1 to 5)	NEED OR DESIRE
	By benchmarking, we want to create a learning network within the organization.
	By benchmarking, we want to provide tools to empower the field organization.
	By benchmarking, we want to stimulate a culture of striving to be the best, not average.
	By benchmarking, we want tools to help us achieve better results with less resources.
	By benchmarking, we want tools to create more satisfied customers and taxpayers.
	We want to have the means of being more accountable to the public, motorists and elected officials by having an effective performance measurement and benchmarking process.
	We want to use benchmarking information as input into decisions regarding the allocation of funds among maintenance activities and products and services.
	We want to be able to identify Best Management Practices (BMPs) for environmental issues in delivering maintenance to our customers
	We want to be able to identify technological changes that can improve or result in "best" practices.
	We would like to measure and compare productivity of organizational units in meeting customer needs.
	We want to compare performance at the crew level.
	We want to compare performance at the district or residency level.
	We want to compare performance at the county level.
	We want to compare performance at the area or garage level.
	We want to compare contractor performance.
	We want to compare contractor performance with our agency performance.
	We want to be able to benchmark performance against other highway organizations.
	We want to be able to benchmark performance against "world class" practices including our own organization, other highway agencies, other industries, and other countries.
	We would like be able to measure and compare across organizational units customer satisfaction.
	We would like to be able to measure and compare across organizational units customer-oriented outcomes including levels-of-service
	We would like to be able to measure and compare across organizational units the economic value customers receive (e.g. avoidable life-cycle and user costs).
	We would like to be able to measure and compare across organizational units the physical condition of maintenance assets.
	We want to conduct comparisons in a manner that accounts for differences in variables outside the control of maintenance organizations, for example weather, terrain and traffic.
	We want to be able to identify and document business processes associated with "best" practices.
	We want to be able to identify the cost savings and/or the improvement in outcomes and value added that can be achieved by adopting "best" practices.
	We want to be able to view benchmarking results on a web site, assuming we can control who within and outside our organization can identify units in our organization being compared.
	We want to be able to access information about "best" practices on a web site.

SECTION D. PERFORMANCE MEASURES

15. Which of the following types of performance measures do you use within your maintenance organization? Check each one that applies:

- Inputs (i.e. labor, equipment, materials, and funds)
- Outputs/Production (e.g. potholes patched, lane miles paved, acres mowed)
- Outcomes (e.g. pavement roughness, visibility of signs, accidents, customer satisfaction)
- Economic value added (e.g. avoidable lifecycle costs, avoidable road user costs)
- Factors external to maintenance operations (e.g. weather, terrain, traffic)

16. Do you have a maintenance quality assurance program in which you have defined condition and/or levels of service for each maintenance activity or product or service area. Yes ___ No ___.

SECTION E. ORGANIZATIONAL RESPONSIBILITY

17. Are most maintenance crews assigned to and have fixed responsibility for only a specific set of roadway sections? Yes ___ No ___.

18. List what specialized crews (e.g. signing, striping, bridge inspection), if any, are assigned to and have responsibility for specific sections of roads?

- _____
- _____
- _____
- _____
- _____

SECTION F. INTEREST IN YOUR AGENCY PARTICIPATING IN AND HOSTING CUSTOMER DRIVEN BENCHMARKING OF MAINTENANCE ACTIVITIES.

19. Would your agency be interested in participating in a test and evaluation of benchmarking methods developed under this NCHRP Project? The Principal Investigators of this NCHRP project would work directly with maintenance personnel in your organization to apply customer-driven benchmarking to one or more maintenance activities using quantitative measures in order to identify "best" practices, to assess opportunities for improvement, and to implement "best" practices. If you check "yes", we will get in touch with you for possible participation in Phase II of this NCHRP Project: Yes ___ No ___.

APPENDIX B.

**NCHRP PROJECT 14-13 CUSTOMER-DRIVEN
BENCHMARKING OF MAINTENANCE
ACTIVITIES SURVEY SUMMARY**

NCHRP PROJECT 14-13
CUSTOMER-DRIVEN BENCHMARKING
OF MAINTENANCE ACTIVITIES

SURVEY SUMMARY

(STATE RESPONDENTS)

Total # of Respondents:	31
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SECTION A. CUSTOMER SURVEYS OF THE MOTORING PUBLIC

1. Do you use customer surveys to periodically assess customer satisfaction, preferences and/or expectations regarding the levels of service of highway maintenance activities or products or services?

Yes	12	No	19.
-----	----	----	-----

What type of survey techniques do you use? (e.g., telephone, focus groups, mail, booths at fairs, inserts in newspapers, internet, kiosks at events, mall intercepts, etc.)

Half the respondents indicated that telephones were their primary means of conducting surveys. Five (42%) indicated that they mail surveys (not exclusive). Rest area comment cards were used by 17% of respondents.

How frequently do you conduct surveys? (e.g., annually, every two years, seasonally, continuously, no specific frequency, etc.)

The frequency with which surveys were conducted depended largely on the type of survey instrument and time of year (i.e., summer or winter). While rest area comment cards are collected continuously, 42% of the respondents conduct surveys annually while 25% conduct surveys every 2-5 years. One respondent conducts weekly surveys during snow/ice periods, and two respondents (17%) do not conduct surveys with any regular frequency (not exclusive).

*Do you use **statistically valid** procedures?*

Yes	6	No	5	Not Sure	2
-----	---	----	---	----------	---

If yes, indicate each level for which the surveys are statistically valid by checking the box(s):

	# of Times Indicated
State (or entire highway system)	6
District	3
County	2
Lower level:	0

2. If you have customer survey results, answer "Yes" or "No" regarding whether you use the results for the following purposes:

Do you use ratings of customer satisfaction or preferences as a measure of the effectiveness of different parts of the maintenance program?

Yes	10	No	2
-----	----	----	---

If yes, check the lowest organizational level for which you do this:

	# of Times Indicated
State (or entire highway system)	5
District	5
County	5
Lower level:	2

Do you use customer survey results as direct input into developing your annual or seasonal work plan?

Yes	4	No	8
-----	---	----	---

Have you ever used survey results as input to reallocating budget resources among maintenance activities, products and services, or different geographic areas?

Yes	6	No	5
-----	---	----	---

If yes, please explain:

Surveys have resulted in the reallocation of resources and/or shifting of emphasis from one program to another for six (33%) of respondents. Surface maintenance (mowing, snow/ice removal) was improved for one-third of those respondents. A second third of those respondents have improved or identified rest areas as needing improvement.

Have you used customer surveys to assess the economic value customers place on different attributes of road maintenance?

Yes	2	No	8
-----	---	----	---

If yes, please explain:

Responses to this question were unclear. Respondents may not be familiar with the concept.

SECTION B. BENCHMARKING EXPERIENCE

3. *Are you benchmarking maintenance operations in your agency?*

Yes	9	No	23
-----	---	----	----

If yes, please continue the questions in order. Otherwise skip to Question 12.

4. *State at what level(s) of your organization benchmarking is occurring by indicating the number of organizational units being compared to the left of the name of the organizational unit below, and indicate the total number of actual organizational units at that level to the right of the name. (Example: If only three of seventy five garages are engaged in a pilot benchmarking program, then write "3" to the left of "Garage" and "75" to the right of "Garage."):*

Avg.		Avg.
	District	
	County	
4	Area	4
37.33	Garage	49.25
68	Crew	68
	Road Section	
4	Other: (road sections)	4

5. What primary activities, products, or services do you benchmark? Please list below:

Responses	# of Respondents
Roadside Programs (e.g., mowing, shoulder activities, landscaping, drainage)	6
Litter Pickup/Dead Deer Removal/Graffiti Removal	4
Maintenance	4
Productivity/Performance	3
Pavement	2
Bridges	2
Shop Activities/Equipment Repair	2
Traffic	1
Station Programs	1

6. Have you ever used the results of customer surveys for benchmarking within your organization or with other organizations?

Yes	2	No	9
-----	---	----	---

If yes, please explain:

Both respondents indicated that local customer survey responses were used for comparisons to National Quality Initiative survey numbers.

7. Do you benchmark your agency's performance against other organizations?

Yes	2	No	8
-----	---	----	---

If yes check each type of organization you benchmark against:

	# of Times Indicated
Other state highway agencies	4
Bridge, Tunnel and Turnpike Authorities	1
Maintenance contractors	1
Maintenance organizations in industries other than transportation	1
City or county highway agencies	0
Highway organizations outside the United States	0
Maintenance organizations in other transportation sectors	0

8. Do you identify, document, and share among organizational units the business processes (activities and sequences) associated with the "best" practices?

Yes	7	No	3
-----	---	----	---

9. Do you have a process for tracking the implementation of "best" practices?

Yes	1	No	9
-----	---	----	---

If yes, please explain:

The only respondent to this question indicated that their tracking process was not formalized.

10. Do you do benchmarking as a continuing or periodic process?

Yes	7	No	2
-----	---	----	---

11. *What part of the organization is responsible for the benchmarking process and evaluating the progress or change in performance resulting from benchmarking? Explain:*

Of the six respondents to this section, two (33%) indicated that their maintenance divisions were responsible for overseeing performance results. One respondent (17%) indicated that their equipment service section is responsible for the benchmarking process. The administrative unit at headquarters oversees benchmarking and evaluation for another respondent (17%). One (17%) identified various agencies as being responsible while another (17%) indicated that no specific agency is responsible for overseeing performance.

12. *Whether or not your organization is practicing specific “benchmarking,” the organization is likely to be comparing performances in some way or another. Please check each way your agency currently compares performance:*

	# of Times Indicated
We compare performance based upon unit costs and productivity measures in our maintenance management system.	19
We exchange information in a variety of ways regarding current practices but do not formally measure and compare performance among organizational units.	16
The performance information for all organizational units at a certain level (e.g., county) is available to every manager, and managers are encouraged to investigate the practices of the best performers.	14
We compare the performance of organizational units based on information obtained from a random sample of highway sections regarding the attainment of level of service goals.	9
We compare performance based on customer-oriented outcome and/or value added measures.	6
Comparison of performance occurs at the initiative of individual managers and occurs for a relatively small number of organizational units.	6
At the headquarters level we compare performance but we do not share these comparisons with lower levels of the organization.	5
We compare performance at the District or lower level based on the results of a statistically valid survey of customer satisfaction, preferences, and/or expectations.	1

13. Please list the most important processes, programs or forums that your agency currently uses to enable maintenance managers to exchange information about maintenance practices within your agency or with other agencies so that managers may gain ideas for change and improvement:

Respondents identified several categories of meetings that they attend in which information is exchanged: internal, district-level, state-level, and annual conferences. Twenty-eight respondents (88%) identified regular maintenance/operations/engineers' meetings as important in the exchange of information. AASHTO seminars and meetings were identified by six respondents (19%). Other meetings identified included TRB, shop productivity meetings, and FHWA's QA workshop.

SECTION C. BENCHMARKING NEEDS AND DESIRES

14. *What aspects of a customer-driven benchmarking process do you think your agency needs or desires. Please rate the importance on a scale of 1 (not important) to 5 (extremely important):*

NEED OR DESIRE	Average Rating (1 to 5)
By benchmarking, we want tools to help us achieve better results with less resources.	4.42
By benchmarking, we want tools to create more satisfied customers and taxpayers.	4.42
We want to have the means of being more accountable to the public, motorists and elected officials by having an effective performance measurement and benchmarking process.	4.27
By benchmarking, we want to stimulate a culture of striving to be the best, not average.	4.12
We would like to be able to measure and compare across organizational units the physical condition of maintenance assets.	4.04
We want to be able to identify technological changes that can improve or result in "best" practices.	3.96
We want to be able to identify the cost savings and/or the improvement in outcomes and value added that can be achieved by adopting "best" practices.	3.81
We want to use benchmarking information as input into decisions regarding the allocation of funds among maintenance activities and products and services.	3.8
We would like to measure and compare productivity of organizational units in meeting customer needs.	3.75
By benchmarking, we want to provide tools to empower the field organization.	3.72
We want to be able to identify and document business processes associated with "best" practices.	3.70
We would like to be able to measure and compare across organizational units customer-oriented outcomes including levels-of-service	3.64
We want to compare contractor performance with our agency performance.	3.62
By benchmarking, we want to create a learning network within the organization.	3.58
We would like be able to measure and compare across organizational units customer satisfaction.	3.56
We want to conduct comparisons in a manner that accounts for differences in variables outside the control of maintenance organizations, for example weather, terrain and traffic.	3.44
We would like to be able to measure and compare across organizational units the economic value customers receive (e.g., avoidable life-cycle and user costs).	3.40
We want to be able to identify Best Management Practices (BMPs) for environmental issues in	3.36

delivering maintenance to our customers	
We want to compare performance at the district or residency level.	3.32
We want to be able to access information about "best" practices on a web site.	3.31
We want to compare contractor performance.	3.30
We want to compare performance at the area or garage level.	3.00
We want to compare performance at the crew level.	2.92
We want to be able to benchmark performance against other highway organizations.	2.92
We want to be able to benchmark performance against "world class" practices including our own organization, other highway agencies, other industries, and other countries.	2.80
We want to be able to view benchmarking results on a web site, assuming we can control who within and outside our organization can identify units in our organization being compared.	2.80
We want to compare performance at the county level.	2.62

SECTION D. PERFORMANCE MEASURES

15. Which of the following types of performance measures do you use within your maintenance organization? Check each one that applies:

	# of Times Indicated
Outputs/Production (e.g., potholes patched, lane miles paved, acres mowed)	25
Inputs (i.e., labor, equipment, materials, and funds)	24
Outcomes (e.g., pavement roughness, visibility of signs, accidents, customer satisfaction)	15
Economic value added (e.g., avoidable lifecycle costs, avoidable road user costs)	3
Factors external to maintenance operations (e.g., weather, terrain, traffic)	3

16. Do you have a maintenance quality assurance program in which you have defined condition and/or levels of service for each maintenance activity or product or service area.

Yes	13	No	17
-----	----	----	----

SECTION E. ORGANIZATIONAL RESPONSIBILITY

17. *Are most maintenance crews assigned to and have fixed responsibility for only a specific set of roadway sections?*

Yes	23	No	3
-----	----	----	---

18. *List what specialized crews (e.g., signing, striping, bridge inspection), if any, are assigned to and have responsibility for specific sections of roads?*

	# of Times Indicated
Signing	10
Bridge	13
Striping	15
Herbicide/Vegetation	6

SECTION F. INTEREST IN YOUR AGENCY PARTICIPATING IN AND HOSTING CUSTOMER-DRIVEN BENCHMARKING OF MAINTENANCE ACTIVITIES

19. *Would your agency be interested in participating in a test and evaluation of benchmarking methods developed under this NCHRP Project? The Principal Investigators of this NCHRP project would work directly with maintenance personnel in your organization to apply customer-driven benchmarking to one or more maintenance activities using quantitative measures in order to identify "best" practices, to assess opportunities for improvement, and to implement "best" practices. If you check "yes", we will get in touch with you for possible participation in Phase II of this NCHRP Project:*

Yes	16	No	8
-----	----	----	---

NCHRP PROJECT 14-13
CUSTOMER-DRIVEN BENCHMARKING
OF MAINTENANCE ACTIVITIES

SURVEY SUMMARY

(COUNTY RESPONDENTS)

Total # of Respondents:	44
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SECTION A. CUSTOMER SURVEYS OF THE MOTORING PUBLIC

<p>1. Do you use customer surveys to periodically assess customer satisfaction, preferences and/or expectations regarding the levels of service of highway maintenance activities or products or services?</p>
--

Yes	17	No	27
-----	----	----	----

What type of survey techniques do you use? (e.g., telephone, focus groups, mail, booths at fairs, inserts in newspapers, internet, kiosks at events, mall intercepts, etc.)

Over half (53%) indicated using either mail or telephone surveys as the primary means of conducting surveys. Three (18%) indicated using a mix of job completion, mail, and internet surveys. Three (18%) respondents use customer service cards and booth survey cards at special events. The remaining two (12%) of the respondents said they use responses to surveys completed by community officials or municipal advisory groups (MAC).

How frequently do you conduct surveys? (e.g., annually, every two years, seasonally, continuously, no specific frequency, etc.)

Six respondents (35%) indicated surveying continuously, in which all but one case was a mail survey. One respondent (6%) indicated the use of surveys twice a year, also a mail survey.

Three respondents (18%) conduct surveys annually. All three respondents indicate the use of surveys at annual fairs or special events. Three (18%) of those who responded indicated the use of surveys every two years, two of those via telephone, and the remaining one indicated surveys were conducted by community officials. The remaining 24% of the respondents said there was no specific frequency in conducting surveys, and, when conducted, it was by mail or telephone.

Do you use **statistically valid** procedures?

Yes	4	No	9	Not Sure	4
-----	---	----	---	----------	---

If yes, indicate each level for which the surveys are statistically valid by checking the box(s):

	# of Times Indicated
State (or entire highway system)	0
District	0
County	4
Lower level:	0

2. If you have customer survey results, answer "Yes" or "No" regarding whether you use the results for the following purposes:

Do you use ratings of customer satisfaction or preferences as a measure of the effectiveness of different parts of the maintenance program?

Yes	13	No	4
-----	----	----	---

If yes, check the lowest organizational level for which you do this:

	# of Times Indicated
State (or entire highway system)	0
District	0
County	11
Lower level:	2

Do you use customer survey results as direct input into developing your annual or seasonal work plan?

Yes	5	No	12
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Have you ever used survey results as input to reallocating budget resources among maintenance activities, products and services, or different geographic areas?

Yes	4	No	13
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If yes, please explain:

One county developed a process for incorporating feedback into budgeting for maintenance services. Others noted that maintenance services are adjusted according to needs identified from surveys.

Have you used customer surveys to assess the economic value customers place on different attributes of road maintenance?

Yes	2	No	15
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If yes, please explain:

One respondent indicated that surveys are used in this manner only as a point of reference and another indicated that customer survey input influences decisions about maintenance techniques (i.e., paving methods).

SECTION B. BENCHMARKING EXPERIENCE

3. Are you benchmarking maintenance operations in your agency?

Yes	12	No	32
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If yes, please continue the questions in order. Otherwise skip to Question 12.

4. State at what level(s) of your organization benchmarking is occurring by indicating the number of organizational units being compared to the left of the name of the organizational unit below, and indicate the total number of actual organizational units at that level to the right of the name. (Example: If only three of seventy five garages are engaged in a pilot benchmarking program, then write "3" to the left of "Garage" and "75" to the right of "Garage."):

Avg.		Avg.	# Resp.
4	District	4	1
20	County	26	6
16	Area	22	3
7	Garage	7	2
35	Crew	50	2
6	Road Section	6	2
	Other:	(road sections)	

5. *What primary activities, products, or services do you benchmark? Please list below:*

Resnonses	# of Resnondents
Roadside Programs (e.g., mowing, shoulder activities, landscaping, drainage)	8
Litter Pickup/Dead Deer Removal/Graffiti Removal	
Maintenance	5
Productivity/Performance	2
Pavement	11
Bridges	2
Shop Activities/Equipment Repair	3
Traffic	5
<u>Station Programs</u>	

6. *Have you ever used the results of customer surveys for benchmarking within your organization or with other organizations?*

Yes	1	No	11
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If yes, please explain:

The respondent indicated using criteria, developed by employees to track work done in relation to anything considered re-do work. This allows them to identify problem areas and to provide information on how to improve their services and evaluate new products and procedures.

7. *Do you benchmark your agency's performance against other organizations?*

Yes	8	No	4
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If yes check each type of organization you benchmark against:

	# of Times Indicated
Other state highway agencies	2
Bridge, Tunnel and Turnpike Authorities	0
Maintenance contractors	4
Maintenance organizations in industries other than transportation	0
City or county highway agencies	7
Highway organizations outside the United States	0
Maintenance organizations in other transportation sectors	0

8. Do you identify, document, and share among organizational units the business processes (activities and sequences) associated with the "best" practices?

Yes	8	No	4
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9. Do you have a process for tracking the implementation of "best" practices?

Yes	5	No	7
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If yes, please explain:

Two respondents indicated regular tracking of cost effectiveness of new and existing practices. Two respondents also described programs to implement, test, review and document new "best practices."

10. Do you do benchmarking as a continuing or periodic process?

Yes	11	No	1
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11. *What part of the organization is responsible for the benchmarking process and evaluating the progress or change in performance resulting from benchmarking? Explain:*

Responsibilities for benchmarking vary. In many responding counties, multiple divisions or entities have various roles in benchmarking. Most commonly, individual departments (3) or department directors (3) are responsible for benchmarking relevant activities. In some cases, a single department is solely responsible, those named include: Operations (2), Transportation Operations (2), Maintenance (2), Planning (1). In some cases, the Administration Section or Division has a role in compiling data (2), and, in some, the Executive Director or regional superintendents have ultimate responsibility for benchmarking (3).

12. *Whether or not your organization is practicing specific "benchmarking," the organization is likely to be comparing performances in some way or another. Please check each way your agency currently compares performance:*

	# of Times Indicated
We compare performance based upon unit costs and productivity measures in our maintenance management system.	4
We exchange information in a variety of ways regarding current practices but do not formally measure and compare performance among organizational units.	25
The performance information for all organizational units at a certain level (e.g., county) is available to every manager, and managers are encouraged to investigate the practices of the best performers.	10
We compare the performance of organizational units based on information obtained from a random sample of highway sections regarding the attainment of level of service goals.	33
We compare performance based on customer-oriented outcome and/or value added measures.	1
Comparison of performance occurs at the initiative of individual managers and occurs for a relatively small number of organizational units.	10
At the headquarters level we compare performance but we do not share these comparisons with lower levels of the organization.	9
We compare performance at the District or lower level based on the results of a statistically valid survey of customer satisfaction, preferences, and/or expectations.	1

13. Please list the most important processes, programs or forums that your agency currently uses to enable maintenance managers to exchange information about maintenance practices within your agency or with other agencies so that managers may gain ideas for change and improvement:

Respondents identified several categories of meetings that were important for information exchange: internal, multi-county, state-level, and national association meetings and conferences. Seminars through local technical assistance programs and other training seminars were an important sources for exchange of ideas for 10 respondents (25%). Eight respondents (20%) also listed networking with other counties as important for information exchange. Other important forums for exchange include: regional/state maintenance supervisor and superintendent associations (18%), county engineer associations (8%), county road/highway associations (8%), American Public Works Association (15%) , International City/County Managers Association, Institute of Transportation Engineers. Other information sources included: The Internet (8%), contractors (5%), and universities (5%). One county is participating in a formal joint benchmarking program with surrounding counties and another is developing a work management system to assist with benchmarking.

SECTION C. BENCHMARKING NEEDS AND DESIRES

14. *What aspects of a customer-driven benchmarking process do you think your agency needs or desires. Please rate the importance on a scale of 1 (not important) to 5 (extremely important):*

NEED OR DESIRE	Average Rating (1 to 5)
By benchmarking, we want to create a learning network within the organization.	3.66
By benchmarking, we want to provide tools to empower the field organization.	3.76
By benchmarking, we want to stimulate a culture of striving to be the best, not average.	4.07
By benchmarking, we want tools to help us achieve better results with less resources.	4.04
By benchmarking, we want tools to create more satisfied customers and taxpayers.	4.16
We want to have the means of being more accountable to the public, motorists, and elected officials by having an effective performance measurement and benchmarking process.	4.07
We want to use benchmarking information as input into decisions regarding the allocation of funds among maintenance activities and products and services.	3.48
We want to be able to identify Best Management Practices (BMPs) for environmental issues in delivering maintenance to our customers.	3.40
We want to be able to identify technological changes that can improve or result in “best” practices.	3.73
We would like to measure and compare productivity of organizational units in meeting customer needs.	3.46
We want to compare performance at the crew level.	3.07
We want to compare performance at the district or residency level.	2.67
We want to compare performance at the county level.	3.1
We want to compare performance at the area or garage level.	2.56
We want to compare contractor performance.	2.7
We want to compare contractor performance with our agency performance.	2.95
We want to be able to benchmark performance against other highway organizations.	3.19
We want to be able to benchmark performance against “world class” practices including our own organization, other highway agencies, other industries, and other countries.	2.83
We would like to be able to measure and compare across organizational units customer satisfaction.	3.07

We would like to be able to measure and compare across organizational units customer-oriented outcomes including levels-of-service.	3.12
We would like to be able to measure and compare across organizational units the economic value customers receive (e.g. avoidable life-cycle and user costs).	2.87
We would like to be able to measure and compare across organizational units the physical condition of maintenance assets.	3.3
We want to conduct comparisons in a manner that accounts for differences in variables outside the control of maintenance organizations, for example, weather, terrain, and traffic.	2.95
We want to be able to identify and document business processes associated with “best” practices	3.40
We want to be able to identify the cost savings and/or the improvement in outcomes and value added that can be achieved by adopting “best” practices.	3.69
We want to be able to view benchmarking results on a web site, assuming we can control who within and outside our organization can identify units I our organization being compared.	2.85
We want to be able to access information about “best” practices on a web site.	3.09

SECTION D. PERFORMANCE MEASURES

15. Which of the following types of performance measures do you use within your maintenance organization? Check each one that applies:

	# of Times Indicated
Outputs/Production (e.g., potholes patched, lane miles paved, acres mowed)	34
Inputs (i.e., labor, equipment, materials, and funds)	32
Outcomes (e.g., pavement roughness, visibility of signs, accidents, customer satisfaction)	28
Economic value added (e.g., avoidable lifecycle costs, avoidable road user costs)	8
Factors external to maintenance operations (e.g., weather, terrain, traffic)	7

16. Do you have a maintenance quality assurance program in which you have defined condition and/or levels of service for each maintenance activity or product or service area.

Yes	8	No	36
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SECTION E. ORGANIZATIONAL RESPONSIBILITY

17. *Are most maintenance crews assigned to and have fixed responsibility for only a specific set of roadway sections?*

Yes	24	No	19
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18. *List what specialized crews (e.g., signing, striping, bridge inspection), if any, are assigned to and have responsibility for specific sections of roads?*

	# of Times Indicated
Signing	19
Bridge	15
Striping	11
Herbicide/Vegetation/Mowing/Tree Trimming	15
Other Maintenance	4
Patching/Paving/Pothole/Sealing	13
Roadway inspection	1
Grading	3
Drainage repair, cleaning	7
Special projects (sidewalks, retaining wall, structures, etc.)	3
Snow/ice control	3
Fence/guardrail	1
Street cleaning	3
Service Patrol, response	3
Other non-maintenance (construction, planning)	4

**SECTION F. INTEREST IN YOUR AGENCY PARTICIPATING IN AND HOSTING
CUSTOMER-DRIVEN BENCHMARKING OF MAINTENANCE ACTIVITIES**

19. *Would your agency be interested in participating in a test and evaluation of benchmarking methods developed under this NCHRP Project? The Principal Investigators of this NCHRP project would work directly with maintenance personnel in your organization to apply customer-driven benchmarking to one or more maintenance activities using quantitative measures in order to identify "best" practices, to assess opportunities for improvement, and to implement "best" practices. If you check "yes", we will get in touch with you for possible participation in Phase II of this NCHRP Project:*

Yes	30	No	14
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NCHRP PROJECT 14-13
CUSTOMER-DRIVEN BENCHMARKING
OF MAINTENANCE ACTIVITIES

SURVEY SUMMARY

(CITY RESPONDENTS)

Total # of Respondents:	20
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SECTION A. CUSTOMER SURVEYS OF THE MOTORING PUBLIC

1. Do you use customer surveys to periodically assess customer satisfaction, preferences and/or expectations regarding the levels of service of highway maintenance activities or products or services?

Yes	10	No	10
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What type of survey techniques do you use? (E.g., telephone, focus groups, mail, booths at fairs, inserts in newspapers, internet, kiosks at events, mall intercepts, etc.)

Of the 10 respondents who said "yes" to question 1, methods of conducting surveys were reported as follows:

- Telephone: five (50%)
- Direct Mail: six (60%)
- E-mail: one (10%)
- Fax: one (10%)

How frequently do you conduct surveys? (E.g., annually, every two years, seasonally, continuously, no specific frequency, etc.)

Of the 10 respondents who answered "yes" to Question 1, the type or frequency of customer surveys were reported as follows:

- Project-by-Project: one (10%)
- Continuous: two (20%)
- Whenever Required: two (20%)

Quarterly: one (10%)
 Annually: four (40%)
 Bi-Annually: two (20%)
 Every 4-7 years: one (10%)
 Not Sure/Random: two (20%)

Do you use ***statistically valid*** procedures?

Yes	2	No	4	Not Sure	4
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If yes, indicate each level for which the surveys are statistically valid by checking the box(s):

	# of Times Indicated
State (or entire highway system)	0
District	0
County	2
Lower level:	3 (City)

2. If you have customer survey results, answer "Yes" or "No" regarding whether you use the results for the following purposes:

Do you use ratings of customer satisfaction or preferences as a measure of the effectiveness of different parts of the maintenance program?

Yes	8	No	2
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If yes, check the lowest organizational level for which you do this:

	# of Times Indicated
State (or entire highway system)	0
District	0
County	2
Lower level:	6 (City)

Do you use customer survey results as direct input into developing your annual or seasonal work plan?

Yes	6	No	4
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Have you ever used survey results as input to reallocating budget resources among maintenance activities, products and services, or different geographic areas?

Yes	3	No	7
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If yes, please explain:

Of the 3 respondents who answered "yes", use of survey results as input to reallocating resources were reported as follows:

Identification of problem areas and justification for shifting resources into those areas: two (66%)
Proposal of sales tax for infrastructure, bond issues for work programs: one (33%)

Have you used customer surveys to assess the economic value customers place on different attributes of road maintenance?

Yes	1	No	9
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If yes, please explain:

Respondent did not explain.

SECTION B. BENCHMARKING EXPERIENCE

3. *Are you benchmarking maintenance operations in your agency?*

Yes	7	No	12
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If yes, please continue the questions in order. Otherwise skip to Question 12.

4. *State at what level(s) of your organization benchmarking is occurring by indicating the number of organizational units being compared to the left of the name of the organizational unit below, and indicate the total number of actual organizational units at that level to the right of the name. (Example: If only three of seventy five garages are engaged in a pilot benchmarking program, then write "3" to the left of "Garage" and "75" to the right of "Garage."):*

Avg.

Avg.

3	District	3
1	County	1
3	Area	3
4	Garage	4
15	Crew	15
7	Road Section	11
1	Other:	1

5. *What primary activities, products, or services do you benchmark? Please list below:*

Responses	#
Roadside Programs (rough mow, fine mow, drainage, curb/sidewalk)	4
Signs	2
Maintaining right-of-way	1
Guardrail	1
Strip Patching	1
Cost per lane mile of repair	1
Parking Enforcement	1
Crack Pouring/Sealing	2
Signal Maintenance	2
Snow & Ice Control	1
Grading	1
Street Sweeping	2
Asphalt Application	2
Pothole Repair	4
Bridge Maintenance	2
Painting/Stenciling Crosswalks	1

Long Line Striping Application	1
Miles of roads and alleys maintained	1
# of fire hydrants in the system	1
# of water valves in the system	1
# of sewer manholes in the system	1
# of equipment types (backhoes, dump trucks)	1
# of miles of water & sewer lines in system	1
<u>Stenciling Pavement/Street Markings</u>	<u>2</u>

6. *Have you ever used the results of customer surveys for benchmarking within your organization or with other organizations?*

Yes	3	No	3
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If yes, please explain:

The 3 respondents who said "yes" to Question 6 offered three different explanations:

- Find out level of service in comparison to other cities
- Determine whether or not performance is at a level better than what the citizens surveys indicate
- Compare infrastructure size items maintained and number of employees it takes to manage workload

7. *Do you benchmark your agency's performance against other organizations?*

Yes	3	No	4
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If yes check each type of organization you benchmark against:

	# of Times Indicated
Other state highway agencies	1
Bridge, Tunnel and Turnpike Authorities	0
Maintenance contractors	0
Maintenance organizations in industries other than transportation	0
City or county highway agencies	3
Highway organizations outside the United States	0
Maintenance organizations in other transportation sectors	1

8. Do you identify, document, and share among organizational units the business processes (activities and sequences) associated with the "best" practices?

Yes	5	No	3
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9. Do you have a process for tracking the implementation of "best" practices?

Yes	3	No	5
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If yes, please explain:

The 3 respondents who answered "yes" to Question 9 offered three different explanations:

- Internal reviews of what works best
- Safety Officer in Risk Management Department guides internal safety officer and committee on how to correct procedures or implement new or better ones
- Procedures and results documented and monitored by Materials Branch

10. Do you do benchmarking as a continuing or periodic process?

Yes	4	No	4
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11. *What part of the organization is responsible for the benchmarking process and evaluating the progress or change in performance resulting from benchmarking? Explain:*

Of the eight respondents to this section, the distribution of parties responsible for road maintenance benchmarking are reported as follows:

- City Manager's office: one (12.5%)
- Management/Administration Section within a city's transportation organization: four (50%)
- Technical support staff within a city's transportation organization: one (12.5%)
- Engineering Administration: one (12.5%)
- Operations units within a city's transportation organization: two (25%)
- Design/Construction monitors contracts: one (12.5%)
- Each department/division within its transportation organization: two (25%)

12. *Whether or not your organization is practicing specific "benchmarking," the organization is likely to be comparing performances in some way or another. Please check each way your agency currently compares performance:*

	# of Times Indicated
We compare performance based upon unit costs and productivity measures in our maintenance management system.	8
We exchange information in a variety of ways regarding current practices but do not formally measure and compare performance among organizational units.	14
The performance information for all organizational units at a certain level (e.g., county) is available to every manager, and managers are encouraged to investigate the practices of the best performers.	1
We compare the performance of organizational units based on information obtained from a random sample of highway sections regarding the attainment of level of service goals.	0
We compare performance based on customer-oriented outcome and/or value added measures.	4
Comparison of performance occurs at the initiative of individual managers and occurs for a relatively small number of organizational units.	5
At the headquarters level we compare performance but we do not share these comparisons with lower levels of the organization.	0

13. Please list the most important processes, programs or forums that your agency currently uses to enable maintenance managers to exchange information about maintenance practices within your agency or with other agencies so that managers may gain ideas for change and improvement:

Respondents identified four main categories or "conduits" for information exchange: associations or annual conferences, technological implementation and utilization, agency programs and behaviors, and specific analyses or processes with an assumed high degree of participation. The distribution of answers for the 15 respondents answering this question is as follows:

Associations or Annual Conferences:

American Public Works Association conferences: six (40%)
Maintenance Superintendent's Association (MSA) Annual Show and Conference: two (13.3%)
University of New Mexico Paving Conference: one (6.7%)
Western Snow Conference: one (6.7%)
Street Tree Seminar, Inc.: one (6.7%)
Municipal Management Assistants of Southern California: one (6.7%)
International Society of Arboriculture: one (6.7%)
Traffic Control Supervisors Association: one (6.7%)
Participation in ICMA: one (6.7%)
Various association memberships: one (6.7%)

Technological Implementation and Utilization:

Maintenance Management System (MMS): two (13.3%)
Complaint tracking system/ monthly reports from customer complaint line: two (13.3%)
Intranet: one (6.7%)
Lessons Learned Database: one (6.7%)
Various Process Improvement Teams (PITs): one (6.7%)
Total quality management (TQM) - continuous improvement: one (6.7%)
Performance Measurement/Management System: one (6.7%)
Work Management System: one (6.7%)

Agency Programs and Behaviors:

Staff meetings at various levels within transportation organization: five (33.3%)
Observing/Meeting with other city agencies: three (20%)
Various training classes and seminars: three (20%)
Listening to employees/Communicating with staff (brainstorm): two (13.3%)
Reading about new technology/ trade periodicals, magazines etc.: two (13.3%)
Annual performance measures program: one (6.7%)
"Managed competition": one (6.7%)
Equipment vendors and material suppliers on the latest equipment and material innovations: one (6.7%)

Analyses/Processes with Assumed High Degree of Participation:

- Activity-based costing/accounting: two (13.3%)
- Pothole maintenance & snow & ice control surveys (various city governments contacted): one (6.7%)
- Permit restoration: costs and volume of work vs. pre-1998 costs to outsource: one (6.7%)
- Pavement condition survey: one (6.7%)
- Analysis of cost to install (construction of) signals: one (6.7%)
- Analysis of cost to seal cracks per lane mile: one (6.7%)
- Analysis of cost to seal fog? per lane mile: one (6.7%)
- Analysis of cost to micro-surface per lane mile: one (6.7%)
- Competition contracts unit cost bidding: one (6.7%)
- Productivity/cost reports: one (6.7%)

SECTION C. BENCHMARKING NEEDS AND DESIRES

14. What aspects of a customer-driven benchmarking process do you think your agency needs or desires? Please rate the importance on a scale of 1 (not important) to 5 (extremely important):

NEED OR DESIRE	Average Rating (1 to 5)
By benchmarking, we want tools to help us achieve better results with fewer resources.	3.59
By benchmarking, we want tools to create more satisfied customers and taxpayers.	3.35
We want to have the means of being more accountable to the public, motorists and elected officials by having an effective performance measurement and benchmarking process.	4.06
By benchmarking, we want to stimulate a culture of striving to be the best, not average.	4.12
We would like to be able to measure and compare across organizational units the physical condition of maintenance assets.	4.47
We want to be able to identify technological changes that can improve or result in "best" practices.	3.94
We want to be able to identify the cost savings and/or the improvement in outcomes and value added that could be achieved by adopting "best" practices.	3.71
We want to use benchmarking information as input into decisions regarding the allocation of funds among maintenance activities and products and services.	3.06
We would like to measure and compare productivity of organizational units in meeting customer needs.	3.65

By benchmarking, we want to provide tools to empower the field organization.	3.31
We want to be able to identify and document business processes associated with "best" practices.	3.18
We would like to be able to measure and compare across organizational units customer-oriented outcomes including levels-of-service	2.86*
We want to compare contractor performance with our agency performance.	2.31*
By benchmarking, we want to create a learning network within the organization.	2.27*
We would like to be able to measure and compare customer satisfaction across organizational units.	2.94*
We want to conduct comparisons in a manner that accounts for differences in variables outside the control of maintenance organizations, for example weather, terrain and traffic.	3.25
We would like to be able to measure and compare across organizational units the economic value customers receive (e.g., avoidable life-cycle and user costs).	2.94*
We want to be able to identify Best Management Practices (BMPs) for environmental issues in delivering maintenance to our customers	3.13
We want to compare performance at the district or residency level.	2.93*
We want to be able to access information about "best" practices on a web site.	3.35
We want to compare contractor performance.	2.82*
We want to compare performance at the area or garage level.	2.94*
We want to compare performance at the crew level.	3.17
We want to be able to benchmark performance against other highway organizations.	3.47
We want to be able to benchmark performance against "world class" practices including our own organization, other highway agencies, other industries, and other countries.	3.76
We want to be able to view benchmarking results on a web site, assuming we can control who within and outside our organization can identify units in our organization being compared.	2.75*
We want to compare performance at the county level.	3.53

* When computing the average response for each of these twenty-seven questions, it was noticed that most questions which received an average score of less than 3.00 had significantly fewer respondents answering than those with an average score higher than 3.00. It was then calculated that the average number of respondents who answered these nine questions was 13.11, while the average number of respondents who answered the eighteen questions receiving an average score above 3.00 was determined to be 16.78 (the highest number of respondents for any question was 17). Thus it can be hypothesized in this survey that respondents' willingness to answer questions can be correlated with those questions' generally higher average scores.

SECTION D. PERFORMANCE MEASURES

15. Which of the following types of performance measures do you use within your maintenance organization? Check each one that applies:

	# of Times Indicated
Outputs/Production (e.g., potholes patched, lane miles paved, acres mowed)	18
Inputs (i.e., labor, equipment, materials, and funds)	15
Outcomes (e.g., pavement roughness, visibility of signs, accidents, customer satisfaction)	8
Economic value added (e.g., avoidable lifecycle costs, avoidable road user costs)	2
Factors external to maintenance operations (e.g., weather, terrain, traffic)	2

16. Do you have a maintenance quality assurance program in which you have defined condition and/or levels of service for each maintenance activity or product or service area?

Yes	4	No	13
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SECTION E. ORGANIZATIONAL RESPONSIBILITY

17. Are most maintenance crews assigned to and have fixed responsibility for only a specific set of roadway sections?

Yes	10	No	9
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18. List what specialized crews (e.g., signing, striping, bridge inspection), if any, are assigned to and have responsibility for specific sections of roads?

	# of Times Indicated
Asphalt Base/ Street Repair/Road/Pavement	9
Signal/ Signal Construction	2
Drainage Structures/ Storm Basin	3
Repair/Sewer	
Grading	1
Street Sweeping	3
Cement Shop/Concrete Repairs	2
Pothole Patching	2
Parking	1
Electrical	1
Parking Meter Maintenance	2
General Maintenance	1
Resurfacing	1
Thermoplastic	1
Alleys, Sidewalks	1
Ditch & Shoulder	1
Forestry/Landscape	2
Paint Shop	1
Signing	11
Bridge Maintenance/Inspection	3
Striping	10
Repair by council/district	2

**SECTION F. INTEREST IN YOUR AGENCY PARTICIPATING IN AND HOSTING
CUSTOMER-DRIVEN BENCHMARKING OF MAINTENANCE ACTIVITIES**

19. *Would your agency be interested in participating in a test and evaluation of benchmarking methods developed under this NCHRP Project? The Principal Investigators of this NCHRP project would work directly with maintenance personnel in your organization to apply customer-driven benchmarking to one or more maintenance activities using quantitative measures in order to identify "best" practices, to assess opportunities for improvement, and to implement "best" practices. If you check "yes", we will get in touch with you for possible participation in Phase II of this NCHRP Project:*

Yes	9	No	8
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NCHRP PROJECT 14-13

CUSTOMER-DRIVEN BENCHMARKING OF MAINTENANCE ACTIVITIES

SURVEY SUMMARY

(RESPONDENTS FROM CANADIAN PROVINCE DOTs)

Total # of Respondents:	3
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SECTION A. CUSTOMER SURVEYS OF THE MOTORING PUBLIC

1. Do you use customer surveys to periodically assess customer satisfaction, preferences and/or expectations regarding the levels of service of highway maintenance activities or products or services?

Yes	1	No	2
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What type of survey techniques do you use? (E.g., telephone, focus groups, mail, booths at fairs, inserts in newspapers, internet, kiosks at events, mall intercepts, etc.)

The respondent who said "yes" to question 1 said that the method of conducting surveys is telephone.

How frequently do you conduct surveys? (E.g., annually, every two years, seasonally, continuously, no specific frequency, etc.)

The respondents who answered "yes" to Question 1 answered annually in regards to general service satisfaction for both summer and winter.

Do you use **statistically valid** procedures?

Yes	1	No	0	Not Sure	0
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If yes, indicate each level for which the surveys are statistically valid by checking the box(s):

	# of Times Indicated
State (or entire highway system)	1
District	1
County	0
Lower level:	0

2. If you have customer survey results, answer "Yes" or "No" regarding whether you use the results for the following purposes:

Do you use ratings of customer satisfaction or preferences as a measure of the effectiveness of different parts of the maintenance program?

Yes	1	No	0
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If yes, indicate each level for which ratings of customer satisfaction or preferences are used as a measure of the effectiveness of different parts of the maintenance program.

	# of Times Indicated
State (or entire highway system)	1
District	1
County	0
Lower level:	0

Do you use customer survey results as direct input into developing your annual or seasonal work plan?

Yes	1	No	0
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Have you ever used survey results as input to reallocating budget resources among maintenance activities, products and services, or different geographic areas?

Yes	1	No	0
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The respondent who answered "yes" said survey results were used for putting increased emphasis on surface maintenance and signage.

Have you used customer surveys to assess the economic value customers place on different attributes of road maintenance?

Yes	0	No	1
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SECTION B. BENCHMARKING EXPERIENCE

3. Are you benchmarking maintenance operations in your agency?

Yes	1	No	2
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If yes, please continue the questions in order. Otherwise skip to Question 12.

4. State at what level(s) of your organization benchmarking is occurring by indicating the number of organizational units being compared to the left of the name of the organizational unit below, and indicate the total number of actual organizational units at that level to the right of the name. (Example: If only three of seventy five garages are engaged in a pilot benchmarking program, then write "3" to the left of "Garage" and "75" to the right of "Garage."):

Avg.		Avg.
	District	
	County	
	Area	
89	Garage	x
	Crew	
	Road Section	
	Other:	

5. What primary activities, products, or services do you benchmark? Please list below:

productivity

maintenance task costs

6. *Have you ever used the results of customer surveys for benchmarking within your organization or with other organizations?*

Yes	0	No	1
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7. *Do you benchmark your agency's performance against other organizations?*

Yes	0	No	1
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8. *Do you identify, document, and share among organizational units the business processes (activities and sequences) associated with the "best" practices?*

Yes	0	No	1
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9. *Do you have a process for tracking the implementation of "best" practices?*

Yes	0	No	1
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10. *Do you do benchmarking as a continuing or periodic process?*

Yes	1	No	0
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11. *What part of the organization is responsible for the benchmarking process and evaluating the progress or change in performance resulting from benchmarking? Explain:*

Each district office evaluates the garage results in its respective district. The central maintenance branch oversees and reviews all performance results.

12. *Whether or not your organization is practicing specific “benchmarking,” the organization is likely to be comparing performances in some way or another. Please check each way your agency currently compares performance:*

	# of Times Indicated
We compare performance based upon unit costs and productivity measures in our maintenance management system.	2
We exchange information in a variety of ways regarding current practices but do not formally measure and compare performance among organizational units.	2
The performance information for all organizational units at a certain level (e.g., county) is available to every manager, and managers are encouraged to investigate the practices of the best performers.	0
We compare the performance of organizational units based on information obtained from a random sample of highway sections regarding the attainment of level of service goals.	0
We compare performance based on customer-oriented outcome and/or value added measures.	0
Comparison of performance occurs at the initiative of individual managers and occurs for a relatively small number of organizational units.	1
At the headquarters level we compare performance but we do not share these comparisons with lower levels of the organization.	1
We compare performance at the District or lower level based on the results of a statistically valid survey of customer satisfaction, preferences, and/or expectations.	0

13. *Please list the most important processes, programs or forums that your agency currently uses to enable maintenance managers to exchange information about maintenance practices within your agency or with other agencies so that managers may gain ideas for change and improvement:*

The three respondents identified four main categories or "conduits" for information exchange:

- Meetings with managers and staff
- Review of relevant literature
- Seminars

- Conferences (specifically, Annual Highway Operations Technical Conference)

SECTION C. BENCHMARKING NEEDS AND DESIRES

14. What aspects of a customer-driven benchmarking process do you think your agency needs or desires? Please rate the importance on a scale of 1 (not important) to 5 (extremely important):

NEED OR DESIRE	Average Rating (1 to 5)
By benchmarking, we want tools to help us achieve better results with fewer resources.	3.00
By benchmarking, we want tools to create more satisfied customers and taxpayers.	3.50
We want to have the means of being more accountable to the public, motorists and elected officials by having an effective performance measurement and benchmarking process.	4.50
By benchmarking, we want to stimulate a culture of striving to be the best, not average.	3.33
We would like to be able to measure and compare across organizational units the physical condition of maintenance assets.	4.00
We want to be able to identify technological changes that can improve or result in "best" practices.	3.33
We want to be able to identify the cost savings and/or the improvement in outcomes and value added that could be achieved by adopting "best" practices.	4.33
We want to use benchmarking information as input into decisions regarding the allocation of funds among maintenance activities and products and services.	3.00
We would like to measure and compare productivity of organizational units in meeting customer needs.	3.67
By benchmarking, we want to provide tools to empower the field organization.	5.00
We want to be able to identify and document business processes associated with "best" practices.	1.50
We would like to be able to measure and compare across organizational units customer-oriented outcomes including levels-of-service	3.50
We want to compare contractor performance with our agency performance.	3.00
By benchmarking, we want to create a learning network within the organization.	3.00

We would like to be able to measure and compare customer satisfaction across organizational units.	2.33
We want to conduct comparisons in a manner that accounts for differences in variables outside the control of maintenance organizations, for example weather, terrain and traffic.	3.00
We would like to be able to measure and compare across organizational units the economic value customers receive (e.g., avoidable life-cycle and user costs).	2.33
We want to be able to identify Best Management Practices (BMPs) for environmental issues in delivering maintenance to our customers	2.50
We want to compare performance at the district or residency level.	5.00
We want to be able to access information about "best" practices on a web site.	5.00
We want to compare contractor performance.	3.50
We want to compare performance at the area or garage level.	5.00
We want to compare performance at the crew level.	4.00
We want to be able to benchmark performance against other highway organizations.	4.50
We want to be able to benchmark performance against "world class" practices including our own organization, other highway agencies, other industries, and other countries.	4.50
We want to be able to view benchmarking results on a web site, assuming we can control who within and outside our organization can identify units in our organization being compared.	2.00
We want to compare performance at the county level.	4.00

SECTION D. PERFORMANCE MEASURES

15. *Which of the following types of performance measures do you use within your maintenance organization? Check each one that applies:*

	# of Times Indicated
Outputs/Production (e.g., potholes patched, lane miles paved, acres mowed)	2
Inputs (i.e., labor, equipment, materials, and funds)	3
Outcomes (e.g., pavement roughness, visibility of signs, accidents, customer satisfaction)	1
Economic value added (e.g., avoidable lifecycle costs, avoidable road user costs)	0

16. Do you have a maintenance quality assurance program in which you have defined condition and/or levels of service for each maintenance activity or product or service area?

Yes	1	No	2
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SECTION E. ORGANIZATIONAL RESPONSIBILITY

17. Are most maintenance crews assigned to and have fixed responsibility for only a specific set of roadway sections?

Yes	3	No	0
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18. List what specialized crews (e.g., signing, striping, bridge inspection), if any, are assigned to and have responsibility for specific sections of roads?

	# of Times Indicated
Steel Bridge - by district	1
Striping (entire Province)	1

SECTION F. INTEREST IN YOUR AGENCY PARTICIPATING IN AND HOSTING CUSTOMER-DRIVEN BENCHMARKING OF MAINTENANCE ACTIVITIES

19. *Would your agency be interested in participating in a test and evaluation of benchmarking methods developed under this NCHRP Project? The Principal Investigators of this NCHRP project would work directly with maintenance personnel in your organization to apply customer-driven benchmarking to one or more maintenance activities using quantitative measures in order to identify "best" practices, to assess opportunities for improvement, and to implement "best" practices. If you check "yes", we will get in touch with you for possible participation in Phase II of this NCHRP Project:*

Yes	1	No	1
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NCHRP PROJECT 14-13
CUSTOMER-DRIVEN BENCHMARKING
OF MAINTENANCE ACTIVITIES

SURVEY SUMMARY

(RESPONDENTS FROM BRIDGE, TUNNEL AND TURNPIKE AUTHORITIES)

Total # of Respondents:	3
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SECTION A. CUSTOMER SURVEYS OF THE MOTORING PUBLIC

1. Do you use customer surveys to periodically assess customer satisfaction, preferences and/or expectations regarding the levels of service of highway maintenance activities or products or services?

Yes	1	No	2
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What type of survey techniques do you use? (E.g., telephone, focus groups, mail, booths at fairs, inserts in newspapers, internet, kiosks at events, mall intercepts, etc.)

The respondent who said "yes" to question 1 said that the method of conducting surveys is by focus groups.

How frequently do you conduct surveys? (E.g., annually, every two years, seasonally, continuously, no specific frequency, etc.)

The respondents who answered "yes" to Question 1 indicated that survey frequency is based on projects.

Do you use **statistically valid** procedures?

Yes	0	No	0	Not Sure	1
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If yes, indicate each level for which the surveys are statistically valid by checking the box(s):

	# of Times Indicated
State (or entire highway system)	0
District	0
County	0
Lower level:	0

2. If you have customer survey results, answer "Yes" or "No" regarding whether you use the results for the following purposes:

Do you use ratings of customer satisfaction or preferences as a measure of the effectiveness of different parts of the maintenance program?

Yes	0	No	1
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If yes, indicate each level for which ratings of customer satisfaction or preferences are used as a measure of the effectiveness of different parts of the maintenance program.

	# of Times Indicated
State (or entire highway system)	0
District	0
County	0
Lower level:	0

Do you use customer survey results as direct input into developing your annual or seasonal work plan?

Yes	0	No	1
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Have you ever used survey results as input to reallocating budget resources among maintenance activities, products and services, or different geographic areas?

Yes	0	No	1
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The respondent who answered "yes" said survey results were used for putting increased emphasis on surface maintenance and signage.

Have you used customer surveys to assess the economic value customers place on different attributes of road maintenance?

Yes	0	No	1
-----	---	----	---

SECTION B. BENCHMARKING EXPERIENCE

3. *Are you benchmarking maintenance operations in your agency?*

Yes	1	No	2
-----	---	----	---

If yes, please continue the questions in order. Otherwise skip to Question 12.

4. *State at what level(s) of your organization benchmarking is occurring by indicating the number of organizational units being compared to the left of the name of the organizational unit below, and indicate the total number of actual organizational units at that level to the right of the name. (Example: If only three of seventy five garages are engaged in a pilot benchmarking program, then write "3" to the left of "Garage" and "75" to the right of "Garage."):*

Avg.		Avg.
	District	
	County	
	Area	
11	Garage	11
	Crew	
	Road Section	
	Other:	

5. *What primary activities, products, or services do you benchmark? Please list below:*

Responses	# of Responses
Parts & services for fleet care	1
Materials & services for maintenance of roadways	1

6. *Have you ever used the results of customer surveys for benchmarking within your organization or with other organizations?*

Yes	0	No	1
-----	---	----	---

7. *Do you benchmark your agency's performance against other organizations?*

Yes	1	No	0
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If yes check each type of organization you benchmark against:

	# of Times Indicated
Other state highway agencies	1
Bridge, Tunnel and Turnpike Authorities	1
Maintenance contractors	1
Maintenance organizations in industries other than transportation	0
City or county highway agencies	0
Highway organizations outside the United States	0
Maintenance organizations in other transportation sectors	0

8. Do you identify, document, and share among organizational units the business processes (activities and sequences) associated with the "best" practices?

Yes	0	No	1
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9. Do you have a process for tracking the implementation of "best" practices?

Yes	0	No	1
-----	---	----	---

10. Do you do benchmarking as a continuing or periodic process?

Yes	1	No	0
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11. What part of the organization is responsible for the benchmarking process and evaluating the progress or change in performance resulting from benchmarking? Explain:

Maintenance Division

12. Whether or not your organization is practicing specific "benchmarking," the organization is likely to be comparing performances in some way or another. Please check each way your agency currently compares performance:

	# of Times Indicated
We compare the performance of organizational units based on information obtained from a random sample of highway sections regarding the attainment of level of service goals.	2
We compare performance based upon unit costs and productivity measures in our maintenance management system.	2
We compare performance based on customer-oriented outcome and/or value added measures.	0

We exchange information in a variety of ways regarding current practices but do not formally measure and compare performance among organizational units.	2
At the headquarters level we compare performance but we do not share these comparisons with lower levels of the organization.	0
Comparison of performance occurs at the initiative of individual managers and occurs for a relatively small number of organizational units.	0
The performance information for all organizational units at a certain level (e.g., county) is available to every manager, and managers are encouraged to investigate the practices of the best performers.	1
We compare performance at the District or lower level based on the results of a statistically valid survey of customer satisfaction, preferences, and/or expectations.	0

13. *Please list the most important processes, programs or forums that your agency currently uses to enable maintenance managers to exchange information about maintenance practices within your agency or with other agencies so that managers may gain ideas for change and improvement:*

The three respondents identified four main categories or "conduits" for information exchange:

- Seminars (leadership training)
- Industry meetings and conferences
- Networking with area agencies
- Peer group meetings
- Foremen's meetings

SECTION C. BENCHMARKING NEEDS AND DESIRES

14. *What aspects of a customer-driven benchmarking process do you think your agency needs or desires? Please rate the importance on a scale of 1 (not important) to 5 (extremely important):*

NEED OR DESIRE	Average Rating (1 to 5)
By benchmarking, we want to create a learning network within the organization.	4.33

By benchmarking, we want to provide tools to empower the field organization.	4.00
By benchmarking, we want to stimulate a culture of striving to be the best, not average.	4.00
By benchmarking, we want tools to help us achieve better results with less resources.	4.00
By benchmarking, we want tools to create more satisfied customers and taxpayers.	4.00
We want to have the means of being more accountable to the public, motorists, and elected officials by having an effective performance measurement and benchmarking process.	3.33
We want to use benchmarking information as input into decisions regarding the allocation of funds among maintenance activities and products and services.	3.33
We want to be able to identify Best Management Practices (BMPs) for environmental issues in delivering maintenance to our customers.	3.00
We want to be able to identify technological changes that can improve or result in “best” practices.	3.67
We would like to measure and compare productivity of organizational units in meeting customer needs.	3.33
We want to compare performance at the crew level.	3.33
We want to compare performance at the district or residency level.	3.33
We want to compare performance at the county level.	3.00
We want to compare performance at the area or garage level.	2.67
We want to compare contractor performance.	2.50
We want to compare contractor performance with our agency performance.	2.50
We want to be able to benchmark performance against other highway organizations.	2.50
We want to be able to benchmark performance against “world class” practices including our own organization, other highway agencies, other industries, and other countries.	3.00
We would like to be able to measure and compare across organizational units customer satisfaction.	4.33
We would like to be able to measure and compare across organizational units customer-oriented outcomes including levels-of-service.	4.00
We would like to be able to measure and compare across organizational units the economic value customers receive (e.g. avoidable life-cycle and user costs).	3.00
We would like to be able to measure and compare across organizational units the physical condition of maintenance assets.	2.67
We want to conduct comparisons in a manner that accounts for differences in variables outside the control of maintenance organizations, for example, weather, terrain, and traffic.	3.67
We want to be able to identify and document business processes associated with “best” practices	3.33
We want to be able to identify the cost savings and/or the improvement in outcomes and value added that can be achieved by adopting “best” practices.	4.33
We want to be able to view benchmarking results on a web site, assuming we can control who within and outside our organization can identify units I our organization being compared.	2.00
We want to be able to access information about “best” practices on a web site.	4.00

SECTION D. PERFORMANCE MEASURES

15. *Which of the following types of performance measures do you use within your maintenance organization? Check each one that applies:*

	# of Times Indicated
Outputs/Production (e.g., potholes patched, lane miles paved, acres mowed)	2
Inputs (i.e., labor, equipment, materials, and funds)	2
Outcomes (e.g., pavement roughness, visibility of signs, accidents, customer satisfaction)	3
Economic value added (e.g., avoidable lifecycle costs, avoidable road user costs)	1
Factors external to maintenance operations (e.g., weather, terrain, traffic)	2

16. *Do you have a maintenance quality assurance program in which you have defined condition and/or levels of service for each maintenance activity or product or service area?*

Yes	1	No	2
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SECTION E. ORGANIZATIONAL RESPONSIBILITY

17. *Are most maintenance crews assigned to and have fixed responsibility for only a specific set of roadway sections?*

Yes	2	No	1
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18. List what specialized crews (e.g., signing, striping, bridge inspection), if any, are assigned to and have responsibility for specific sections of roads?

	# of Times Indicated
Drainage systems	1
Sign shop	1
Bridge crew	
Roadway electric	
Snow removal	

SECTION F. INTEREST IN YOUR AGENCY PARTICIPATING IN AND HOSTING CUSTOMER-DRIVEN BENCHMARKING OF MAINTENANCE ACTIVITIES

19. Would your agency be interested in participating in a test and evaluation of benchmarking methods developed under this NCHRP Project? The Principal Investigators of this NCHRP project would work directly with maintenance personnel in your organization to apply customer-driven benchmarking to one or more maintenance activities using quantitative measures in order to identify "best" practices, to assess opportunities for improvement, and to implement "best" practices. If you check "yes", we will get in touch with you for possible participation in Phase II of this NCHRP Project:

Yes	2	No	1
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