

# RESEARCH RESULTS DIGEST

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Number 193

These Digests are issued in the interest of providing an early awareness of the research results emanating from projects in the NCHRP. By making these results known as they are developed, it is hoped that the potential users of the research findings will be encouraged toward their early implementation in operating practices. Persons wanting to pursue the project subject matter in greater depth may do so through contact with the Cooperative Research Programs Staff, Transportation Research Board, 2101 Constitution Ave., N.W., Washington, D.C. 20418.

Area of Interest:      IA Planning and Administration  
                                 IIB Energy and Environment

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## Administration of Highway and Transportation Agencies "Project 20-24 Series"

*An NCHRP digest on the progress of projects emanating from Project 20-24,  
"Administration of Highway and Transportation Agencies."*

### THE PROBLEM AND ITS SOLUTION

Most research in the National Cooperative Highway Research Program (NCHRP) is designed to solve specific problems experienced by practitioners in the operational and planning functions of state transportation departments. Although top management is certainly affected by these problems and benefits from solutions through improved agency performance, this type of research does not necessarily address top management's most immediate needs. Since September 1986, the American Association of State Highway and Transportation Officials (AASHTO) Standing Committee on Research has annually approved the selection of a series of projects to be carried out under NCHRP Project 20-24, "Administration of Highway and Transportation Agencies."

In the past, many chief administrative officers (CAOs) came from the ranks of the state departments of transportation and brought with them many years of technical and political experience in transportation. Recently, however, there has been an increase in the number of CAOs appointed with little or no prior transportation experience. In addition, there has been an increase in the speed of turnover among CAOs. Together, these trends have caused two concerns: it takes longer for the new leadership within a state to become familiar with the many complexities of transportation and, in some cases, by the time new leadership takes on transportation challenges and is ready to implement

trends, coupled with the continually evolving character of innovative programs, that leadership is replaced. These state transportation agencies require chief administrative officers to deal with a wide range of multimodal issues during their tenure.

Under Project 20-24, an initial study was conducted to identify areas of concern to top management of state departments of transportation. The projects emanating from this study were designed to provide chief administrative officers and top managers with a resource to support their decisions and improve their effectiveness. A panel, consisting of top officials of transportation departments, academicians, and representatives from private industry and government agencies, guided the initial effort and continues to select individual projects to be researched based on the initial study design and other suggestions, such as those from the AASHTO Board of Directors. Once a project is selected, it is assigned to a panel of experts in the subject area. The panel further defines the scope, formulates requests for proposals, selects a contractor, and guides the researchers in their efforts.

To date, ten projects have been initiated. Four of these have been completed and the others are in progress. Brief synopses are provided here; however, for more information please contact Crawford F. Jencks, NCHRP Manager, Transportation Research Board, 2101 Constitution Avenue, N.W., Washington, D.C. 20418 or (202) 334-2379.

## **COMPLETED PROJECTS**

### **NCHRP Project 20-24, "Research Program Design — Administration of Highway and Transportation Agencies"**

Through surveys and interviews, the contractor, Apogee Research Inc., identified the issues of greatest concern to top managers in state transportation and highway departments. Individual projects were developed to address these issues; they were then described to provide background information and suggested research plans. All of the projects were classified under one of three categories—resource development, decision support, or financial management. The research is complete, and the principal findings and brief summaries of all the recommended projects were published in NCHRP Research Results Digest 170, "Research Program Design, Administration of Highway and Transportation Agencies." Additional details are available in the unpublished agency final report, entitled "NCHRP Project 20-24, Research Program Design," which is available for purchase (\$15.00) or on a loan basis.

### **NCHRP Project 20-24(1), "Using Market Research to Improve Management of Transportation Systems"**

How market research techniques can be adapted to help guide departments of transportation was the subject of this research. Apogee Research Inc., with the assistance of Gordon S. Black Corporation, conducted the study. The researchers reviewed several aspects of the problem: data collection and analysis procedures, previous transportation applications, and DOT functions amenable to marketing techniques. Detailed explanations of how to obtain and evaluate data are included. The research agency conducted a focus group and a national telephone survey to demonstrate sampling and interviewing procedures as well as the use of various statistical methods. Guidance on potential applications to various functions of publicly funded transportation agencies is also provided. Research is complete, and the final report has been published as *NCHRP Report 329*, "Using Market Research to Improve Management of Transportation Systems."

### **NCHRP Project 20-24(2), "Executive Management Information Systems for State Departments of Transportation"**

Executive Management Information Systems (EMIS) are relatively new to departments of transportation and, as such, AASHTO requested that a project be conducted to develop guidelines to assist member departments in the

development and implementation of EMIS. The objectives of this project were to develop a prototype to assist DOT executives in understanding what an EMIS can do for their departments and to outline the step-by-step process that would be needed to design, implement, and support EMIS. The contract research agency, Andersen Consulting, worked with an AASHTO task force to develop a guide for implementing executive management information systems in state DOTs. Work is complete, and *NCHRP Research Results Digest 173*, summarizing the project, is available. The unpublished agency final report, entitled "Guidelines for Establishing Executive Management Information Systems for State Departments of Transportation," is available on a loan basis or for purchase (\$40.00).

### **NCHRP Project 20-24(4), "Senior Executive Support Program Participant's Manual"**

Turnover among chief administrative officers (CAOs) of transportation agencies occurs frequently. At the same time, there has been an increase in the number of CAOs appointed with limited transportation experience. As a result, it has become important to establish better orientation programs for new CAOs. A senior executive support group comprised of current and past CAOs may offer management support to new CAOs through face-to-face visits or other means. Senior executives, acting as mentors or advisors, may help new CAOs to quickly orient themselves to their positions, thus eliminating the costly delays of a protracted transition and learning period.

The objective of this project was to develop an instructional manual for use by potential program participants. The manual was designed to assist and prepare the executive participant for subsequent interactions with new CAOs. In addition to the manual, the contractor provided guidance on how to match senior executives with CAOs based on such possible factors as experience, age, region of country, and type of organization. A camera-ready copy of the report submitted by the consultants, Mr. Richard Braun, Mr. Robert Johns, and Dr. Herb Golden, was given to AASHTO. AASHTO used this report to help prepare "A Leadership Manual for New Chief Administrative Officers - April 1993."

### **NCHRP Project 20-24(6)A, "Performance Measures Used by State Highway and Transportation Agencies"**

Chief administrative officers of state highway and transportation agencies must manage vast organizations with numerous functions and departments. In order to do

this effectively, a CAO must know how well the agency is currently performing as a whole and within each department. Agency-performance information is a powerful analytical tool for assisting CAOs in tracking their agency's performance over time and, perhaps, for generally comparing their state to others. The objective of this project was to produce a compendium of performance measures and indicators to assist state highway and transportation departments and their CAOs in evaluating and continuously improving the operational performance of their agencies. This compendium includes performance measures and indicators most commonly used by individual states and provides a recommended composite list of measures and indicators with synthesized definitions that could be acceptable to a large number of states. Work by the Highway Users Federation for Safety and Mobility is complete, and the final report has been published as *NCHRP Report 357*, "Measuring State Transportation Program Performance."

A supplemental report titled, "Exploring Methodologies for Comparing State Highway Performance," is included in *NCHRP Report 357*. The supplement documents a study conducted by Mr. Thomas F. Humphrey, Dr. Michael D. Meyer, and Dr. C. Michael Walton. This study was prompted by publicity over a published ranking of the overall performance of state departments of transportation, and its purpose was to comment on the overall process, issues, and difficulties in making such comparisons. At the request of AASHTO and subsequent acceptance by the NCHRP, Project 20-24(6)A was amended to include this additional scope of work.

#### **Project 20-24(8), "Project 20-24 Series - Revisited"**

In May 1992, Project Panel 20-24 met to select new projects for the series. However, in the discussions about possible topics, questions of the series' success and appropriate future direction arose. Although believed to be successful based on anecdotal information, the panel concluded that it was time to check with the intended audience, i.e., the chief administrative officers (CAOs) of state transportation departments. Accordingly, the objective of this project was to provide an assessment of (1) the impact of past and ongoing projects within the NCHRP Project 20-24 series on chief administrative officers, specifically, and other top managers of state departments of transportation; (2) the desirability of a research program for chief administrative officers and top managers; and (3), if desired, the issues that would benefit from research. The study was performed by Apogee Research, Inc. The major conclusions from the study regarding completed work and proposed new

research areas are as follows:

#### Evaluation of Previous Research:

- Awareness of the research projects needs to be raised among CAOs; results need to be presented in a higher profile manner.
- The formats in which the research projects are presented need to be more accessible to CAOs with busy schedules; the research must be more "user-friendly."
- The research needs to present up-front what it can do for CAOs in their policy formulation; the ideas need to be "sold" to CAOs before they can be implemented.

Proposed Research Topics:

- Environmental Consensus Building
- Project Development
- Privatization Options
- State DOT Relationships with Other Governmental Units
- Decentralization and Organizational Change
- Management Support for Chief Administrative Officers
- Effective Communication to Chief Administrative Officers
- Strategic Investment Analysis: Choosing Among Competing Needs
- Manager Training and Retention
- Effectiveness of Incentive Systems
- Civil Service Regulations

#### ACTIVE PROJECTS

#### **NCHRP Project 20-24(3), "Expanding the Civil Engineering Pool"**

The overall objective of the project, conducted by the Pennsylvania Transportation Institute (PTI) grew to include recommendations on various implementable actions that will improve not only the number of civil engineers interested in transportation careers, but also the quality of those engineers and the recognition of the increasingly diverse demographics of our population.

Under the first phase, PTI catalogued and described existing techniques that are now being used to promote among students an awareness of civil engineering career options as well as those techniques that provide an awareness for mathematics and science studies. Programs designed to improve upon employee shortages in other professions were studied to benefit from any similarities in the problem and subsequent solutions. Also under this phase, 17 focus groups at 4 locations were conducted with students, teachers, parents, and counselors to gain insight into attitudes on civil engineering as a profession and career option.

Under the second phase and based on the results of Phase I, PTI recommended a series of actions that span kindergarten through college. Acknowledging that other programs promote mathematics and science, the degree to which these recommended actions stress civil engineering

as a career option increases as the level of education increases. These various actions have been categorized under three themes: Awareness, Retention, and Curriculum, and are now referred to as the ARC model. The results of Phases I and II have been published as *NCHRP Report 347*, "Civil Engineering Careers: Awareness, Retention, and Curriculum."

Under a third and final phase, PTI produced a user's guide for implementing the ARC model and a directory of programs and services categorized by the various ARC components. The user's guide is under review and will be published in the NCHRP series. The directory will be provided to all state DOTs and to others on loan or for purchase.

#### **NCHRP Project 20-24(3)A, "Civil Engineering Careers in Transportation - Outreach Program"**

In addition to the research just described under Project 20-24(3), the NCHRP was aware of a unique opportunity to advance specific portions of the ARC model with the actual development, application, and evaluation of prototype material. A pilot program had recently been created by the American Association of State Highway and Transportation Officials (AASHTO), with principal funding from the Federal Highway Administration, although several other organizations are also providing financial support or making in-kind service contributions. This pilot program, which is a possible delivery mechanism for the prototype material, is called the TRAC (Transportation and Civil Engineering) Careers Center. TRAC will be engaged in various outreach activities.

Consequently, the NCHRP accepted a proposal from the staff at AASHTO TRAC Careers Center, who, in turn, hired The Naidus Group to develop prototype material for TRAC and recommend suitable delivery mechanisms and evaluation criteria. This work has been completed and released to TRAC for its use. A summary Research Results Digest is expected from the TRAC manager.

#### **NCHRP Project 20-24(5), "Public Outreach in Transportation Management"**

Many transportation departments are concerned that the public is relatively uninformed about such issues as how transportation facilities and services are financed, how they are provided, how well they function, and, in general, the importance of an effective transportation system. This limited understanding complicates the process of consensus building in the provision and

operation of the transportation system. First, it is vital to understand what the public thinks about how transportation is provided and what their feelings are regarding the adequacy of the system and how best to improve it; and, second, to develop and implement techniques for communicating the needed information to fill the identified gaps.

The objectives of this research were to recommend to state transportation departments programs and techniques to better inform the public of transportation issues and to demonstrate, by example, the effectiveness of public outreach communication techniques and programs. The research, conducted by Frank Wilson & Associates, Inc., is complete. A "Public Outreach Handbook for Departments of Transportation" is in the NCHRP publication process. An earlier version was distributed to those state DOTs requesting it. The agency's research final report and a videotape of presentations made at AASHTO's 1992 Annual Meeting in Rapid City, South Dakota, will be available on loan or for purchase.

The NCHRP project panel received additional funding to continue research in public outreach. A panel meeting is pending to decide the specifics of needed research.

#### **NCHRP Project 20-24(6)B, "Business Systems Plan for Highway Engineering Information"**

The American Association of State Highway and Transportation Officials and its member departments have traditionally developed information and engineering systems supported by computer software and equipment on a bottom-up, project-by-project basis and in the absence of a business systems plan. As information systems grow in this manner, the ability to share data and logically integrate systems becomes impaired, and modifications are expensive. In recognition of this problem, the management of transportation information needs to be analyzed using a top-down approach that recognizes all business areas of state DOTs. Because highway engineering is the traditional emphasis of state departments of transportation, this project will concentrate on the highway engineering system (HES) of transportation departments. A business systems plan for the HES will show where AASHTO's in-house information-systems efforts could complement member department's information-systems efforts and, thus, avoid duplicative, expensive development activities. Accordingly, the specific objectives of this study are to define business areas for typical state transportation departments and to develop a business systems plan for support of all engineering functions necessary for the design and construction of highway projects. Work is

being done by PRODATA, Inc. An agency draft final report is pending.

**NCHRP Project 20-24(7), "Alternatives to Motor Fuel Taxes for Financing Surface Transportation Improvements"**

Current revenue sources for providing, maintaining, and operating an effective surface transportation system are inadequate to meet present and projected needs. Petroleum-based motor-fuel taxes have not kept pace with either needs or inflation. Until recently, the taxation of motor fuels was a reliable, economical, and popular method. These revenues have been used by federal and state governments in dedicated accounts to fund transportation improvements and to produce a reliable flow of funds. Now, many factors are reducing the effectiveness of motor fuel taxes as the primary financing mechanism for highway and other surface transportation improvements.

Motor fuel taxes are used increasingly to implement national policies on energy issues, environmental concerns, and for budget-deficit reduction. State and local governments are having to assume increasing responsibilities for funding the surface transportation system. These trends will require innovative approaches to ensure adequate funding, by using new technologies and ideas to provide opportunities for new pricing and financing mechanisms.

The objective of this research is to identify and evaluate alternatives to the traditional motor-fuel tax as a principal method for financing the surface transportation system. Alternatives will be evaluated within the context of a range of possible, future scenarios. The research will also consider the role of the user-pay principle in financing the surface transportation system and give attention to financing mechanisms at all levels of government. Research began on March 1, 1992, by Cambridge Systematics, Inc., and is expected to be completed by March 31, 1994.

**Project 20-24(9), "State Departments of Transportation — Strategies for Change"**

State departments of transportation (DOTs) are continually evolving because of planned and unplanned reactions to internal and external influences. Recently, however, the pace of this evolutionary process has greatly accelerated, so much so, that many state DOTs must rethink traditional ways of doing business. Influences contributing to this evolution include economic and demographic changes, variations in service and use

demands, legislative edicts, rehabilitation needs versus new construction, modal integration, and elective and mandated changes in relationships with other governmental agencies and private organizations. Specifically, requirements in the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 and the Clean Air Act Amendments (CAAA) of 1990 have accelerated changes in state DOTs and created more challenges to their operations and functions.

Moreover, ISTEA has raised the expectations and the responsibilities of state DOTs. In many instances, these expectations and responsibilities are accompanied by reductions in staff to comply with across-the-board cuts in state governments, resulting in DOTs trying to do more with less. At the same time, ISTEA has raised the expectations and increased the responsibilities of other governmental and private organizations. Because of ISTEA's increased flexibility in the use of funds, many organizations now see the possibility for accessing these funds and sharing in decision-making responsibilities.

Research by the National Academy of Public Administration is underway. The objectives are to (1) evaluate current and potential influences that affect the future of state DOTs, (2) describe and discuss the impacts on DOTs, (3) provide guidance for DOTs to assess their ability to respond, and (4) recommend solutions or techniques that will assist in the transition of DOTs to meet current and future challenges. The scheduled completion date is December 12, 1994.

**Project 20-24(10), "Customer-Based Quality in Transportation"**

The American Association of State Highway and Transportation Officials (AASHTO) and its member departments are committed to continually improving the quality of their organizations and activities — a process often referred to as Total Quality Management (TQM). For example, AASHTO, along with the Federal Highway Administration and industry representatives, has become party to a National Quality Initiative and signed a National Policy on the Quality of Highways.

Many organizational efforts on quality begin with concerns about products and employees. However, in recent years, American businesses have been more successful when they took a broader approach and focused on "customer-based" quality. Quality achievements in products and by employees are necessary and commendable, but a quality-oriented program must be firmly grounded in customer-based quality.

(continued on page 8)

**SUMMARY OF STATUS**

<b>Project Number</b>	<b>Title</b>	<b>Research Agency</b>	<b>Contract Amount</b>	<b>Start Date</b>	<b>Completion Date</b>	<b>Project Status</b>
20-24	Research Program Design - Administration of Highway and Transportation Agencies	Apogee Research Inc.	\$125,000	5/11/87	9/30/88	Completed - NCHRP Research Results Digest 170
20-24(1)	Using Market Research to Improve the Management of Transportation Systems	Apogee Research Inc.	\$200,000	10/1/88	9/30/89	Completed - NCHRP Report 329
20-24(2)	Executive Management Information Systems for State Departments of Transportation	Andersen Consulting Inc.	\$100,000	5/1/89	10/14/89	Completed - NCHRP Research Results Digest 173
20-24(3)	Expanding the Civil Engineering Pool	The Pennsylvania State University	\$300,000	7/1/90	12/31/93	Phases I and II completed- NCHRP Report 347. Phase III final report in publication process.
20-24(3)A	Civil Engineering Careers in Transportation - Outreach Program	AASHTO/TRAC Careers Center	\$300,000	5/1/92	8/31/93	AASHTO provided prototype material. RRD expected.
20-24(4)	Senior Executive Support Program Participant's Manual	Braun, Johns & Golden	\$ 25,000	7/1/90	4/30/91	AASHTO furnished camera-ready copy of final report for Leadership Manual
20-24(5)	Public Outreach in Transportation Management	Frank Wilson & Associates, Inc.	\$ 99,973.90	8/1/91	1/31/93	Completed - to be published as NCHRP Report

**SUMMARY OF STATUS (cont'd)**

<b>Project Number</b>	<b>Title</b>	<b>Research Agency</b>	<b>Contract Amount</b>	<b>Start Date</b>	<b>Completion Date</b>	<b>Project Status</b>
20-24(6)A	Performance Measures Used by State Highway and Transportation Agencies	Highway Users Federation on Safety & Mobility	\$ 49,786	8/1/91	4/30/93	Completed - to be published
20-24(6)B	Business Systems Plan for Highway Engineering Information	PRODATA, Inc.	\$149,977	8/26/91	5/25/92	Third Agency draft pending
20-24(7)	Alternatives to Motor Fuel Taxes for Financing Surface Transportation Improvements	Cambridge Systematics, Inc.	\$300,000	3/1/92	12/31/93	Research in Progress
20-24(8)	Project 20-24 Series - Revisited	Apogee Research, Inc.	\$ 20,000	6/1/92	8/24/92	Completed - for NCHRP Administrative Use
20-24(9)	State Departments of Transportation - Strategies for Change	National Academy of Public Administration	\$280,000	6/15/92	12/14/94	Research in progress
20-24(10)	Customer-Based Quality in Transportation	Howard/Stein-Hudson Associates, Inc.	\$100,000	Contract Pending		

All efforts to improve product development and employee performance could fail unless there is a clear understanding of the needs, desires, and expectations of the customer. Therefore, research was needed to determine the following: (1) what the "transportation customer" needs, desires, and expects; (2) the components and indicators of quality as discerned by the customer; (3) transportation program objectives and performance measures for the movement of both people and goods; and (4) strategies for improving product development and employee efforts.

This effort can be accomplished by developing a program that uses "focus groups" in several states. These groups would be comprised of the beneficiaries of

transportation (transportation meaning the movement of people and goods) from a cross section of geographic areas and socioeconomic levels. This approach, while not producing statistically valid data for direct application in all states, will establish clear benchmarks for any customer-based quality program.

A contract with Howard/Stein-Hudson Associates, Inc. will be initiated in early 1994.

**SUMMARY OF STATUS**

See attached table for a summary of the status of the foregoing projects in the NCHRP Project 20-24 series.

**ACKNOWLEDGEMENTS**

Grateful acknowledgement is made to the chairman and members of the project panel SP20-24 who have provided direction for the various projects and have reviewed the materials generated by the research teams. The members of the panel overseeing the tasks under Project 20-24 are:

Wayne Muri, Chairman; William A. Bulley, E. Dean Carlson, Donald W. Collier, Thomas M. Downs, Thomas A. DeCoster, Peter B. Everett, Dan Flowers, Francis B. Francois, Lester A. Hoel, Craig Holt, Lowell B. Jackson, Hal Kassoff, Richard Morgan, Ray A. Mundy, Darrel Rensink, John R. Tabb, Marcus Yancey, Jr., John Clements, FHWA Liaison Representative; and Thomas B. Deen, TRB Liaison Representative.

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