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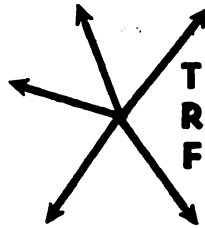
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TRANSPORTATION RESEARCH FORUM

Technology Sharing — A Realistic Approach

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1.0 INTRODUCTION

1.1 What Is Technology Sharing?

ONE OF THE MAIN objectives of the U.S. Department of Transportation's (DOT) Research, Development and Demonstration (RD&D) activities is to develop and provide technology which is appropriate to alleviate transportation problems on national, regional, state, and local scales. For this process to be effective, it is necessary that DOT's RD&D efforts be responsive to state and local needs, and that the results of the RD&D efforts be effectively and actively disseminated to the ultimate users. The Office of the Secretary's (OST) Office of R&D Policy is a DOT Headquarters focal point for the exchange of technical, economic, and planning information for state and local agencies. The Transportation Systems Center's (TSC) Technology Sharing Program Office supports OST in the collection and effective dissemination of the results of the research, development, and demonstration activities.

There are two main factors to be carefully considered in any process of sharing technology, namely:

(1) An understanding and realistic assessment of what technology is actually ready to be applied to state and local needs, and

(2) An understanding of the prioritized needs as perceived on the state and local level.

Successful technology sharing requires that the technology be sufficiently well in hand so that it can be reliably and effectively applied on state and local levels, and that it address a high priority need. It is generally not useful to encourage the adoption of technology which addresses low priority needs, since it does not engage the attention of state and local personnel and also suffers in the resource allocation process. Nor is it productive to rush insufficiently developed technology to service high priority needs. The failure of a technology to "solve" satisfactorily an urgent need can lead to widespread disappointment, which then hinders rather than helps future technology utilization.

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The process of technology sharing is further complicated by the fact that differences of opinion can exist between the Federal Government and state and local authorities with respect to the prioritization of needs as well as the readiness of technology to address these needs. Consequently, it is essential that effective communication mechanisms be used to (1) afford state and local personnel the opportunity to prioritize and voice their needs so that the Federal RD&D program responds to these needs, and (2) afford the Federal agencies the opportunity to disseminate information on the technical outputs of the RD&D program to be better utilized by regional, state, and local agencies.

Personal interchange between the developers and the potential users of the technology is essential to the efficient sharing of information. However, a high degree of relevancy and interest by both users and developers is required to optimize the sharing process. Consequently, user group needs and the DOT technical assistance activities and delivery systems must be carefully examined for compatibility and effectiveness.

1.2 What Is DOT Technology Sharing?

Technology Sharing is the communication of the results of RD&D efforts from the DOT to state, regional, and local governments in a manner which encourages practical application of the products and meets existing needs at these levels. However, for technology sharing to be considered effective and successful, there must be eventual use or implementation of the RD&D product information being provided. This definition leads to a determination of what products at the Federal level are capable of being shared, what products actually have application, what is needed at the state/local level (that is, how should the sharing be achieved), what are the mechanisms for communication, and how is the probability of success maximized, both in the sharing process and the ultimate implementation of the product.

The DOT has addressed the development of a Technology Sharing program, the mechanisms of which are delineated in DOT's two reports, both titled Technology Sharing. As stated in the earlier Technology Sharing (September

1973) report, "... the Department (of Transportation) must assure that state and local needs are reflected in its R&D and that the results of its R&D are being actively disseminated to the ultimate users."^[1]

The recent report, *Technology Sharing* (January 1976), provides an up-to-date overview of the many mechanisms and programs available. This report and the *Directory of Federal Technology Transfer* have been summarized in Table 1-1.

2.0 THE TECHNOLOGY SHARING PROCESS

2.1 Steps to Effective Technology Sharing

Effective technology sharing rests on good communications between the sharers and users, and on clear definition of the users needs.

To maximize the communications process in delivering information to the proper governmental elements, one must recognize the available existing mechanisms and internal state/local government relationships to be addressed. These institutional elements must be identified within a given region together with their interrelationships: what each is responsible for and is doing, their impacts on one another, and their relationship to the whole. The hierarchy of needs within the region must also be identified as it relates to the institutional elements and to the whole.

An approach may then be structured to provide the information to the proper governmental elements to ensure ultimate, positive action based on the information provided. The needs to definitize existing frameworks for communication and intergovernmental relations is a basic step to establishing the foundation for effective information sharing. This in no way means that the communications process is the only barrier to be overcome in the execution of a successful Technology Sharing program; however, it is a major inhibiting factor when not addressed properly.

As stated in the report, *Research and Development Priorities in Pennsylvania*, "... Intergovernmental bureaucratic linkages provide continuous communication among levels of government in the Federal System . . . Increasingly, responsibility for information dissemination and utilization of policies and programs in the intergovernmental system has devolved upon administrators. The conception of states and localities as the experiment stations for innovation in the Federal system becomes increasingly strained as one loses sight of the role intergovernmental bureaucracy has played in the diffusion of innovation

throughout the Federal system. There needs to be additional research which describes the nature of vertical inter-agency transactions and communications and conditions and consequences of these transactions for community problem solving . . ."^[2]

The identification of specific areas of "need" and market potential for applicable DOT RD&D products, then, is a basic step in the design of an effective tool for meeting the Technology Sharing objective.

Complicating these communication steps is the need for a systematized methodology for delivery and implementation follow-up within existing governmental frameworks. This will be no easy task, as outlined by Robert Crawford in his paper, "The Application of Science and Technology in Local Governments in the United States." As stated by Mr. Crawford, the problems that technology must confront involve social, economic, political, and legal considerations. Moreover, in total there are more than 81,000 local governmental units . . . with about 38,000 of these units being general local governmental authorities such as counties, cities, townships, towns, and boroughs. Each state has its own arrangements for local government structures and authorities. While many of these are similar to arrangements in other states, many are different as well.^[3] Extracting from the International City Management Association report, *A Strategy for Support of Local Government Science and Technology Programs*, he goes on to say "... there are a range of specific barriers to technology utilization that must be confronted. These range from a lack of understanding by local officials regarding the need for science and technology and a concomitant inability to define problems in technical terms, to an inability of the science and technology community to understand the technological needs of local governments (even when adequately communicated) and the complexities of the decision-making process in that sector."

The above comments provide an overview of the conditions which the DOT resources must consider in the execution of a Technology Sharing effort. The purpose of these comments in this discussion is to emphasize that for positive program results, these "realistic" conditions must be fully recognized and approached accordingly.

2.2 Levels of the Technology Sharing Audience

An integral element of the Technology

DOT MECHANISMS AND PROGRAMS FOR TECHNOLOGY SHARING

Adminis- trations	Mechanisms for Communication	Programs for Technology Sharing	Adminis- trations	Mechanisms for Communication	Programs for Technology Sharing
OST	Secretaryal Representative DOT-Technical Advisory Board Urban Commuter for Technology Initiatives Urban Transportation Advisory Council Intermodal Planning Groups in the Field Technical Pipeline Safety Standards Advisory Committee Office of RAD Policy	BART Impact Program Program of University Research National Transportation Studies Pilot Training/Systems Studies Planning Studies Model Interstate Scientific and Technical Information Clearing- house (NISTIC) Transportation Safety Institute Information System (TBIS) "Stimulation" Portion of OST/NOT RAD Aviation Security Program	FMA FMA	FRA Field Offices Safety Information System (SIS) High Speed Ground Transportation Railroad Incident Information Reporting System (MARS)	Railroad Research Information Service (RRIS) Portion of RAD Budget Urban Commuter Program Grade Crossing Program Urban Railroad Relocation Railroad Network - Core System High Speed Rail System Advanced Systems Hardrock Tunneling Railroad Research Bulletin
FHWA	FHWA Field Offices FCR Documents Regional Implementation Committee Traffic Control Devices Committee National Highway Institute (NHI) Office of Highway Planning Office of Development	Highway Planning and Programming Manual BP&R Funds - Research Portion R&D Contract Program NHI State Program Highway Research Information Service (HARIS) Implementation Packages FCR Documents	HTSA	HTSA Field Offices National Highway Safety Advisory Committee National Motor Vehicle Safety Advisory Council National Conference of Governors Highway Safety Representatives NHTSA Advisory Committee Office of Traffic Safety Programs Office of Research and Development	Highway Safety Information Service (HSIS) Highway Safety Manual Highway Safety Program Management Course Transportation Safety Institute Alcohol Countermeasures Priority Program
UMTA	UMTA Field Office Associate Administrator for RAD Office of Transit Management	UMTA Transportation Planning System (UTPS) UMTA RAD Program Managerial Training Grants Managerial Research Planning Grants Transit Research Information Program (TRIP) Transit Research Information Center	USCG	USCG Field Offices National Association of State Boating Law Administrators Office of Research and Development Coast Guard Science Advisory Committee	Marine Research Information Service. (MRIS) Cooperative Marine Sciences Program Close working relationships with state and local governments in the area of research and rescue, marine environmental pro- tection, port safety, and boating safety.
FAM	FAM Field Offices Flight Information Advisory Committee FAM Advisory Board Annual Planning Review Conference	Portion of FAM RISE Program Airport Development Aid Program (AADP) Air Transportation Research Information Service	TSC	Technology Sharing Program Office	Supports the DOT in the exchange of technical, economic, and planning information with state and local agencies of the transportation com- munity.

Source: Directory of Federal Technology Transfer, Committee on Domestic Technology
 Transfer, Federal Committee for Science and Technology, Washington, D.C., June 1975;
 Technology Sharing, U.S. Department of Transportation, Washington, D.C., January 1976.

TABLE 1-1

Sharing program is DOT's role relative to policy management assistance to state and local government officials. It is here where DOT may make a positive contribution to the policy-making and decision process at the state and local level.

There are three general levels of participants involved in this process:

1. Policy Level (government officials and support staff),
2. Planning and Evaluation Level (regional planning council and planning department, for example), and
3. Operations Level.

DOT activities have in fact taken the needs priorities and requirements of each level into consideration in the development of Technology Sharing state-of-the-art documents. The interactions of each level must be considered in a systematic approach to the information delivery and the ultimately effective utilization of that information. For example, on a given project a government official will be influenced by political impact considerations as well as the overall project aims. A planner will concern himself with the functional aspects of the project, and operations personnel (who must eventually live with the transportation "product") will be concerned with items ranging from maintenance problems to labor relations. This example is an oversimplification, of course, but does reflect the complexities encountered in the overall process.

DOT is striving to make the delivery of RD&D information products relevant to all of these three levels. There is greater and greater sensitivity to effective communication requirements with these user groups, who on a vertical plane include:

1. State DOT's.
2. State highway departments,
3. Regional/local planning agencies, and
4. Transportation systems operators.

One technique for improved communication is the establishment of a forum to express the local point of view. In addition to these vertical relationships, DOT has made provisions for horizontal relationship coordination through the use of intermodal planning programs.

3.0 TECHNOLOGY SHARING PROGRAM IMPLEMENTATION

A successful information exchange program, such as Technology Sharing, reflects an understanding of local transportation information needs and a viable mechanism to facilitate the dissemination of this data. During the initial program planning phases the TSC

Technology Sharing Program Office determined that the following activities needed to be undertaken:

- (1) A definition of the needs and priorities of transportation practitioners;
- (2) An understanding of the relationship among the ultimate users of the information at the various involved governmental levels; and
- (3) An identification of those organizations, both public and private, that do currently play a role in the information dissemination process.

3.1 Technology Sharing Program Approach

The Technology Sharing focal point at DOT Headquarters is the Office of R&D Policy. This office is key to the successful design, coordination, and implementation of a total technology information dissemination effort. TSC in Cambridge, Massachusetts, as DOT's research agent, is both the repository for transportation research information and the focal point for contact with state and local governments.

The Technology Sharing Program Office at TSC has incorporated two very pragmatic steps into its delivery mechanisms. First is the investigation of the institutional relationships among various interest groups in the transportation community. This step spans the spectrum from state DOT's to professional and service organizations to civic organizations such as the League of Women Voters. It also includes the identification of organizational relationships and communication facets in the transportation decision-making process. This identification is critical, since a technology sharing program can best deliver information in a credible and usable fashion through the established informational and institutional frameworks. As stated in its 1972 report, *Urban Transportation Research and Development*, the Committee on Transportation of the National Academy of Engineering suggested that "the increasing focus on the quality of urban life clearly calls for a better understanding of the interactions and the functions of metropolitan areas. This, in turn, requires an enhanced program of analysis and real-world experimentation."^[4]

It was further acknowledged that the major difficulties in improving transportation systems lie in the institutional structure—the political, jurisdictional, social, and other community organization systems which impact the economic order and related processes.

3.2 State-of-the-Art Documents

One step in the program delivery approach is the development of state-of-

the-art documents on critical technologies and methodologies. Examples are demand-responsive transportation service, high-occupancy vehicle priority techniques, light-rail transit systems, and rural public transportation considerations. Inherent in this document development sequence is the application and use of the workshop/seminar as the forum for information exchange among state and local transportation system practitioners, including decision-makers, planners and operators, and Federal transportation personnel within OST, TSC, and the various modal administrations.

The document development process includes the development of a "working draft" document prepared for use in a discussion and validation workshop. The subject is presented from the perspective of potential users of the information. The final documents which emanate from this working session not only represent a comprehensive compendium of information on the subject matter, but further reflect the insights of a cross section of the transportation community. These documents, coupled with edited video-tapes of the actual sessions, do in fact provide a vital tool for information links between Federal, state, and local governments. The effectiveness of this total program has been attested to by an overwhelming broad-based national demand for the Technology Sharing products which have been developed to date.

3.3 Workshop/Seminars

As part of an information sharing process, properly conceived workshops and seminars can be a key component in the overall information dissemination and feedback process. Personal interchange between the developers of new technologies and potential users of the technology is essential to the rapid and efficient transfer of information. However, a high degree of relevancy and interest is required to optimize the use of this particular sharing tool. Consequently, the topics of the various sessions and the attendance at each session have to be carefully examined to assure that priority needs are addressed and that appropriate levels of state and local personnel will be attracted to the sessions.

TSC has sponsored a study to identify those products of DOT RD&D programs whose utility and utilization would be especially improved by conducting workshops and seminars for users. It involved the participation of state, local, and regional government personnel who have an appreciation for the day-to-day prob-

lems and requirements at the working levels of government. This study integrated the potential user's perspective of his transportation related needs with the DOT's existing RD&D products which would be amenable to information sharing through a workshop/seminar mechanism.

Although the primary focus of the study was on the workshop/seminar as a tool for technology sharing, the field investigation provided a wide latitude to the interviewed state and local officials to express themselves relative to their feelings about a Federal Technology Sharing program. This freedom permitted a greater insight into local government attitudes, problems, and views which must be recognized by the Federal government for any kind of Federal/local assistance program to succeed.

This assessment of the workshop/seminar requirement of transportation related personnel utilized a field survey with on-site interviews. These interviews involved 103 persons: 19 persons from the Federal DOT and 84 persons from 54 state, local, and other agencies. The 84 persons were all users of transportation systems and planning techniques.

The field survey suggestions for workshop/seminar subject matter provided a total list of over 100 transportation related areas of interest. This list was consolidated and refined to provide ten major candidate topics.

The technique employed for the development of these final ten workshop/seminar candidates included the integration of the information elicited from field user personnel with that from DOT sources. Iterations included quantifying responses as to subject matter and applying judgment factors on an intuitive basis, the latter being dependent on the field investigator's evaluation of individual respondent contributions.

Another major factor considered was the ability of the DOT to provide compatible support to each program in that available technology can be matched with state and local needs. Thus the list of ten candidate workshop/seminar topics was developed which met two basic criteria:

(a) the technology in question is ready to be applied to state and local needs, and

(b) information transfer through the mechanism of workshops/seminars is considered appropriate from the point of view of both state/local and DOT personnel.

Subsequent to the workshop/seminar requirements study, a national mail sur-

vey was undertaken to expand upon the information gained from the previous field surveys. This survey presented the ten potential workshop/seminar candidates for prioritized ranking by survey respondents. These ten candidates were incorporated into a questionnaire mailed to more than 400 persons. The almost 300 respondents represented a geographic and demographic sample of governmental organizations including state transportation agencies, state agencies for local affairs, regional agencies, and various municipalities. The results showed a distinct preference for the overall resultant top three candidates (transportation systems planning process, bus systems, and technology review), while smaller differences were noted among the remaining candidates. The overall results were disaggregated to show regional governmental unit differences, as well as urban/suburban/rural biases. Data summaries are presented in Figures 3-1, 3-2, and 3-3.

3.4 Other Technology Sharing Activities

Complementing the workshop/seminar and state-of-the-art document mechanisms are two other significant Technology Sharing activities: (1) responses to direct requests on specific subjects from state and local governments and (2) the Transportation Research Information System (TRIS), a computerized on-line information/data retrieval system. TRIS

on-line provides abstracts on on-going active, and recently completed, transportation related activities. TRIS on-line also has the capability to handle more sophisticated requirements such as on-line statistical analysis, interactive graphics, and report generation.

4.0 THE FUTURE

The Department of Transportation has undertaken to fulfill its obligations as espoused in the 1966 Act of Congress, which established the DOT and directed it to "promote and undertake development, collection and dissemination of technological, statistical, economic and other information . . ." and to "consult and cooperate with state and local governments . . ." These obligations were highlighted by former Secretary of Transportation John A. Volpe in his remarks of October 18, 1972, "I have charged the office of my Assistant Secretary for Systems Development and Technology with the responsibility for seeing that our state and local Technology Sharing efforts move forward rapidly and effectively." He went on to say, "To make transportation Technology Sharing effective, we first need a centralized source of competence and information on modal/multimodal/intermodal transportation technology, systems, and planning. We have that source in the form of the Transportation Systems Center (TSC)." To be sure, the Office of the Assistant Secretary for

OVERALL RAW SCORE (BASED ON 292 RETURNED QUESTIONNAIRES) (SCORE OF 1 FOR HIGHEST PRIORITY ON A RESPONSE, SCORE OF 10 FOR LOWEST PRIORITY ON NO RESPONSE)

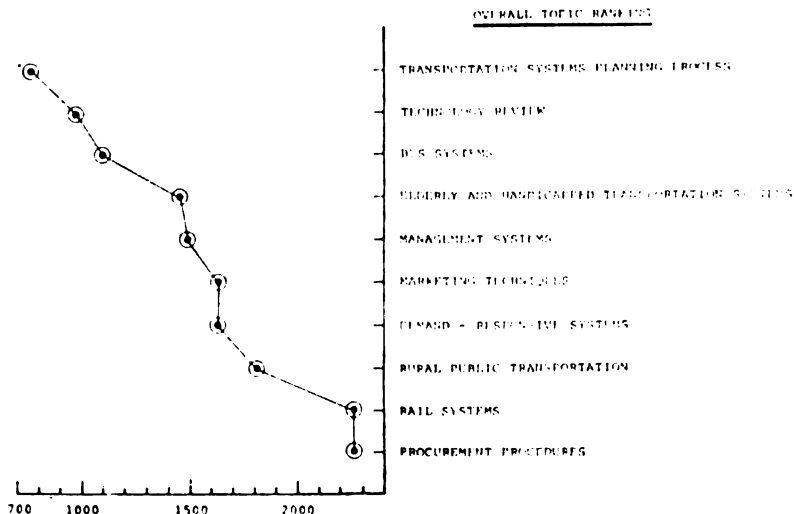


FIGURE 3-1

PRIORITY PROFILE BY GOVERNMENTAL CLASS

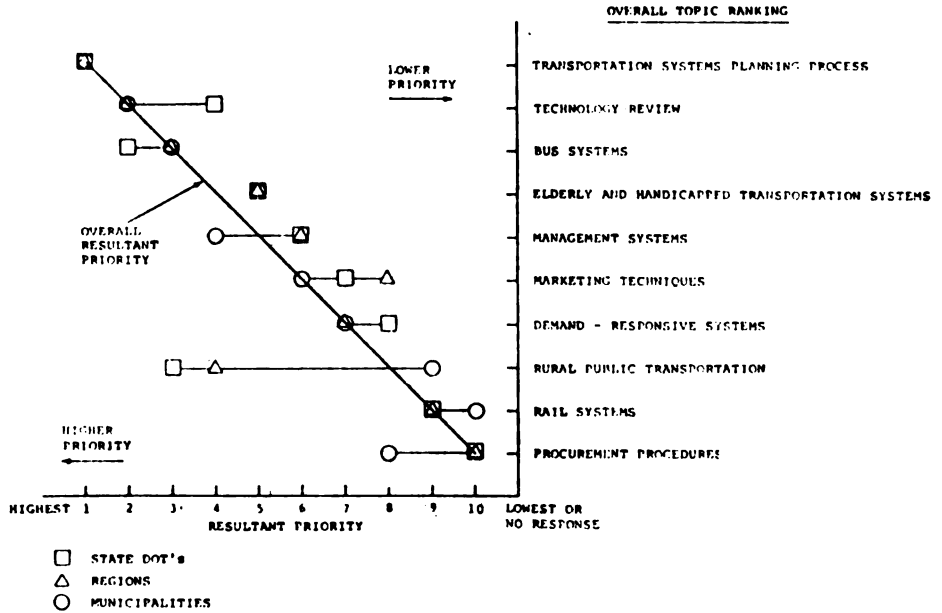


FIGURE 3-2

Systems Development and Technology (R&D Policy Analysis Division) and the Transportation Systems Center (Technology Sharing Program Office) are more than fulfilling these objectives within the limits of their resource capabilities.

Technology Sharing was articulated by Mr. William C. Steber, Deputy Assistant Secretary of Transportation for Systems Development and Technology, in his remarks before a Congressional subcommittee on November 6, 1975.^[6] His concluding statement was "Our (DOT) commitment to sharing with oth-

The continuation of this focus for

PRIORITY PROFILES OF MUNICIPALITIES BY POPULATION CLASS

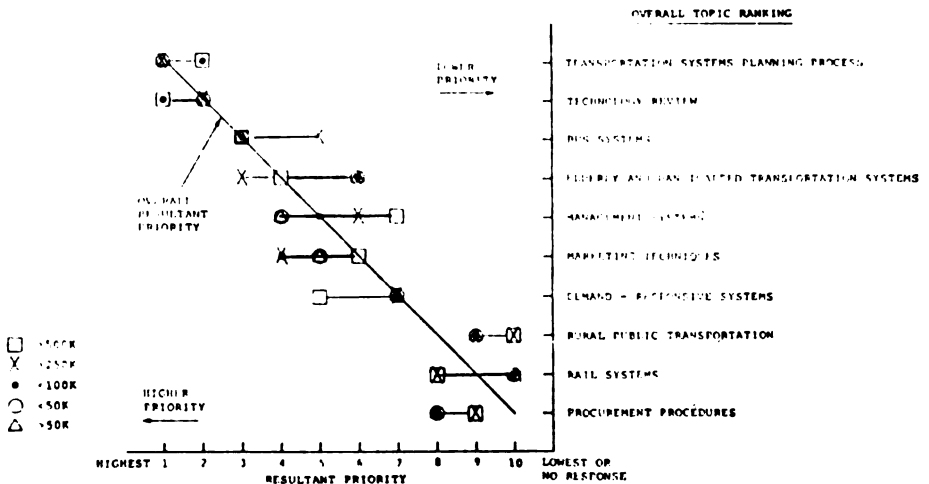


FIGURE 3-3

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er government agencies the fruits of our research was underlined by (Secretary Coleman's) recent Statement on National Transportation Policy, in which he stated that: "The value of RD&D expenditures is ultimately realized in their applications in government operations or in the private sector. Consequently, the effective dissemination of information about new technology, community demonstration projects, and financial incentives to utilize cost effective, energy efficient technology are essential elements of the complete RD&D program." We look forward to building on our progress in this important area."

The continued support of Departmental officials such as Secretary Coleman and Deputy Assistant Secretary Steber provides the necessary impetus for the assurance of a realistic Technology Sharing program for the future.

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