

shop is conducted in the morning to present the concepts and the details on the merits of the technology and how it should be used. In the afternoon, the participants attend a working demonstration of this application. An outstanding example of this was the demonstration of the use of Mirafi sheets to control groundwaters under a surfaced road in Stilwell, Oklahoma. Both municipal and county government provided men and equipment to remove the existing section of road, prepare drainage, install the Mirafi sheets, and relay and surface the roads. Municipal and county officials and workers from both Oklahoma and Arkansas attended. This was the first use of this technology in Oklahoma. We would like to think that this program has many similar examples.

The problem, or imagined problem, of overlap with other organizations has been minimal. In essentially every case where a problem has appeared to exist, when contact was made, the problem was either nonexistent or resolved simply. After the first series of workshops on needs evaluation, the center decided that its role would be in the area of engineering and management technology because this area had the greatest void. Another major reason for the minimal problem is the philosophy adopted at the start of this program to not create problems via turf wars. The needs are so great that no organization can fill the demand—so what if two organizations provide similar service? Cooperation has resulted in strengthening both programs. A classic example is the relationships of the center with the Oklahoma Municipal League. The center serves as a major technical resource and backup for the league. In this mode, the league often delivers program material developed by the center. This may give the appearance of overlap, but it is really a significant cooperative effort. In most cases where program overlap is cited, it is due to the lack of awareness of information on the part of the viewer.

Different approaches must be taken to deal with the needs of county versus municipal government. In general, the causes of these differences may be attributed to the following:

1. County commissioners are elected; most city managers are professionals, hired especially for that capability;
2. Municipal services are much broader and thus require a broader base of technology; and
3. County government (with the exception of a few large counties) is influenced by rural or agricultural needs much more than are towns and cities.

Additional problems arise from turnover of personnel. This results from elections, dismissals, and normal job switching. It would normally be a significant, detri-

mental factor at both the state and local level due to the importance of maintaining program identity, awareness, and credibility. This appears to be typical and must be coped with; therefore, new programs need to be fully aware of this problem.

RECOMMENDATIONS

To summarize what we learned into a requirement for success to share with newly emerging programs, the following items are proposed. An attitude of sharing with other organizations is essential. Turf wars are nonproductive and deadly. Good projects create enough glory for all participating organizations. Share projects, publicity, and success with all organizations that should be appropriately included.

Local credibility is the single most important factor. This means deliver solutions, not reports. Quick response is essential. All material must contain the appropriate level of technology presented in operational terms. Your people must conduct investigations on site, not in the office. Work on the problems identified by your public, not the ones that you are interested in. Be sure your solution works and makes them look good.

A significant need exists for a nonagricultural extension service, in both the public and private sectors. However, it must present usable problem solutions, not just social programs. It must have a federal base of funding, but funding does not necessarily have to be 100 percent federal. The service could be effectively located and operated by a state university. Economics could result if a working relationship could be established with the cooperative extension service.

If the results of federal research are to be used on a broader basis, the dissemination mechanism must have a final implementation linkage at the local level. Simply spreading the work via reports, brochures, computer networks, or the like will not promote use. Federal research that is to be used at the local level must begin with problem definition at the local level and end with a field test of the results at the local level to ensure that the material can and will be used. Federal agencies should give higher priority to the implementation of the results of their research. To do this, a mechanism that links all federal agencies to local users must be developed and used. To prevent excessive duplication via many federal networks, they should give serious consideration to funding local programs to provide this final on-the-spot linkage.

ACKNOWLEDGMENT

The program described in this paper has been partially funded by a grant from the National Science Foundation.

Local Government Technology Transfer: A Service User's View

Dean Anklan, Ramsey County, Minnesota

Technical information gathered as a product of research is most valuable when it is usable in day-to-day applications. Useful application of technical information can be achieved early if recognized conduits of infor-

mation are established and the relationship of researcher and implementor are recognized. The Federal Highway Administration, state departments of transportation, and National Association of County Engineers

have traditionally been the agencies that provide information to transportation agencies, and they should be encouraged to expand on the existing information-distribution system. Technical information can be more valuable to a greater user audience if the following points are recognized and implemented. First, established and recognized systems for the distribution of transportation-related information are essential. State departments of transportation should be encouraged to maintain highly visible secondary road departments to actively carry on technical-information dissemination and technical support to lower governmental units. Second, elected officials should recognize that their transportation officials need to participate in technical conferences and seminars, both as contributors and recipients in the learning process. Elected officials and governmental managers should encourage employee participation in peer group activities for the purposes of information exchange. Third, research projects should be developed that use potential product users as participants and advisers. The Federal Highway Administration and state departments of transportation should expand the use of research data digests and technical briefs to alert and advise cities, counties, and townships of available research information. Fourth, document failures; not all research results in success. Visibility of unsuccessful efforts may suggest different courses of actions for future research. Fifth, technical data can and should be digested to provide a base for public information use. Too often, the transportation engineer fails to recognize the public's need and right to know about what precipitated a final decision. Last, update existing technical data periodically. Rapidly changing transportation events require revisions in guides and standards to ensure that current and future needs are met. Additional methods for alerting potential users about technical information should be developed along with methods to stimulate user application. These systems can be an extension of assignments within the agencies cited in this report.

The most sophisticated experiments in the transportation arena are impractical if they have no impact on the populus. We have come to the realization that the fallout effect of many experiments has been a great boon to individuals far removed from the initial research effort. The final value of any research effort is determined by its application to everyday activities. Recognition of the relationship of the researcher-experimenter to the user of the product (in this case, research and the resulting compilation of technical information) is a must to realize the greatest value from the research. With this need in mind, the Highway Extension and Research Project for Indiana Counties (HERPIC) was formed at Purdue University, as was the Local Road Research Board (LRRB) in the Minnesota Department of Transportation. The need also prompted the formation of the National Association of County Engineers and the evolution of the research committee within that organization.

THE MINNESOTA LRRB

The Minnesota LRRB is a committee of city and county engineers and consulting engineers who have transportation interests and work with the staff of the research department of the Minnesota Department of Transportation, the University of Minnesota, and the Saint Paul Technical Vocational Institute for the development and implementation of research projects and the dissemination of technical information.

A needs and use subcommittee of the LRRB meets semiannually to select projects from suggestions of interested parties and committee participants. Suggested investigative subjects vary greatly in scope and nature. Projects have been conducted in local vegetation use and control, road maintenance methods and materials, new construction procedures, and different applications of old procedures. Once selected, the investigated subject is assigned a number and title that remains catalogued with the Minnesota Department of Transportation for retrieval.

The needs committee sets priorities, establishes funding, participates in site selection for physical experiments, and selects the research team or organiza-

tion to conduct the work proposed. The head of each research project provides the board with a project report at the semiannual meetings. Interim changes in project status or extended authorities needed by the researchers are usually approved via telephone conferences. During the last few years, the research committee has made it a practice to tour the sites of ongoing and recently completed physical research projects. The assigned project researcher and the local engineer participant meet with the committee at the project site to consult on these projects. These site visits provide participants with better insight into project problems and final results.

When each project is completed, a digest of the information gathered and the results are compiled, and the board reviews the project to determine whether it should be published. In any event, the project retains the gathered information under the original catalogue number and title for future recovery. Completed and published research projects are placed in the data library at the Minnesota Department of Transportation and are available to other agencies through the Transportation Research Information Service Network (TRISNET) program.

Use of data stored in TRISNET and approximately 60 other data-base systems are available to Minnesota agencies through the Minnesota Department of Transportation library computer terminal.

Availability of information and use of the library computer system has been the topic of several panel sessions at the annual Minnesota County Highway Engineers Institute, which is conducted jointly with the University of Minnesota. The four-day institute is attended by county engineers, their assistants, the staff of the State Aid Division of Minnesota Department of Transportation, and Federal Highway Administration (FHWA) regional personnel. Its purpose is to update secondary roads authorities in regulatory and technical areas as well as to provide a format for the open exchange of general information. The LRRB and the National Association of County Engineers Research Committee report to the attendees on various research projects during this meeting.

Major cities and counties that have adequate staffs are able to screen and digest research reports and technical information and apply the data to local needs; however, smaller municipalities and rural counties usually do not have this capability. The Minnesota LRRB project number 645, Implementation of Research Finding, directed by Eugene L. Skok, is one effort to bridge this gap. In 1975, a cooperative agreement between the LRRB and other participants established a contractual arrangement whereby Skok, a professor of Civil Engineering at the University of Minnesota, assumed the task of creating a method of integrating both ongoing and completed research projects into local transportation activities. Skok's familiarity with local engineers, the research projects, and local needs places him in an excellent position to suggest application of project data to local needs. He confers with the responsible engineer user and outlines the proposal and assists in design and application of project data. He remains in contact with the user until the project application is completed. Because the system is new, additional evaluations of on-site use of research material have not yet been compiled. In the future, the information gathered from the user will be added to the project file so that greater project scope will be available to information seekers.

Minnesota's short construction season confines activities into a tight time frame and precludes Skok's close contact with many of the projects during construction periods. There is a need to provide subcom-

mittee assistance and review during the application period. A working subcommittee assigned to each implementation project would improve liaison between the user and the research board.

The LRRB also publishes a monthly digest of transportation research projects and articles that have possible local application. This digest is prepared by Miles S. Kersten, of the Department of Civil Engineering, University of Minnesota. The publication is mailed to all government agencies that participate in the Minnesota State Aid Highway Program and, on request, to consulting engineers and engineering schools. The digest also identifies contacts for obtaining additional information on the published subject matter.

THE NATIONAL ASSOCIATION OF COUNTY ENGINEERS RESEARCH COMMITTEE

The National Association of County Engineers (NACE) Research Committee is a service supplier and user in the technical information and research areas. Committee research is usually conducted in the areas of transportation management. They explore methods for disseminating technical information compiled by others and tailoring this information to needs at a county level.

A permanent subcommittee advises the executive board of the association on the various technical needs of county engineers nationwide. The research committee activities are coordinated through Marian Hankerd and the staff of the National Association of Counties Research Foundation. Selected projects are assigned to committee members who have volunteered to participate in special interest areas. Project information is usually gathered by individual committee members, who work separately and meet as necessary in workshop sessions throughout the life of the project.

Much of the information gathered for county use is a digest that readily lends itself to dissemination in the form of guideline booklets used by operating personnel and, because of this, much of the very technical matter has been deleted except for reference use. There is little need for field personnel to know the exact experimental procedures used to determine finite specifics, such as determining structural steel strength needed for bridge construction or concrete pavement loadings, so long as the user recognizes that the suggested guidelines have suitable foundation. If the need for further information develops, it is imperative that the user have a method of securing that information through a recognizable information conduit.

NACE also uses its membership to provide a one-to-one working arrangement by placing county engineers who have developed expertise in specific areas in direct contact with other engineers who request technical assistance. Through the NACE newsletter, carried in the weekly county newspaper, approximately 1500 county engineers are alerted to the availability of new or updated technical material, technical meeting schedules, changes in federal regulations, and proposals for the development of transportation-oriented legislation.

With organizational membership, each new county engineer receives a copy of each of the publications developed by the organization as a nucleus for the county public works library. These publications are not intended to identify standards but to provide general guidelines in areas where standards have not been established. Each publication identifies the committee members responsible for developing the information, so engineers who seek additional assistance can readily contact them.

A 2½-day management and research meeting is held annually to coordinate the activities of the various county

engineer working groups and committees, to review ongoing research, and to select new project areas. Attendance at the spring research meeting averages 175 engineers, public works directors, and road superintendents, who actively participate in workshop sessions on various selected subjects. Recently, the areas of high interest for these workshops are changes in federal regulations, right-of-way acquisition, personnel management, and government tort liabilities.

The county engineers association has made a practice of evaluating various public works activities with the goal of transmitting the recognized best practices to those who need assistance. It is apparent that, with more than 3000 counties in the United States, only half of these receive the information through mailings. Approximately 23 states and Canada have strong county engineer organizations. In most states, a definite relationship links the secondary roads engineers (city, county, and township representatives) to the state highway departments and state transportation departments. This does not always mean there is a cooperative exchange of information. cursory review indicates that Minnesota is one of the few states that has a program of information continuance between the state and other transportation authorities. Although most federally funded programs require cooperative planning between agencies, the responsible coordinating agency is usually unable to provide the lesser governmental units with suitable technical information to allow for adequate participation and representation. It is necessary that local units of government be appraised of the ongoing research and the volumes of technical help available. The general need for this information flow reaches beyond the ability of a general planning agency or coordinating unit as the unit to dispense technical information. The information must be channeled through technically aligned groups; thus, public works and transportation data generated by TRB and other aligned agencies should be properly directed through FHWA to the states and regional governments, then to counties and cities.

TRANSFER OF INFORMATION BETWEEN FEDERAL AND STATE GOVERNMENTS

Recognition of the information transfer gap at the federal-state interface has resulted in establishment of the FHWA Implementation Division. FHWA's recent program of reviewing ongoing research with other transportation agencies through regional meetings is a step in advancing the practical use of research projects.

Establishment of an annual meeting sequence and expansion of the attendance to include secondary roads personnel, who will eventually use the information and implement research, can provide better insight for the theorists to the needs of the user. It will also alert potential users to newly available data and ongoing research. User input to experimental research and data development at an initiating stage will allow for earlier use of developing research. It will reduce the possibility of continuing research and gathering information that lacks practical application.

A program to expand audiences at technical meetings to include participants at various educational and interest levels could create a whole new atmosphere. At times, the same faces, minds, and intellects seem to meet to rehash the same problems year after year. The introduction of researchers, academic leaders, and the implementors to each other at technical meetings provides the best available opportunities for informational exchange.

It is difficult for government and private business managers to understand why several persons who have

various responsibilities should attend the same technical meeting. The answer is that each has something different to learn and a different need to learn. It is important for them to understand the other's needs. Although it is important for a researcher to have a practical interest in the research, it is far more fruitful to have research that is of interest to others. It is more fruitful to have general interest research and a method of disseminating the results. Technically oriented employees should be encouraged to look beyond the boundaries of their assigned duties and to participate in and comment on projects that might be considered beyond their scope, and, above all, they should be encouraged to critique research and technical data when asked to apply the results to their operations.

SUMMARY

The world's transportation industry has advanced as rapidly as most professional endeavors during the last century. It has also created more than its share of problems. As transportation professionals, we are responsible for delivering all the products and benefits the other professional fields develop; and, therefore, we should make it a point to be understood. In order for others to understand us, we should understand ourselves. An assured method of distribution of transportation-related information is essential. State departments of transportation should be encouraged to maintain highly visible secondary roads departments that actively carry on technical information dissemination and technical support to lower governmental units. Elected officials should recognize the importance of appointed transportation officials' participation in technical conferences and seminars, both as contributors and recipients of the learning process, and should encourage memberships in peer groups for the purposes of information exchange.

Leaders in the academic and research areas should invite the user to join in the development of research and resulting data. Digesting research data and technical information and preparing a format for application should be expanded through state departments of transportation and made available to local transportation authorities. Document failures; visibility of failures will allow others to avoid the pitfalls. State agencies and county organizations have an obligation to keep the public informed, and no better method exists than to have participants in public endeavors understand the need and scope of a program. Technical information can and should be digested and edited to serve the public information need. Additional methods of alerting potential users of research data, technical information, and data recovery systems need to be developed. The vast storehouses of transportation information will continue to go untapped if we do not provide the user with a method of reaching that information. There is a great need to provide periodic updating of developed information. A prime example is the public's refusal to accept current highway design standards and the methods used for determining transportation facility capabilities and needs. As transportation experts we may be technically correct, but the public frequently questions the foundation for our recommendations, and more often than not, this creates an impasse situation.

Peer groups, in cooperation with FHWA and state departments of transportation, are capable and should be used to develop and disseminate transportation-related data. The state departments of transportation that do not have designated secondary roads divisions should be encouraged to develop these departments. NACE should continue to seek expansion of its participatory membership. Current cooperative research programs that involve FHWA and TRB should be continued to attain this end.

Measuring the Effectiveness of a Research Program

Dale E. Peterson*, Utah Department of Transportation, Salt Lake City

The purpose of this paper is to present various traditional techniques used to measure the effectiveness of a research program and to identify steps that can be used to improve its effectiveness. There is considerable variation in how the effectiveness of a research program is rated depending on the subjective point of view of the individual rater. Some of the methods used include benefit/cost, reduced accidents, lives saved, and improved aesthetics with benefits generally exceeding costs by a ratio of nine to one. Some steps identified for improving the effectiveness include (a) agreement on the need for the research and a definition of the problem by all concerned, (b) identification of the wants of administration, (c) literature search for a possible existing solution that can be used, (d) redefinition of the problem, (e) prioritization of research needs, (f) conduct of research in a proper manner with guidance from an advisory panel, (g) involvement of potential users, (h) writing the report in the language of the user, and (i) implementation in a timely manner. The importance of a well-organized program that embodies good management concepts is stressed as the means of providing maximum benefits of research through proper and timely implementation.

Over the last several years, much concern has been

expressed on how to get research findings into practice. A significant time lag existed between when the research was completed and when the results were put into use. This was both unnecessary and undesirable. Communication was identified as the major problem contributing to this time lag. Steps were taken by the American Association of State Highway and Transportation Officials (AASHTO), the Federal Highway Administration (FHWA), and others to close this gap, and these have resulted in more complete and timely research implementation. Large sums of money have been expended annually for research and development activities, which total approximately \$350 million by the U.S. Department of Transportation (DOT) of which \$50 million was spent by FHWA. The research program has been diversified to cover a wide spectrum of areas.

Efforts have been made to show the benefits of re-