ment and transit outreach at OSTP. However, in order to be accountable to PTN, careful records are kept on time allocation. Such documentation provides an excellent basis for performance evaluation.

Finally, there is the question of evaluating the PTN program, at least in terms of using actual, implemented innovations as a criterion. At this time it is more appropriate to evaluate the activities involved in laying the groundwork for later innovation.

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Technology Transfer: A View from the Receiving End

ELDO W. SCHORNHORST

ABSTRACT

The receiving end is where technology transfer is expected to produce results. To make the technology work, the object of the transfer, the recipients, and recipients' needs must be known. These items are addressed from the viewpoint of an Iowa county highway engineer.

The receiving end of technology transfer is not glamorous. At the local road department level, it is where the technology is expected to work and where technology comes face to face with the public.

DEFINITION OF TECHNOLOGY TRANSFER

No one has a clear, or even the same, understanding of what technology transfer is or should be. Moreover, the question can be expanded to: What is being transferred?

Transfer processes occur continuously as the information required to conduct life is given and received. Technology transfer, the exchange of information on subjects directly related to specific job needs, is part of this daily process. Note the use of "exchange," which indicates that the transfer of information requires two-way communication.

Technology transfer is not new. The process includes conferences, short courses, seminars, or other types of training sessions. At the local county level in Iowa such well-structured technology transfer sessions have been conducted for at least 70 years.

Technology transfer is often thought of as involving highly developed research programs and formalized presentations, but this approach is not necessarily required. Technology transfer also means people talking to people about their specific needs and exchanging information and ideas on problems. Reading an article in a trade publication or an association newsletter or reviving an old method are part of technology transfer. Note that there will not always be a new way of solving problems.

THE RECEIVERS

The receivers vary greatly. A low-volume road is yet to be defined adequately, and the diversity of the group working on low-volume roads also defies categorization. There are wide variations in responsibilities, education, and ability. Responsibilities range from highly organized counties with large staffs, to small rural townships with two or three staff members. Education levels vary from advanced college degrees to eighth-grade educations. Add to this diversity the common denominator of lack of time for receiving information, and the problem of information transfer is magnified.

The desire for information depends on the specific needs of the job. This, in turn, depends on the responsibilities assigned to various jurisdictions. Some counties have a full range of highway-related duties on all roads, but others are limited to certain classifications of roads and functions. For example, if a county is not responsible for bridges, the need for bridge-related technology would be very low; however, there may be many problems with road-surfacing materials. On the other

Office of County Engineer, Shelby County, Box 66, Harlan, Iowa, 51537.

hand, sophisticated bridge design information is wasted on the small-county superintendent trying to build bridges out of salvaged material.

The statements in this paper are from the perspective of 99 registered professional Iowa county engineers. Their duties are those of a typical highway department, and include full responsibility for all roads and bridges outside of city limits and off the state system. Figures are somewhat staggering, with over 90,000 mi of county roads in the state and over 20,000 bridges. These roads vary from multilane high-traffic roads to gravel and dirt roads with less than 10 vehicles per day. In Shelby County, 965 mi of road and 335 bridges serve a population of 15,000 and approximately 1,200 farms. Technology really meets the public by serving the 1,200 farms.

RECEIVER NEEDS

In the case of Shelby County, need can be translated into the kind of service provided. This service consists of a local road system for the transportation needs of a small rural county. Clearly, the area served is of low density with an extensive road system providing access to farmsteads and rural suburban areas. Roads are largely granular-surfaced, but 16 percent of the system is earth-surfaced and only 10 percent is paved. Because conveyance to or from a farm depends on a wheeled vehicle, all types of vehicles must be taken into account, from the smallest compact car and pickup to a 16-wheel semitrailer truck or a 1,200-bushel grain wagon pulled by a four-wheel-drive farm tractor. In addition, the weather extremes of the Midwest must be considered.

The typical problems of the low-volume rural road system in the Midwest also apply to parts of the systems of most states. Those who administer and manage this system are the ones being targeted for some form of technology transfer. To gain a broader outlook, a number of Iowa county engineers were interviewed concerning their expectations of a good technology transfer program.

Although opinions varied according to personal experience, there were also strong similarities in the responses. The word most often used was "practical." The Iowa county engineer is operations oriented, and therefore concerned about application and results. Information must have an immediate and practical application in daily operations. Large numbers of research reports are less important than the application of information received. Information should be relatively easy to understand for staff members who are less technically trained.

In addition to being practical and understandable, information must be supported by experience. Although the county engineers are willing to try new ideas, they hesitate at being always on the leading edge. No doubt, this is partly due to politically constituted governing boards that require assurance that investing in a new idea will not result in a total loss.

Experience relates to demonstration. Experience from a demonstration project, either at the federal or state level, answers many questions and encourages participation in new areas. Over the years, the Iowa Highway Research Board has extended research projects beyond the laboratory and small-scale pilot projects. Full-sized construction projects based on research results have had joint funding and have provided an excellent opportunity for all interested parties to observe both techniques and results. In past years, the concept of shared risk has been developed on projects that incorporate more research-oriented items. This helps shield the local unit from the full burden of any research-related failures. Although the demonstration procedure is not new, it does provide one of the best opportunities for technology transfer on specific items.

Another request of the county engineers, which closely parallels demonstration projects, is for area- or region-specific information. Information for one area of the country might be of questionable value at another location. This concern gains importance as the struggle for highway dollars becomes more intense.

Some county engineers commented on the adaptability of information to their maintenance or construction practices. Iowa has legislative limitations on the dollar volume of day-labor construction done by a county; however, there was some feeling that consideration should be given to this type of work. Even with the current popularity for contract maintenance, it is sometimes easier to do certain types of work in house.

Although the engineers were concerned with design, maintenance, and construction items, they had an equal concern for administrative- and management-related information. This is understandable, as the Iowa county engineer is responsible for the full range of highway-related activities. These duties begin with advance planning and extend to budgeting, design, construction, and maintenance. In addition, public relations are needed in working with an elected board in a political arena.

Because microcomputers are now a way of life, most engineers expressed interest in ways to computerize day-to-day operations. Others mentioned equipment specifications and selection. Equipment selection has been a controversial issue for many years. Those involved in the procedure for the first time face a monumental problem for which little or no training is provided. Detailed information and a critical performance analysis of equipment and maintenance products would help reduce many hours of work and worry.

The last consideration is that of money. How will the technology transfer system be paid for? To begin with, those on the receiving end of technology transfer require enough money to do the things they already know how to do. Rural, farm-state sections of the country still face the same problems of 70 years ago.

One of the first annual reports of the original Iowa Highway Commission (ca. 1915) details a special effort directed toward low-volume roads. In those days commission engineers designed culverts to replace small bridges, tried to dig adequate ditches to provide drainage along the roadways, placed granular surfacing on the roads to protect people from the mud, and attempted to control the dust from traffic after granular surfacing was put down. This was all accomplished with very low funding.

A review of the 1984 budget and construction program for Shelby County shows similar funding levels for the same projects for replacing small bridges with culverts, ditch cleaning, and granular surfacing for roads. Moreover, complaints are received about muddy or dusty roads. Dust complaints are particularly hard to handle, because Shelby County has been replacing oiled roads, which can no longer be afforded, with granular-surfaced roads.

HOW TO PROVIDE A GOOD TECHNOLOGY TRANSFER PROGRAM

Iowa seems fairly up to date with developments on the administration of the secondary road system. This is achieved through cooperation between the county engineers association, state highway department, state universities, and FHWA, when possible. Short courses, seminars, and other training sessions

have been provided for over 35 years but were not termed as technology transfer. Because Iowa has mandatory continuing education requirements for professional engineers, these activities have taken on additional importance in the past few years.

From the beginning, the Iowa Highway Research Board has had funding from counties, and the participation of county engineers. Reports on research sponsored by the board and its participation in demonstration projects have provided a valuable resource. These activities should continue.

Technical problems can be addressed through research projects, but more reports are not the answer to the majority of problems. Information needs to be tailored and existing programs must specify daily needs and present them effectively. Because more money is spent on maintenance activities than on construction at the local level, upgrading and improving maintenance efforts should take priority. Iowa has produced a good slide-tape presentation on maintaining granular-surfaced roads. Other subjects should lend themselves to effective slide or video presentations.

Group meetings have always been an effective way of presenting information in a one-on-one, face-to-face exchange. Such meetings must continue and take place on a smaller regional basis to reduce time and expense to participants. Boards and councils are balking at paying the fees charged by some universities for continuing education courses. These courses must continue at the lowest cost possible.

In maintenance administration, superintendents and foremen need consideration. In any organization, these people expedite the work; however, little time is devoted to train and assist them in their jobs. Training becomes more difficult in terms of their ability to read and comprehend training literature.

Engineer-managers need help and information in other ways besides the technical. For example, they need information on handling personnel problems, union negotiations, budgeting problems, and public relations. The National Association of County Engineers, with the aid of FHWA, has produced an excellent series of manuals on these and other subjects. However, manuals are less effective than group discussions. Perhaps a continuing series of group meetings with case studies similar to the business-school approach would provide needed training in these areas.

The technical issues are too numerous to mention. Granular surfacing and a cheap method of dust control remain the most common problems. Sources of quality granular surfacing material are rapidly decreasing. Material is harder to find, and for even minimal performance specifications need modifying. At a Michigan Technological University-FHWA sponsored research project on granular surfacing last summer, strong similarities in granular surfacing problems in every state were noted.

CONCLUSION

The perspective at the receiving end of technology transfer tends to be rather narrow. Problems that need to be solved are of immediate importance and may not be the same ones faced next month or next year.

Technology transfer information should be practical, understood by people with limited training, supportable by experience, applicable to demonstration, and area-specific.

Primary concern should be the provision of information that can be applied within the financial abilities of local units.