

THE SYNTHESIS OF INFORMATION AS AN IMPLEMENTATION TOOL

Thomas L. Copas, Highway Research Board

●WHAT is a synthesis? It is important that we have general agreement on what a synthesis is and—equally important—is not. Some definitions offered by Webster are "the composition or combination of parts or elements so as to form a whole"; "the combining of often diverse elements into a coherent whole"; and "deductive reasoning". The project statement for NCHRP Project 20-5, "Synthesis of Existing Information Related to Highway Problems", suggests that textbooks, nomographs, and state-of-the-art papers are conventional synthesis methods for maximizing the use of existing knowledge and for minimizing the total effort expended in bringing together useful information.

It has also been stated, "Information synthesis can bring together and interrelate stored information, current research activity, and current engineering practice" (1).

A synthesis, if we accept these definitions, is not intended to develop new information, techniques, or procedures or to serve as a manual or handbook. The synthesis process should survey and evaluate all that is known about a problem that can be brought to bear on its solution.

Why synthesize information? "Distill or Drown: The Need for Reviews" was the title of a 1968 article in a physics magazine (2). The article discussed the information explosion and stressed the need for creative synthesis of facts and ideas. It stated, "No set of information tools is going to enable the scientist to make full use of our information output unless it includes some means for digesting, evaluating and above all condensing the scattered bits of valuable information into coherent and comprehensible packages".

The responsibility for developing a synthesis document should rest with someone who is a recognized authority in the subject area. A panel of other experts should be available to provide additional experience and overall guidance (3). The panel will normally include a practitioner, a researcher, and an author.

Unfortunately, it is not possible to prepare a single synthesis report that will satisfy all levels of users. Nor will a single synthesis always be suitable for both research and management. Their responsibilities and interests are different. Most of the syntheses that have been prepared under NCHRP 20-5 contain a summary that is written for management. The body of the report is directed specifically to the personnel involved with the subject area.

How is the synthesis report developed? There are four major phases in the development of a synthesis:

1. Identification of related literature, people, agencies;
2. Collection of documents and information on practice;
3. Evaluation of documents and practice; and
4. Preparation of the synthesis.

Intermediate or support steps include literature search, document acquisition and review, identification of panel members, scope development, consultant selection, contacts with practitioners and agencies, draft preparation, review, and revisions, publishing, distribution, and follow-up.

Each phase or step has some relationship with research implementation and successful practice. There is much to be gained from synthesizing practice. While many are reluctant to use new methods, nearly all will follow an established practice that has been successful in getting the job done.

How have completed syntheses of highway practice been put to use? "Traffic Control for Freeway Maintenance" has been used as a guide for preparation of agency manuals and as a check document at work sites. "Bridge Approach Design and Construction Practices" has been translated by one foreign government. "Concrete Bridge Deck Durability" has been identified as a basic document in the continuing development of practices and procedures to cope with the problem (4). "Scour at Bridge Waterways" has been translated into Spanish as an "information bulletin". "Principles of Project Scheduling and Monitoring" has been used as a text supplement at the Mississippi Highway Management Course. "Motorist Aid Systems" has been used by AASHO, FHWA, the Congress, and various communication industries. "Construction of Embankments" was reviewed by one highway agency and recommended for distribution on a wide basis to agency field personnel.

Distribution on a nationwide basis to other than highway agencies was attained when AT&T purchased 50 copies each of two syntheses for members of their organization in each state.

I feel also that the synthesis effort is implementing research in other ways that are difficult to document. The panel discussions at the three or four meetings for each topic are useful. The investigative effort causes practitioners and researchers alike to take a fresh look at their work. One director of a midwestern highway agency called the day after a synthesis topic consultant had visited his agency to inform me that he and his staff had benefited from the exchange of views. The opportunity to bring several staff members of the agency together to bear upon a single problem is difficult to measure. But it is useful.

GETTING RESEARCH FINDINGS INTO PRACTICE

The following comments are extracted from the draft of the synthesis on "Getting Research Findings Into Practice" (5). Dr. Reynold Watkins of Utah State University has assisted the panel and staff in the preparation of this draft.

The time and money put into research cannot be justified unless the research findings are used. The primary use of research results is to change practice—those methods and procedures used to design, construct, and maintain highways. To change practice it is usually necessary to change the "media of practice", i.e., plans, specifications, standards, handbooks, manuals, etc.

Most of the problems of implementing research results derive from four failings. First is the failure to report results, particularly negative findings. The second is a failure in the distribution of reports—too much information and frequently to the wrong people. Another failing occurs when personnel do not have time to read, understand, and evaluate reports or because they are not written clearly and concisely or in appropriate terminology. Finally, applicable research findings sometimes are not put into practice because of resistance to change.

Some of the problems can be overcome through the proper type of organization. A research organization that is set up with the clear knowledge that the end result of the research program is implementation helps considerably in getting the agency's own in-house and contract research into practice. But the implementation of research by others takes a separate procedure. Distribution of research reports to interested offices by the research engineer is one method used. An improvement on this requires the recipient to submit a written report on the applicability of the research results. Another approach uses a committee whose members represent a cross section of the agency. Committee members are assigned reports as they are received, and they present a summary and recommendation to the committee for appropriate action.

Professional associations have a major role in implementing research. The committees and task forces of groups such as AASHO, ASTM, ASCE, ACI, and ITE use research results to prepare specifications, manuals, and guides that can be used by practitioners.

The techniques of implementation are communication and motivation. Communication techniques include the following:

1. Readable and understandable reports—that is, reports written in orderly, direct fashion and in the language of the practitioner;
2. Research information services—the best known in our field is the Highway Research Information Service;
3. The Technical Activities Staff of the HRB, which, through trips to state highway agencies, colleges, and industry, acts to correlate research;
4. Seminars and workshops where one of the objectives is to present research results to potential users; and
5. Demonstration teams that involve the practitioner.

Motivation is a force that can be used to get people to put research results into practice. Some of the means include

1. Administration, which can reward positive efforts toward implementation;
2. The research engineer, who can act as a link between the researcher and the practitioner;
3. Involvement of the practitioner in the research from the beginning through the check-testing of results; and
4. Interloan of personnel among divisions and districts, which frequently will result in fresh points of view being applied to old problems.

The federal-state cooperative highway research implementation program is designed to stimulate implementation efforts, encourage reporting of research results, and obtain feedback on research needs. One effort is the Experimental Projects Program, where the main thrust is to obtain useful results on experimental features in a short space of time. The purposes of the Research and Development Demonstration Projects Program are to promote utilization of research and development and to provide special training opportunities for FHWA and state highway personnel.

There has been much progress by highway agencies in the implementation of research findings, particularly for research conducted within or at the direction of the agency. There is still a time lag in implementing research done by others. It is recommended that highway agencies improve techniques for utilizing research done by others. Additional conclusions and recommendations are as follows:

1. Management is responsible for supporting implementation effort.
2. Communication remains a problem; organized channels of communication should be improved.
3. To increase implementation, practitioners should be involved at all stages of research.
4. The research effort should be planned for implementation—even to the extent of developing draft specifications, instructions for use, etc.
5. A system to evaluate research results is important.
6. Interloan of personnel within an agency is advantageous for getting research into practice.
7. Field visits (including trips to other states) have played a role in gaining acceptance of new materials, techniques, and equipment.
8. Conferences, seminars, and workshops are excellent means of informing personnel of research results.
9. Demonstration projects that show the validity of a new product or procedure have been well received.
10. Increased attention should be given to product evaluation methods.
11. A system tailored to the agency's needs should be developed for receiving, cataloging, and routing research reports.
12. Research findings are not fully implemented until they are reflected in specifications, standards, plans, manuals, handbooks, etc.
13. Those agencies with a committee organization assisted by a full-time research engineer are more successful in evaluating and implementing research results.

REFERENCES

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