

# Scoping the Research Problem

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Scoping the research problem means defining the limits of a research problem. This paper presents an overview of the scoping function in the administration of highway research. The paper emphasizes the importance of team rapport for positive, productive research. The parameters of the scoping function are given. A practical example of scoping of research problems as practiced by the Mississippi State Highway Department is included.

Scoping the research problem is the defining of the limits of a given research problem. There are certain necessary scoping actions that overlap. There also is some of the scoping function in the research proposal evaluation. The scoping function is of fundamental importance in any research problem. It is evident that there is some overlapping in these related topics.

The successful scoping of a research problem requires a unique blend of administrative experience and a thorough knowledge of the organization's mission, resources, objectives, and personnel. It also requires technical skill and knowledge of the areas that require immediate attention through research. Most often, the task of scoping a transportation-related research problem is a team effort, consisting of, at a minimum, three key elements: (a) an administrator, (b) operations personnel who have a problem that needs researching, and (c) a researcher.

A high degree of rapport in this group is necessary for a successful research effort. The operations personnel has the problem that needs researching; the administrator knows the organization's resources that can be allocated to the problem at hand; and the researcher has the ability and knowledge required to do the work.

A great deal of thought, time, and effort is required to mesh what needs to be done into its proper relationship with the resources available for doing it. Almost always more needs to be done than there are resources that can be allocated to doing it. Here is where the rapport of the team can become strained and where, probably, the administrator will have to make a choice.

The responsibilities of the research team include the following:

1. The administrator has responsibility for research policies of the organization; knowledge of the organization's mission, objectives, and goals; resources (financial, personnel, and equipment); establishing avenues of communication; and getting research findings into use.

2. The operations personnel have responsibility for the problem that needs solving, gaps in the current state of knowledge that cause the problem, liaison with the researcher during the project, and recommending how research findings should be used.

3. The researcher is responsible for conducting the research; keeping the other members of the team fully informed of progress, problems, and findings; and writing the report in language that operations personnel can understand and use.

After the research team has identified what it considers to be a worthwhile problem, a problem that reasonably can be undertaken with the facilities available, the first level of its analysis will be in terms of its definition. This will serve to aid judgments as to its value and its feasibility.

What does the definition of the research problem mean? Obviously, it implies the separation of it from the complex of difficulties and needs in a given situation. To define a problem means to put a fence around it, to separate it by careful distinctions from like questions found in related situations of need. Monroe and Englehart give an excellent statement on this (1):

To define a problem means to specify it in detail and with precision. Each question and subordinate question to be answered is to be determined. Frequently, it is necessary to review previous studies in order to determine just what is to be done. Sometimes it is necessary to formulate the point of view or educational theory on which the investigation is to be based. If certain assumptions are made, they must be explicitly noted.

The research team should perform the following in the scoping process.

1. The operations personnel must specify the problems; the limits of investigation must be recommended.

2. The researcher must know the current state of knowledge on the subject to test a hypothesis that has been postulated and to explain or predict on the basis of observed phenomena. He or she must also determine ways to make optimum use of the locality and facilities where the investigation can be conducted. The researcher looks to the phenomena brought up by the operations personnel and asks why, what, how, where, and when. When the researcher has completed all of this, and assuming that there is a problem, he or she will make comments and recommendations to the administrator as to where to install the fence for the research or investigation.

3. The administrator will make the final decision as to the location of the fence. Of course, he or she may also decide that no fence is needed for the proposed research problem because (a) in some cases, certain changes can be made in the management process that will eliminate the problem, (b) to solve the problem fenced by the researcher would exceed the financial capability of the organization and the problem would need to be refenced in smaller areas so research can get started, or (c) for the overall mission of the organization, this research problem does not possess a priority rating high enough to warrant immediate action. In this case, he or she may decide not to conduct the project.

Theoretically, this is how a research problem is scoped. It is appropriate to present a real-life situation and see how this procedure works. The Mississippi State Highway Department is small enough and its financial resources limited enough that it is blessed with a degree of flexibility and informality that enables the researchers to call on anyone in the organization for the information and cooperation needed to define a research problem.

The operations people have a problem that needs answers. The problem is referred to the Research and Development Division. This is done by memorandum or telephone. The first thing the researchers do after getting the problem is to discuss it with division staff members, as well as members of other divisions, to try to get a better feel and understanding of the problem. This process also has had a side benefit on several occasions. Often, the solution to the problem

could be found by visiting experienced fellow employees. They have been able to provide the answer simply because they had been confronted with the same problem during their service to the department and found the answer by conducting their own research or by trial and error. Most of these findings were not documented. Therefore, when this occurs, the researchers always record the findings so they will be available in the future.

At the same time that the interdepartmental research scoping is going on, the researchers also perform a state-of-the-art search of the problem subject. Available for search and consultation are the experience, findings, and recommendations of others in TRB, the National Technical Information Service, Federal Highway Administration (FHWA) and U.S. Department of Transportation (DOT) publication program, FHWA National Evaluation and Experimental Program, FHWA Demonstration Projects, American Association of State Highway and Transportation Officials (AASHTO), and other state highway or transportation departments.

The researchers study the information in the literature to learn what research has been done in the area of the problem at hand. This takes time and is not easy. It is not often that one is able to find exactly what is sought in the literature. It happens, but not often.

Although one seldom finds exactly what one is seeking in the literature, it is almost always possible for an experienced researcher to use the literature to begin defining the scope of a research problem. Sometimes these findings of others can show what cannot be done or, at least, what has not yet been done; for example, preventing the accumulation of bird droppings on bridges. There is considerable material on this subject in the literature, but no completely satisfactory solution has been found.

Again, there may be much information available on a subject, but the researcher is then faced with deciding if the findings are applicable to a particular physical condition such as soil, temperature, rainfall, and elevation.

After the completion of this work, the research problem is presented to the Mississippi State Highway Research and Evaluation Committee for final review and comments before it is submitted to top management for funding consideration. The research and development engineer chairs the Mississippi State Highway Research and Evaluation Committee. It is composed of the heads of most of our divisions and the three assistant chief engineers, plus a representative of the FHWA division office. The committee meets quarterly and can meet more often, if necessary. There is a wealth of technical and administrative experience available to aid the researchers in finally defining the scope of any particular research problem of interest to the department.

Having defined the problem scope, and assuming that it meets the approval of the top management, the proposal is written, including the nuts and bolts of time, money, other personnel, equipment, and facilities. All that is necessary then is formal FHWA and Mississippi State Highway Department approval before work begins on the conduct of the actual research.

The FHWA, at least at the division level, and probably higher, has been in on the process almost from the beginning. As FHWA personnel do their job in the evaluation of the research proposal, certainly they also perform some function of scoping. However, the department's relationship with the FHWA, at all levels, has been outstanding and productive. All of Mississippi's research program is funded with Highway Planning and Research Program (HPR) funds, which means that the department almost always has to check with DOT every time a plan is proposed to do any research work. Only rarely is there a problem. For this, the FHWA people, at all levels, are due sincere thanks.

#### REFERENCE

1. W. S. Monroe and M. D. Englehart. *The Technique of Educational Research*. Univ. of Illinois Press, Urbana, Bureau of Education Res. Bull. 38, 1928.

## Managing the Research Project

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This paper discusses the management of a research project from the perspective of an organized transportation research institute that operates within a major university. The management technique for a contract research project is described as a cycle of four formal evaluations superimposed on a continuous informal evaluation process. The basic objective, nature, and timing of each of the four formal evaluations are discussed as well as the categories of people that should participate in each evaluation. A brief description of the less formal but more continuous management evaluations associated with the management of projects within a cooperative research format is also given. The point is made that an important aim of the management and conduct of any research project should be to develop a close working relationship between the researcher and sponsor. This will make overall management of the project easier and will result in a better end product.

Research, to be efficiently and effectively conducted, must be managed. Whether management is formally organized or conducted intuitively by the principal in-

vestigator, it is critical to research performance.

I would like to address the topic of project management from the perspective of an organized transportation research institute operating within the framework of a major university. From this perspective, our view of research management may be slightly different from that of either the traditional academic-oriented research conducted by many universities or the private consulting firm. We are all seeking the same end product, but we may go about it in a little different manner.

To begin with, the management of a research project should be considered as a part of a continuous research management process that begins well before the individual project begins and extends through the publication of findings. The management of an individual research project is merely a part of this larger process.