

Prologue

The Profession of Transportation Systems Analysis

THE FIELD TODAY

In the last ten years the field of transportation systems analysis has emerged as a recognized profession. More and more government agencies, universities, researchers, consultants, and private industrial groups around the world are becoming truly multimodal in their orientation and are adopting a systematic approach to transportation problems. Specialists in many different disciplines and professions are working together on multidisciplinary approaches to complex issues.

The field of transportation systems analysis has the following characteristics:

It is ***multimodal***, covering all modes of transport (air, land, marine) and both passengers and freight.

It is ***multisectoral***, encompassing the problems and viewpoints of government, private industry, and the public.

It is ***multiproblem***, ranging across a spectrum of issues that includes national and international policy, the planning of regional systems, the location and design of specific facilities, operational issues such as more effective utilization of existing facilities, carrier management issues, and regulatory, institutional, and financial policies. The objectives considered relevant often include national and regional economic development, urban development, environmental quality, and social equity, as well as service to users and financial and economic feasibility.

It is ***multidisciplinary***, drawing on the theories and methods of engineering, economics, operations research, political science, psychology, other natural and social sciences, management, and law.

Transportation systems analysts are professionals who endeavor to analyze systematically the choices available to public or private agencies in making changes in the transportation system and services in a particular region. They work on problems in a wide variety of contexts, such as:

- urban transportation planning, producing long-range plans (5–25 years) for multimodal transportation systems in urban areas as well as

short-range programs of action (0–5 years), including operational improvements in existing facilities and services and location and design decisions for new facilities and services;

- regional passenger transportation, dealing primarily with intercity passenger transport by air, rail, and highway and possible new modes (as in the Northeast Corridor Study in the United States or Project 33 in Western Europe; see Grëvsmahl 1978, Wheeler 1978, Wilken 1978);
- national freight transport, in developed countries such as the United States, where issues of truck-rail-water competition are of particular importance, as well as in developing countries, where the magnitude of investments in the transport sector, its spatial distribution, and its allocation among modes are all important components of the overall problem of national economic development planning;
- international transport, where issues such as containerization, competition between sea and air, and intermodal coordination are important for freight shippers and carriers in an era of increasing international trade.

The field of transportation systems analysis began with the application of systems analysis methods to urban transportation studies. Most of these early applications were concerned with long-range planning, were public-sector-oriented, and used similar methodological approaches. Now, many different variations in methodologies are being used in a wide variety of operational, planning, design, and policy applications, in both private and public sectors, and involving short-range as well as long-range perspectives, in all of the contexts indicated above.

Today, transportation systems analysis is a mature profession, with a unified theoretical basis and many and diverse practical applications. It is an exciting field in which the concerns extend from abstract theory and complex models to politically important policy questions and institutional change strategies. Our objective in this volume is to show the unity and the diversity of this field. We also hope to impart some of the excitement and satisfaction of practicing this profession.

UNITY AND DIVERSITY

The field today is characterized by a diversity of problem types, institutional contexts, and technical perspectives. But underlying this tremendous diversity is a central intellectual core: a body of theory and a set of basic principles to be utilized in every analysis of a transporta-

tion system. The elements of this core are introduced in chapter 1 and amplified in later chapters.

The intellectual core provides a set of unifying themes. As a consequence of the historical development of the field, however, there is a rich variety of ways in which analysts can draw on this core in performing a practical analysis of a specific set of issues. While the same basic theory and principles apply to each problem, very different types of models and methods of analysis are appropriate in different situations.

THE CHALLENGE

The focus of transportation systems analysis is on the interaction between the transportation and activity systems of a region. ***The substantive challenge of transportation systems analysis is to intervene, delicately and deliberately, in the complex fabric of a society to use transport effectively, in coordination with other public and private actions, to achieve the goals of that society.*** To know how to intervene, analysts must have substantive understanding of transportation systems and their interactions with activity systems; this requires understanding of the basic theoretical concepts and of available empirical knowledge.

To intervene effectively, and actually bring about change, analysts must also have a proper perspective on their role. ***The methodological challenge of transportation systems analysis is to conduct a systematic analysis in a particular situation which is valid, practical, and relevant, and which assists in clarifying the issues to be debated.***

An analyst will often use models and other technical means to assist in developing the analysis. There is a wide spectrum of modeling approaches available, ranging from complex computerized simulation models, to very simple algebraic models, to no formal models at all.

A key task for the analyst is to select a process of analysis, including a choice of model, that will help to produce an analysis that is relevant, valid, and practical, and that helps to clarify the issues. To implement this process effectively may involve the analyst in public participation and even in institutional change. An important element of the design of a process of analysis may be inclusion of activities that stimulate constructive and timely involvement of affected interests in an open, participatory process designed to recognize explicitly potential value conflicts and to promote constructive resolution of those conflicts.

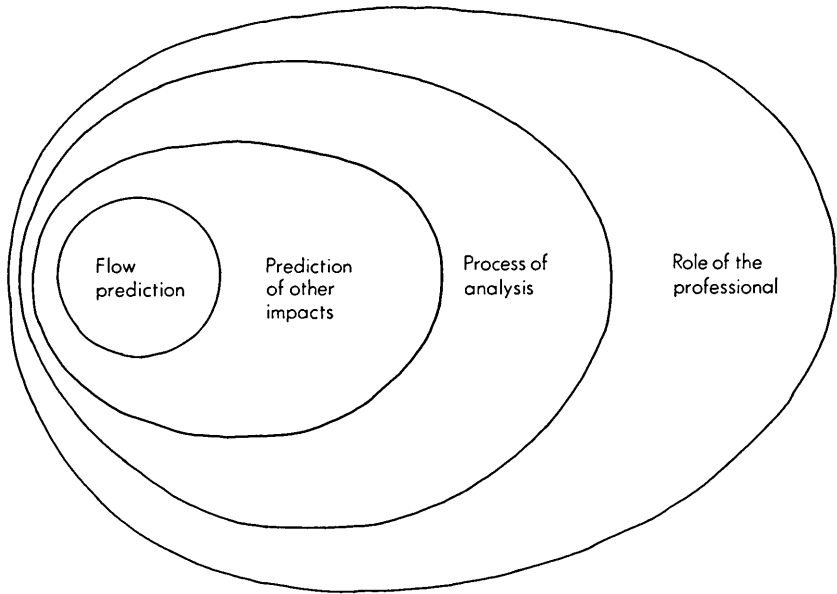


Figure P.1 The scope of transportation systems analysis.

Figure P.1 presents symbolically the image we have been describing. At the core of the field is the prediction of flows, which must be complemented by the prediction of other impacts. Prediction, however, is only a part of the process of analysis; and technical analysis is only a part of the broader problem, namely the role of the professional transportation systems analyst in the process of bringing about change in society.

Today, transportation systems analysis is a field so broad and diverse that few individuals can remain competent in all its aspects; rather, many specialties are emerging, such as demand analysis, evaluation, policy, and the development of new systems. It is an exciting field, spanning the range from abstract theory and sophisticated mathematics to important public policy questions and issues of political strategy.

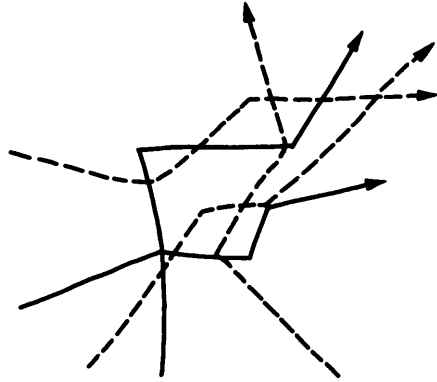
Within this broad spectrum of intellectual styles and problem applications, each individual, building on the same basic foundations, can develop his or her own unique potential as a transportation systems analyst.

PROFESSIONAL TRAJECTORIES

An education in transportation systems analysis can lead to many different professional careers (figure P.2). Transportation systems analysts

Application specialties

- highway engineering
- flight transportation
- marine transportation
- transportation management
- traffic engineering
- urban transportation planning
- developing country transportation
- rail transportation
- port development and planning
- airport planning
- transit operations
- trucking
- transportation regulation
- transportation and economic development
- transportation engineering
- transportation economics
- national transportation policy
- transportation environmental analysis
- and others



Methodological specialties

- demand
- transportation system performance evaluation
- policy analysis and implementation
- institutional change strategies
- urban planning and development management
- systems analysis methods
- environmental impacts
- economics
- activity systems analysis
- and others

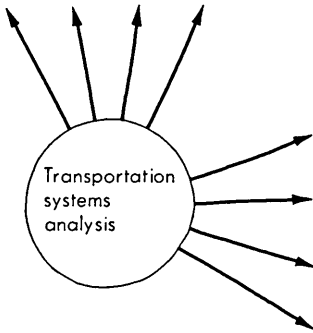


Figure P.2 Careers in transportation systems analysis.

work for private firms and for public agencies; for carriers such as airlines, steamship companies, railroads, or transit agencies and for other operators such as airport or seaport authorities or highway departments; for government agencies at local, state, and federal levels, as analysts, planners, and policy makers, as traffic engineers, highway engineers, transit planners, airport planners, or railroad analysts; and for private firms involved in the design and operation of facilities, in the manufacture of equipment, or in consultation work.

Professionals in the field can take many different roles: technical analysts, working primarily with quantitative methods in any or all of the varied methodologies of the field; project managers, managing groups of technical professionals; community interaction specialists, at the interface of technical analysis and political action; policy analysts, providing technically oriented support to elected officials, legislators, and others; policy makers, such as heads of transportation firms or agencies, or ministers or secretaries of transportation; and, of course, educators and researchers.

Thus transportation systems analysts can follow a wide variety of professional careers. We like to use the term “trajectory” because, as suggested by the upper right-hand corner of figure P.2, an individual’s career is rarely a predictable “linear” progression up a well-defined career ladder.

Transportation is a rapidly changing profession in a rapidly changing world. The careers of most transportation systems analysts are likely to resemble the randomness of Brownian motion more than a simple linear progression. Each individual’s career will evolve in unpredictable ways: new jobs, new events, changing external forces, development of new personal skills, all contribute to a largely unpredictable professional trajectory.

This uncertainty suggests that an individual must acquire a broad professional base as well as specialized training in particular aspects of the field. From this basic grounding in the fundamentals of transportation systems analysis, one will usually go on to acquire more specialized training through academic coursework and on-the-job experience. As the individual acquires this more specialized training and advances from job to job, he or she becomes more “expert.” This is valuable and natural, but it is also a source of concern.

As one acquires more and more technical expertise, one also acquires a set of attitudes, values, and perspectives peculiar to a particular subculture—the community of related specialists. While this has positive features, it also has serious dangers. The dangers arise from the

loss of a sense of perspective and increasing rigidity in one's professional approaches—the belief that there is a “right way” to do something, or a “right solution” to a particular problem, or, most dangerous of all, that “the expert knows best.”

As one enters into a career in transportation systems analysis, one needs to be conscious of the balance to be achieved between “expertise” and “flexibility.” Specialization and increasingly deeper knowledge of one's specialty are important; but personal flexibility, the ability to modify one's capabilities in response to the needs and challenges of new opportunities in one's unpredictable professional trajectory, is equally important. (These themes are taken up in chapters 14 and 15 and in the epilogue.)