# The Chicago Area Transportation Study: A Case Study of Rational Planning

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## Abstract

This case study of the Chicago Area Transportation Study during the late 1950s and early 1960s illustrates execution of the rational planning model. The model is outlined in ten steps and the way the agency performed each step is described. A final section discusses staff attitudes in a research-oriented agency that emphasized rationality and avoided politics. The study shows that the rational model is workable but raises questions about whether it is effective in influencing decisions.

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## ■ Introduction

The rational planning model is the orthodox or mainstream theory of how the planning process is supposed to work. In practice, it is probably honored more by breach than observance as planners succumb to the pressures of deadlines and the temptations of opportunism. In academia, it is criticized far more than it is praised (Banfield 1959; Altshuler 1965; Kravitz 1970). Yet planners rely on it when they prepare a work program or explain to non-planners how the planning process works.

There are few case studies that present the rational planning model in a favorable light, such as the one by Rothblatt (1971). I contend that the metropolitan transportation studies conducted during the 1960s (and mandated by the 1962 Highway Act) provide excellent examples of the model. They were successful in some respects, but also showed the weaknesses for which the rational, apolitical appproach has been faulted (Catanese 1974; Kaufman 1978). They were highly technical studies that were often conducted in a political vacuum and had limited influence on public decisions.

This is a case study of the Chicago Area Transportation Study (CATS), which, according to Weiner (1987, 13), "set the standard for future urban transportation studies." CATS is a good example because it followed the rational model closely, completed the planning process, and published a plan. Some other studies ran into difficulties and never completed a plan.

## ■ Background on CATS

Near the end of World War II, the U.S. Bureau of Public Roads turned its attention to urban traffic problems. Previously it had focused on intercity highways and rural roads; in fact, federal highway aid could not be used in cities until 1944. The Bureau developed the home inter-

view origin-destination survey as a methodology for measuring travel behavior and laying the basis for planning future roads. The first O-D survey was conducted in Little Rock in 1944; many others were done around the country in succeeding years.

There were parallel advances in forecasting methodology. Thomas J. Fratar devised a technique for factoring the zone-to-zone trip tables that resulted from the surveys to match future totals (Fratar 1954). This was first used in a study of Cleveland around 1953. Alan M. Voorhees applied the gravity model to traffic; his approach allowed synthesizing of zone-to-zone movements without an existing trip table (Voorhees 1955). The interrelationship between land use and travel behavior began to attract major interest in the planning field (Voorhees 1959).

Up to this time, highway planning was usually limited to individual corridors, but system-wide planning began to emerge. The Detroit Metropolitan Area Traffic Study, which began in 1953, is usually considered to be the first comprehensive metropolitan transportation study. In 1956 it published a plan for a highway system based on a land use plan for the metropolitan area. The Study surveyed mass transit use, but did not prepare a transit plan.

The late J. Douglas Carroll, Jr., was Director of the Study. He had received a doctorate from Harvard University in 1950; he was the third person in the country to get a Ph.D. in planning (after Melville Branch and Lloyd Rodwin). He firmly believed in the rational planning process and thought that planning should be made as scientific as possible. Later he was cited by Catanese (1984, 79) as an example of a successful planner who adopted the "apolitical-technician role."

## ■ Formation of CATS

The second metropolitan study was CATS, which was formed in 1955 as an ad hoc public agency with the purpose of preparing a long-range transportation plan for the metropolitan Chicago area. It was patterned after the Detroit study and Dr. Carroll was hired as Director. He brought several staff members to Chicago and formulated a work program based on the Detroit experience. But as time went on, CATS branched out in new directions and made numerous improvements in transportation planning methodology. It pioneered in the use of computers, trip distribution, traffic assignment, and benefit-cost analysis.

CATS was independent of other public bodies, but was jointly sponsored by the City of Chicago, Cook County, the State of Illinois, and the U.S. Bureau of Public Roads, which all contributed to its expenses according to an agreed-upon formula. The "governing board" was called the Policy Committee and consisted of one person named by each sponsoring agency. None were elected officials. Unlike the typical planning department, CATS had no operating or implementation responsibilities. It was to recommend a plan to the sponsoring agencies, which presumably would carry it out. The CATS staff was largely protected from "brush fires" and free to concentrate on long-range planning.

CATS took seven years to finish its original mission and spent $3,500,000 in the process. The staff was research-oriented and produced scores of technical reports, journal articles, and conference papers. Their work culminated in the three-volume *Final Report* (Chicago Area Transportation Study 1959, 1960, 1962). Volume I gave results and analyses of the surveys CATS made. Volume II covered land use and travel forecasts for the target year, 1980. Volume III presented the recommended highway and transit plans.

While CATS was under way, the idea of the metropolitan transportation study became popular, and other studies were started around the country. A report published in 1962 listed twelve metropolitan areas exceeding 1,300,000 in population that had major transport studies completed, in progress, or authorized (Zettel and Carll 1962). The most important of the other studies was the Penn-Jersey Study of the Philadelphia area, which began in 1959, because it was technically the most ambitious. Under its Research Director, Britton Harris, the staff tried to improve on what CATS had done and better relate methodology to social science theory.

The Bureau of Public Roads encouraged the studies and gave financial aid with the 1½ percent planning funds authorized by the Hayden-Cartwright Act in 1934. Meanwhile, there was mounting concern from urban interests about the impacts of the highway program and the decline of public transportation (Levin and Abend 1971). Hence in 1960 the Bureau signed an agreement with the Housing and Home Finance Administration (the predecessor of HUD) to share in financing the studies. HHFA funds came from the 701 planning assistance program initiated by the 1954 Housing Act.

This arrangement was solidified by the 1962 Highway Act, which stipulated that after July 1, 1965, all federal aid highway projects in any urban area of 50,000 or more population must be "based on a continuing, comprehensive transportation planning process carried on cooperatively by the states and local communities" (Weiner 1987, 19). This is often called the "3C requirement." Essentially it required every metropolitan area to conduct a transportation study. As a result, hundreds of studies were conducted during the 1960s, which has been called the "golden age" of urban transportation planning (Weiner 1987, 17).

## ■ The Rational Model

Among theories of the planning process, the rational comprehensive model is "the dominant tradition, and

the point of departure for most other planning approaches" (Hudson 1979, 388). Planners believe that improving the rationality of decision making is one of their major contributions. Many planners consider themselves more rational than others with whom they deal (other professionals and, certainly, politicians) because they take a comprehensive, long-range view and a systematic, analytical approach.

Over the years, the profession developed a fairly standard rational planning process. Eventually, some people wrote it down. Edward Banfield was perhaps the first to define a model of rational planning (Banfield 1955); his write-up is still cited frequently. Many others have written their own versions of the rational model (Stuart 1969; Lichfield 1975). Barclay Hudson called it "synoptic planning," and this term is sometimes used (Hudson 1979). These descriptions range from concise to exhaustive (Churchman 1968; Chadwick 1971; Quade 1975).

The simplest version I know was done by Herbert Simon and had just three steps (Simon 1960): (1) Intelligence: searching the environment for conditions calling for decision; (2) Design: inventing, developing, and analyzing possible courses of action; (3) Choice: selecting a particular course of action from those available. Simon called this a model of decision making, but it clearly applies to planning.

I shall offer my own version of the rational model which has ten steps, and show how CATS applied them. I have been giving this description to planning students for several years. I also teach students the alternatives represented in the SITAR framework (Hudson 1979), as well as mixed scanning (Etzioni 1967), and I try to present them in a neutral manner. I emphasize incrementalism (Lindblom 1959; Braybrooke and Lindblom 1963) as the major alternative in practice. The students have overwhelmingly indicated preference for the rational model. They acknowledge the criticisms, but most say they intend to follow the rational model when they go into planning practice because they dislike the political bargaining implied by incrementalism.

The presentation makes the process appear linear, which is not necessarily so. In practice, two or more steps may be performed concurrently or may overlap. Sometimes there is recycling: Results of a later step make the planner go back and rework an earlier step. I should note that this is my view of how rational planning should be carried out; it is not exactly the same as the work program that CATS followed (Chicago Area Transportation Study 1957). Some planners would alter the sequence of steps slightly; I do not consider these differences critical. I do believe it is important that every step be given serious attention, that none be neglected.

First, there is a prerequisite: There must be awareness of a problem or need, a desire to prepare a plan, and a commitment of resources to do it. In this case, there was an awareness that highway-building in the Chicago area had not kept up with the growth of motor vehicles, traffic congestion was steadily getting worse, and transit ridership was falling. The study was also encouraged by the Bureau of Public Roads which paid 75 percent of the cost.

## ■ The Ten Steps as Applied by CATS

### 1. Data collection

*This is normally the first thing a planner does: preparing base maps, field surveys, inventories, and library research. The planner may conduct new surveys to secure original data (e.g., on land use) or may consult secondary sources (e.g., Census reports). The data may be historical, so that trends can be determined. The object is to measure the problem and its context.*

Data collection was the largest single phase of the Chicago study and cost more than one million dollars. The base year for all surveys was 1956, and during that summer, the staff reached its peak size of 368 persons. Field surveys were conducted in three areas: travel, land use, and the transportation system. Some of the surveys followed standard methodology developed by the Bureau of Public Roads; others were based on experience in the Detroit study.

The travel surveys took the most effort, especially the home interview survey, which involved personal interviews of almost 50,000 households and cost about $675,000. This was a one in thirty sample of all households within the Study Area, which had an area of 1,236 square miles and a population of 5.2 million. Other travel surveys covered trucks, taxis, railroad passengers, and motor vehicles crossing the cordon line designated as boundary of the Study Area.

There was also a large expenditure on the land use survey which had two parts: 1) Usage of land in the whole Study Area was determined from aerial photographs and classified into six categories (residential, manufacturing, transportation, commercial, public buildings, and public open space) plus streets and vacant land; 2) for those areas covered by Sanborn Company maps (295 square miles, including all of Chicago), floor area was measured and classified into about ninety categories that mostly corresponded to the Standard Industrial Classification (Hamburg and Sharkey 1960).

Surveys of the transportation system were relatively simple and cheap. There were inventories of existing expressways and arterial streets (about 2,900 miles) and of public transportation routes (about 1,900 miles). There was research on the relationship between average speed and traffic volume which was important in later steps.

### 2. Analysis of data

*The planner tries to make sense out of the bare facts and understand what is happening and why. The object is to*

*interpret and explain the data, to find cause-effect relationships. This may involve extensive analysis of survey results, not just to create lucid presentations, but also to derive explanations. It may involve evaluation of strengths and weaknesses of the current situation, determination of historical trends, and identification of opportunities and constraints.*

Processing and analysis of the CATS data took more time than the fieldwork. It went on for several years, so that Volume I (summarizing the results) did not appear until 1959. CATS was a pioneer among planning agencies in electronic data processing, but the process was agonizingly slow by current standards. Most data were keypunched and tabulated with card-processing equipment. It still can be true that processing and analysis of survey results takes more time than the fieldwork of collecting the data (Creighton 1989).

This phase was of great interest to the research-oriented staff members. There was a sense of making new discoveries, of pushing back the walls of ignorance. The staff was especially stimulated by Robert Mitchell's work on the interaction of land use and traffic (Mitchell and Rapkin 1954). Measuring relationships between land use and trips generated was an exciting new area to explore. While there were precedents for most of the surveys, nothing on this scale had previously been attempted in transportation planning.

### 3. Forecasting the future context

*This step gives the overall dimensions within which plans must fit. These are factors largely beyond the community's control, such as population, economic activity, consumer preferences, and public financial resources. These may be regarded as constraints. Usually a target year is established for the plan (a simplification that makes the analysis easier). For a long-range plan, the target year is typically twenty to thirty years in the future.*

CATS devoted major effort to this phase. Volume II (published in 1960) was wholly concerned with projections for the target year of 1980. The process started with a population forecast, which was based on published forecasts for the United States and Illinois (Chicago Area Transportation Study 1960, 6-8). Then came a forecast of economic activity, for which a 50-sector input-output model of the local economy was formulated (Hoch 1959). Next, 1980 land use in six categories was estimated for each of the 582 zones into which the Study Area was divided (Hamburg and Creighton 1959). Finally came forecasts of future trip-making, mode of travel, and travel demand for the highway and transit systems. The Study Area population was estimated to grow from 5.2 million in 1956 to 7.8 million in 1980. The number of person trips per day was estimated to increase from 10.2 million to 18.1 million.

CATS received much criticism for its land use forecast because it was not a plan, but an extrapolation of historical trends. It was a commendable research effort, directed by John Hamburg, but it was unlike anything planners had done before. The question of whether it was legitimate for planners to forecast future land use, instead of planning it, became a major issue in the field, enunciated in a landmark article by Britton Harris (1960).

CATS's defense was that there was no land use plan for the metropolitan area (or even for Chicago), and it was not part of the Study's charge to prepare one. That would presumably be done by the metropolitan planning agency, the Northeast Illinois Planning Commission. However, it had just been created in 1957 and, at the time, "the disposition was less towards plan preparation and more towards study and research" (Boyce 1970, 228).

Another criticism is that the land use forecast was made independent of the transportation plan. There was no feedback from the transportation system to land use development. Roger L. Creighton, Assistant Director, later noted in his book, "A failing of the Chicago model was that it was insensitive to changes in accessiblity within an urban region" (Creighton 1970, 183). Of course the CATS planners knew that transportation improvements influence land development, but they thought it was too difficult to estimate exactly how this happens. This became one goal of the series of land use models developed around the country in the 1960s (Harris 1965, Lowry 1968).

### 4. Establishing goals

*What does the community want to achieve in the future? This is a normative step, not a technical matter. There are several approaches: 1) The planner selects the goals, based on professional experience and personal judgment. This was once common, but this approach came to be criticized as elitist. 2) Someone gives the goals to the planner (the legislative body, policy-making board, or some other client). 3) The planner tries to find out shared goals through public opinion surveys or citizen participation programs. The last approach is currently quite popular.*

CATS used a combination of numbers 1 and 2. Dr. Carroll and Creighton drafted and discussed possible goal statements with advisory committees and the Policy Committee. Finally, a list of six objectives for the transportation system was adopted, as follows:

1. Greater speed
2. Increased safety
3. Lower operating costs
4. Economy in new construction
5. Minimizing disruption
6. Promoting better land development

Much has been written about the difference between goals and objectives (Lichfield 1975, 22-25). It is generally understood that a goal is abstract, ideal, and futuristic, while an objective is concrete, attainable, and has a specific time frame. The CATS staff used the two terms interchangeably (Creighton 1970), but their usage corresponded to the common conception of objectives. They were to be as specific as possible, not fuzzy, idealistic targets. Ideally, they could be reduced to quantitative criteria, so it would be clear whether one alternative was better than another.

It was possible to measure attainment of the first four objectives (all in dollar costs), but not the fifth and sixth. They were relegated to the status of "review criteria." This meant that after the quantitatively best plan was determined, it was checked to see if it satisfied the nonquantitative objectives. If not, modifications might be made to ameliorate the problems.

Dr. Carroll stressed the problem of having multiple objectives that may conflict. For example, increasing speed may also increase operating costs and require expensive new construction. This is the familiar problem of making trade-offs between goals. Dr. Carroll believed that insofar as possible you should combine all objectives into a single comprehensive objective. This was possible for the first four objectives which were all measured in dollars, and they were combined into one overall objective: ". . . to provide that transportation system for the region which will cost least to build and use over a period of thirty years" (Chicago Area Transportation Study 1962, 15).

### 5. Design of alternatives

*The planner devises alternative ways of achieving the goals. This step requires the most creativity. There is rarely any systematic way of scanning all the possibilities. Only if the situation is simple enough to reduce it to a mathematical problem is it possible to guarantee that the global optimum is found. This is seldom the case with the kinds of problems that planners deal with.*

*In physical planning, this step involves design in the sense that architects and engineers use the word. You sit at a drafting table and try out various arrangements of objects. In nonphysical areas, alternatives may be different programs, laws and regulations, or institutional arrangements.*

*The alternatives should be taken seriously; they should not be "straw men" that are just meant to show how good the plan is. It is bad practice to settle on a plan prematurely without giving thorough study to alternatives. A null alternative should be included — that is, doing nothing. This may seem unrealistic, but it gives a basis for comparison with the other alternatives.*

The problem facing the CATS staff did involve physical design: drawing networks of highway and transit routes. The planners did sit down with maps and sketch out possible arrangements. A list of design principles was developed to guide the planners (Chicago Area Transportation Study 1962, 36-38). It turned out that there were many constraints because of the existing systems (such as gaps that obviously had to be filled). The planners did not have a blank slate on which to design an ideal pattern.

It was decided that the expressway system should approximate a gridiron pattern. This was considered superior because it disperses traffic, while a radial-circumferential (or cobweb) pattern concentrates traffic and causes congestion at the center. There remained the important question of what the spacing of the grid should be. This question was reduced to an idealized mathematical problem of calculating optimal highway spacing and was solved (Creighton 1960). The results indicated that the sum of travel and construction costs would be minimized if expressways were about three miles apart in Chicago and six miles apart in the suburbs. This provided a guide to drawing sketch plans, even though the network could not be an exact gridiron.

Eventually a dozen major alternative highway networks were designed and tested. They were designated alphabetically as Plan A through Plan L (the letters were simply for identification and had no special significance). Plan A was a null alternative; it consisted of the existing highway system plus those additional routes that were already irrevocably committed (mostly parts of the Interstate System).

Four alternative transit networks were designed and tested. One was the existing system; the second was a plan published by the Chicago Transit Authority (1958); the other two were scaled-down versions of the CTA plan.

One criticism of the rational model is that we humans do not have the problem-solving capacity to investigate all possible alternatives (Braybrooke and Lindblom 1963, 48-50). A mathematical analysis like the highway optimization study does implicitly consider an infinity of solutions, but the problem is so simplified that it only approximates the real world. No rational planner actually attempts to find all possible alternatives. The point is to consider major differences from the status quo which CATS did.

### 6. Testing the alternatives

*This is a forecast of how each alternative would perform in the future context. Sometimes it is called "estimating impacts." Often this utilizes mathematical models and computer programs. Models are simplified representations of real-world systems that are manipulated to see how hypothetical alternatives would perform. Different inputs (representing different alternatives) are fed into the model, which estimates what the outputs would be.*

*Models vary considerably in quality. A good model faithfully replicates what would happen in the real world. Plan-*

*ners have made great advances in this area in the past thirty years. However, there is still a long way to go. Experience has shown that some models are fairly reliable, but there are still many things that cannot be forecast with much certainty.*

CATS put great emphasis on developing the methodology known as "travel demand forecasting." The primary object is to estimate the traffic volumes that will occur on every segment of the transportation network. The process has four major phases which CATS carried out in the following sequence:

1. Trip generation. The number of person trip ends in 1980 in each of the 582 zones was estimated from the forecast land use. Relationships found between land use and trip ends in the 1956 surveys formed the basis for this estimation. This was the main justification for so much study of land use.
2. Modal split. The person trip ends in each zone were divided between those using public transportation and those using private vehicles. This split was based on the belief that "mass transportation trips are relatively firmly fixed by household and car ownership characteristics, and by the pattern of land development" (Chicago Area Transporation Study 1960, 56). Because of the trends to higher family income and car ownership and lower density of development, the total number of transit trips in the region was forecast to increase by only one percent from 1956 to 1980.
3. Trip distribution. The next step was to connect the ends of the trips (the origins and destinations). This is referred to as "computing zonal interchanges," since for simplicity all trip ends in a zone are lumped together and considered to start or end at a single point (the zone centroid). Known techniques for doing this were investigated, like the gravity model, but then Morton Schneider developed a new technique. This is called the "opportunity model" because the number of trips going to a zone depends on the opportunities in that zone and the competing opportunities in other zones (Chicago Area Transportation Study 1960, 81-86, 111). Both the gravity and opportunity models were often used in later studies (Heanue and Pyers 1966).
4. Traffic assignment. The last step was to estimate the route each trip would take from origin to destination, and then to sum up the behavior of all trips to get estimated traffic volumes. Each alternative network was coded into nodes and links to be read by a computer. Then a "minimum path algorithm" calculated the optimal route over the network from origin zone to destination zone for each zonal interchange. The optimality criterion was minimum total travel time (out-of-pocket costs like tolls and transit fares were converted to time equivalents). One of Schneider's major contributions was adapting an algorithm that was originally devised for telephone networks (Moore 1957). Another was to introduce a "capacity restraint" feature that estimated the delays that would occur as a link becomes congested.

Traffic assignment presented a formidable calculation problem, since the highway networks had about 3,000 nodes and 5,000 links. It required the largest high-speed computer existing, the IBM 709. CATS could not find one available in the Chicago area and arranged to buy time during the graveyard shift on one owned by General Electric in Cincinnati. To run an assignment, Schneider would fly to Cincinnati and stay up all night with the computer.

The sequence in which CATS did the four steps became another controversial issue. CATS did modal split before trip distribution, so that characteristics of the networks did not affect choice of mode. This is called a "trip end modal split model." Creighton later wrote, ". . . the first and most basic assumption was that choice of mode of travel could be estimated independently of the level of service provided by mass transportation facilities and, of course, independently of the level of service provided by the automobile. This was an undesirable assumption to make, although necessary at the time" (Creighton 1970, 305).

Later transportation planners opted to do trip distribution before modal split, so that travel times and costs on the highway and transit networks affect choice of mode. This is called a "trip interchange modal split model." The CATS approach is simpler; in this case it was only necessary to estimate modal split for 582 zones. A trip interchange model would have required estimates for a matrix with 582 rows and 582 columns. However, it is alleged that a trip end model is biased against transit because it cannot show that a new transit facility would attract trips away from autos.

Otherwise, the estimating process CATS used is largely the same as now used by transportation planners everywhere. It was, and is, more sophisticated and quantitative than the testing done in any other branch of city planning, but there are other areas in which computer models are used. Undoubtedly there will be many future advances in the methodology of testing plan alternatives.

### 7. Evaluation of alternatives

*This means a comparison of how well the alternatives achieve the goals. It should be as objective as possible; ideally, it should be quantitative. Objectives should be translated into specific criteria by which you can tell whether Plan A is better than Plan B. There are some standard methods for evaluating alternatives, including benefit-cost analysis, cost-effectiveness analysis and rating*

*techniques like the "goals achievement matrix." None of the methods is perfect, but all provide useful information.*

CATS used benefit-cost analysis to evaluate the alternative plans. Four types of costs were estimated (corresponding to four of the objectives): Travel time, accident, and operating costs were related to average speed on each link and were calculated by the computer as an output of the assignment program. Construction costs were estimated separately.

The costs were measured in dollars, and determining the correct values and relationships required some supporting studies. For example, a survey of accident costs was made by interviewing a sample of all car owners in Illinois. Travel time was converted to money at a value of $1.33 per hour for auto trips. CATS did not do original research on this, but reviewed several previous studies (Chicago Area Transportation Study 1962, 126). This value is important: The higher it is, the more new facilities can be justified. CATS was conservative and used a value slightly lower than customary at the time.

Recall that the overall objective was to find the transportation system that would cost least to build and use over 30 years. The annual cost method was used: Construction costs were converted to equivalent annual costs using an interest rate of 10 percent (also considered to be conservative). Then the four types of costs were added; the best plan was the one that minimized this sum. For highways, this was Plan L. Plans with both fewer and more miles of expressways yielded somewhat higher total costs, so the staff felt confident that Plan L was close to the optimum. A paper describing the benefit-cost analysis won the prize as best paper of the year presented at the Highway Research Board conference (Haikalis and Joseph 1961). The recommended transit plan was also selected on the basis of benefit-cost analysis (Haikalis 1962).

### 8. Selection of one alternative

*This is not necessarily an automatic outcome of the previous step. Since the planner has an advisory role, someone else makes the final decision, which may not be the one the planner favors. There may be valid reasons for this. The decision makers may not be convinced by the planner's work. They may have information the planner does not. Politicians must balance the planner's recommendation against other needs. Resources are limited, and it is the politicians' role to allocate them. Political decisions are often called irrational, especially by planners whose advice is ignored, but it is proper for politicians to consider intangible values that are beyond the planner's quantitative analysis.*

While Plan L was best among the major alternatives, the staff felt there was still room for improvement. The assignment indicated some places where capacity and traffic did not match, meaning that either congestion would occur or money would be wasted. Hence there was some fine-tuning and minor variations of Plan L were tested. The plan finally recommended was Plan L-3.

The Policy Committee approved Plan L-3 and the transit plan, which were presented in Volume III (published in 1962). The plans were general and showed routes only for the highest level of facilities. Lines on the maps did not signify precise alignments, only broad corridors. Exact locations might be shifted up to half a mile without seriously affecting the overall network.

Plan L-3 contained 520 miles of expressways, of which 230 miles would be additions to the existing and committed system. Proposed new routes were intended to carry traffic not connected with the Central Business District, letting transit continue to carry the bulk of CBD-oriented travel. It was estimated that expressways would carry half of the vehicle-miles of travel in 1980, compared with 10 percent in 1956. No specific proposals were made for arterial streets.

The transit plan recommended construction of one new rail line and extension of three existing lines, coordination of service between the subway-elevated system and the private railroads, installation of moving sidewalks in the Loop, construction of parking garages at outer terminals of rail transit lines, and experimenting with express bus service on two expressways. Otherwise there were no specific proposals for adding or modifying bus routes.

The plans were estimated to require investment of $2.015 billion for highways and $185 million for transit. There was criticism that the proposals were lop-sided in favor of highways because of this imbalance in spending. It is true that the staff devoted far more effort to the highway plan than the transit plan. Further, the CATS transit plan differed from the one proposed by the Chicago Transit Authority. CATS tested the CTA plan as one of the alternatives, but rejected parts of it as not justified by benefit-cost analysis. In particular, the CTA wanted to build three new subways downtown (two for rail, one for buses), but CATS did not recommend these facilities.

### 9. Implementation

*No plan comes to fruition automatically; various actions must be taken to carry it out, such as drafting legislation, designing operating programs, capital budgeting, proposing bond issues, and project planning. Many plan documents have a final chapter on implementation. This should give a general outline of steps to carry out the plan, with details worked out later. Of course, the planner usually thinks about the feasibility of implementation during earlier steps in the planning process. As noted, the process is not strictly linear.*

*Implementation is often neglected. Some planners con-*

*sider that when a plan is completed and adopted, their work is done. They regard the plan document as the final product. They see their job as preparing plans, not carrying them out (which seems either mundane or "dirty" because it involves politics). Some planners seem to care little about whether their plans are implemented. Sometimes this is because they have since moved to another city.*

This is one step to which the original CATS staff gave little attention. The final chapter of Volume III covered financing and programming the plan; it was intended to show that the highways could be built without raising taxes. Projected revenues from existing sources (fuel taxes, registrations, and federal aid) would be sufficient to fund completion of the plan by 1980. But CATS had no operating responsibility or implementing power. That was up to the sponsoring agencies: the City, County, State, and Federal governments. The Policy Committee representing the four sponsors approved the plan, which implied that the members intended to follow it. However, the Policy Committee really had no legal status and they could not commit their agencies to follow it. CATS publications describe the plan as a staff recommendation.

The staff dispersed after Volume III went to press. Dr. Carroll became head of the Tri-State study in New York, and Schneider joined him. Creighton and Hamburg went to Albany to direct the Upstate New York Transportation Studies. These people did feel they had completed their job in Chicago, and their skills were best suited to preparing other plans in other places.

However, it was decided at an early point that CATS would continue in existence after the plans were released (Campbell 1963). While some key staff members left, others did not, and new people were hired. When the 1962 Highway Act took effect, CATS was designated the "metropolitan planning organization" for transportation planning in the Chicago area (and it still is in 1990).

Attitudes changed after E. Wilson Campbell became Director. He was not so interested as Carroll in basic research and pursued a policy of providing technical assistance to others. Over the years, the staff has regularly done cooperative projects with other public agencies and carried out small-area studies that were more detailed than the original effort. These kinds of activities are part of implementing a long-range, general plan.

### 10. Monitoring

*The planner should periodically review the plan to see whether it works, and if not, to suggest changes. Sometimes this step is called "feedback." Forecasts should be checked to see whether they were correct. If they are seriously off, revising the plan may be indicated. The predictions of models should be evaluated to assess how good the models are. Some agencies accumulate time series data which are scanned regularly to see whether forecasts were right.*

CATS did perform this step. The continuing staff resumed data collection and built up time series on key variables. From time to time, they published reports comparing the original forecasts with the subsequent trends. It turned out that population did not grow as fast as predicted, but auto ownership and highway travel per capita grew more rapidly than predicted. In 1970 CATS repeated the major travel surveys to update its data base.

Because the political tide turned against highways, very little of Plan L-3 was realized. The top priority was the Crosstown Expressway, a north-south route in the Cicero Avenue corridor. This became highly controversial and was the subject of much political debate and many further studies (Pikarsky 1967). Despite extensive efforts to mitigate the impacts and make it acceptable to the neighborhoods, it was never built. Other proposed routes also fell victim to the "highway revolt" that erupted in the 1960s. I believe that only one of the recommended new routes in Plan L-3 was ever constructed: the North-South Tollway in Du Page County that opened in 1989. Otherwise, the expressway network that exists in Chicago today resembles Plan A, the null alternative.

This should not be taken to indicate the futility of planning. What is left out of a plan can be as important as what is put in. For example, the City of Chicago favored widening and upgrading hundreds of miles of arterial streets into what were called "junior expressways." CATS tested this approach in Plan J, which contained 656 miles of intermediate facilities. This turned out to be the most costly of all the alternatives (in travel plus construction costs), and the idea was dropped.

Three of the four rail proposals in the transit plan were implemented: The Skokie Swift began operation in 1964. In 1966, voters approved a $23 million bond issue to build lines in the median strips of the Dan Ryan and John F. Kennedy Expressways. The former opened in 1969, the latter in 1970.

## ■ Staff attitudes

CATS was a very good place to work. There was an aura of excitement about what the Study was doing. People eagerly awaited tabulations of data, results of statistical analyses, and outputs of traffic assignments. There were frequent debates about what this meant, which was the best method for that, how to solve a stubborn problem. Staff members often went to the office on evenings and weekends — not because there was deadline pressure, which was rare, but because they were so enthusiastic about what they were doing.

The atmosphere was informal, and rank meant nothing. Many days Dr. Carroll walked around the offices rounding up people to have lunch with him. Over the meal, he would tell his latest brainstorm and get feed-

back. Staff meetings were competitive, but usually friendly. It wasn't a typical government bureaucracy (with which I became familiar later). It was more like a think tank.

The building had been a bank that failed in the Depression; it had a large open space with a high ceiling. At one time, some of us would play baseball with a tennis ball after 5 p.m. Then one day a line drive struck a fluorescent light fixture; a bulb fell twenty feet and crashed on a desktop. It was Dr. Carroll who hit the ball. No one complained, but that ended the baseball games.

The staff came from a wide variety of backgrounds. Few were trained in planning. When I started in 1960, Dr. Carroll and Creighton were the only others who had planning degrees. Campbell was an engineer, but there were surprisingly few engineers for a transportation agency. Hamburg had studied sociology. Schneider had studied physics and worked as a taxi driver. There were people who had majored in economics, geography, journalism, and mathematics. For some, practical experience in survey research, data processing, or transit operations was more important than formal education.

Because of its many publications, CATS built a reputation for high-quality research. There followed contacts with Northwestern and other universities, and with other transportation planners all over the country. Out-of-town visitors were common. There was a friendly rivalry with several other transportation studies going on at the same time — especially the Penn-Jersey Study, which was seen as the major competitor in regard to developing methodology. There were running debates over the best methods (e.g., the gravity model vs. the opportunity model).

CATS was a training ground for many young people who went on to work for other transportation studies or for consulting firms (like the one started by Creighton and Hamburg). The Pittsburgh Area Transportation Study, which started in 1958, was a direct offshoot of CATS: Louis Keefer left CATS to become its Director, and Dr. Carroll served as a senior consultant. Staff mobility among the studies was high, but CATS was the "mother" study that dispersed its progeny the farthest.

CATS was not popular with many planners who worked for other agencies in the Chicago area. There was considerable awe of the research done by CATS, particularly because it was so quantitative, and many of the planners were not comfortable with numbers. No other planning agency in the area used computers at the time. Opposition focused on two ideas: (1) CATS forecast future land use instead of making a land use plan, and (2) CATS was biased for highways over transit because it recommended many new expressways, but only a few of the facilities that the Transit Authority wanted built. One common observation was that CATS proposed to extend historical trends that were already recognized by planners as having disastrous effects. Another was that CATS did an outstanding study of the problems, but then came up with the wrong solutions.

Dr. Carroll (who set the tone for the staff's thinking) had little tolerance for these ideas. He felt that they were ideological and irrational. He thought most city planners had preconceived ideas that were acquired without thorough, objective study of the problems such as he conducted (with emphasis on measurement). He was suspicious of anyone trained in a traditional planning school, and he almost did not hire me for that reason.

One issue was whether what was happening to the suburbs was good or bad. Most of the non-CATS planners were dismayed by urban sprawl. They claimed that many new suburban developments were monotonous, boring, and ugly, when compared to some of the neighborhoods in Chicago. The CATS staff usually defended the suburbs as reflecting the desires of most average Americans. Creighton once remarked that the suburbs will look fine after the trees grow up. Aesthetics was not a major concern at CATS.

To illustrate the typical thinking of the CATS staff, I shall recount a personal experience. In 1961, I enrolled in a seminar taught by William Goodman of the University of Illinois, which met once a week in downtown Chicago. For the course I wrote a paper titled, "The Influence of Science on Planning," that reflected views I had acquired at CATS. In it I spoke of ". . . the tremendous potential for city planning to develop into what might be called 'urban science.' I feel that such an evolution is inevitable and desirable." I drew a comparison between the scientist and the planner that was unflattering to the planner, whom I characterized as ignorant, opinionated, and lacking in intellectual discipline.

As would-be scientists, the CATS staff usually ignored politics. There was a feeling that political decisions were usually subjective and self-serving, and an implicit hope that some day technocrats would make the decisions on objective, rational grounds. Dr. Carroll emphasized the distinction between fact and value. The staff was to concern itself with facts and not let personal values interfere (the Policy Committee chose the values in adopting objectives for the plan). There was also an understanding that existing policies and laws were to be accepted and assumed to continue.

Two more quotations from my 1961 paper now seem revealing:

> Scientists tend to take a deterministic view of the future, while most planners believe there is a considerable range of choice within which the city can be guided toward pre-selected goals.
>
> The scientist usually accepts the behavior of people without passing judgment on it. He does not attempt to dictate the tastes of the public.

In other words, if the majority of families preferred to

move to the suburbs and rely on personal autos for their travel, then these trends should be accepted. One should not criticize choices freely made in the marketplace.

In retrospect, I feel that the major fault of CATS was failing to anticipate the issues that were to become important in transportation planning. The staff often talked about the future, but it was a future that extrapolated the past and maintained the status quo. There was no premonition of the major changes about to take place in American society. One example: At the time of the CATS effort, air pollution was causing trouble in Los Angeles, but this was dismissed as due to unique local circumstances. No one expected air pollution ever to be a problem in Chicago. No one anticipated such developments as the environmental movement or the energy crisis. Little attention was given to the transportation problems of the poor, minorities, the elderly and handicapped.

It would have taken remarkable prescience to foresee these things, so one cannot blame the staff much. But they can be reasonably criticized on the issue of highways versus transit. At the time, major construction of the Interstate Highway system was under way, and transit ridership was falling steadily. There was ample money available for highways, almost none for transit (privately some of the staff regarded the transit plan as wishful thinking). The staff assumed this pattern would continue and made no effort to change it. With regard to transit financing, Volume III concluded lamely, "It is quite probable that to finance some of the proposed transit improvements, help from sources other than the fare box must be found" (Chicago Area Transportation Study 1962, 106).

In the years just after Volume III came out, there was a reversal of popular and political sentiment. Opposition to new expressways across the nation coalesced into the so-called "highway revolt." Support for mass transit grew. Congress enacted several major transit programs between 1964 and 1974, and many new transit facilities have been built in the last 25 years. None of this was foreseen by the CATS staff.

I think the emphasis on rationality, on trying to be scientific, disposed the CATS staff to this limited vision. The immersion in quantification led to development of mathematical models, which led to numerical forecasts that were given great credence. The future came to be seen as inevitable. The staff did not try to change the future; they did not try to change policies, because these involved values, which were beyond the pale. I do not claim rational planning inevitably produces this result, but I think it tends to attract the kind of planners who prefer the "apolitical-technician role" described by Catanese (1984).

## ■ Conclusion

The role of rationality in planning continues to be a matter of debate (Breheny and Hooper 1985). Critics of the rational model do not suggest that planners should be irrational; they say this model of rationality is a utopian fantasy. Some concede that the rational model is a valid normative theory, but they say it is a poor description of how planners actually behave and how decisions are made. Critics claim that preoccupation with the rational model distracts planners from devising practical strategies for influencing immediate decisions.

The CATS experience demonstrates that the rational model is workable. The staff carried out nine of the ten steps that I have suggested as an outline of the rational planning process (neglecting only the implementation step). They completed the process and produced a plan, which was used by policymakers as a guide for several years. Although little of the highway plan was implemented, major parts of the transit plan were built. The staff never succumbed to the temptations of incrementalism. While they never actually discussed the rational model, it is clear they had it in mind.

CATS was a large planning agency with an ample budget; it had lots of resources. It had a strong director who was very interested in research, but also believed that research should be directed towards producing a plan. It was independent of the existing bureaucracy and was sheltered from current planning and political debate. There was no citizen participation at CATS; there were not even any public hearings on the plan. CATS was given the opportunity to carry out a highly technical planning process that took seven years to complete. Not many planning agencies get such an opportunity.

Some other transportation studies had problems in completing a plan or getting it implemented; several cases are described by Levin and Abend (1971). Penn-Jersey never produced a plan, while the plan done by the Eastern Massachusetts Regional Planning Project was rejected by the Governor. There followed a generation of "open" studies that placed far more emphasis on citizen input and political negotiation than on forecasting methodology. Judging from books about the studies in Boston (Gakenheimer 1976) and Toronto (Pill 1979), they had more impact on decision making.

This revives a dilemma that has troubled planners ever since Robert Walker criticized the independent planning commission as ineffectual (Walker 1941). It is clearly easier to carry out the rational planning process if the planning agency is autonomous and free from political interference. But if planners want to affect decisions, they may have to get involved in politics and sacrifice rationality to some degree. Certainly it remains a challenge to the planning profession to combine rational planning and political influence successfully.

I am also concerned that rationalism may produce a mind-set that is basically conservative, that accepts the world as it is and tries to explain it, but does not try to change it. Perhaps this stems from the appeal of quanti-

tative methods and computer models and the influence of social scientists who are traditionally not interventionists. The attempt to be rational may lead planners to assume constraints that do not actually exist. I think it takes a special effort for rational planners to keep an open mind and recognize that there are opportunities to guide the future.

Author's Note: *Roger L. Creighton and Britton Harris offered helpful comments on drafts of this paper.* □

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