Evaluating Individual Transit Route Performance

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ABSTRACT

Increasing emphasis is found on the objective evaluation of public transit performance. In the past, transit management has often attracted little attention; growing public interest in transportation issues and increasing costs in public transit have brought transit management increased visibility. With such visibility, clear evaluation procedures become necessary.

Performance indicators may be used to evaluate the performance of individual transit routes in much the same manner in which they evaluate the performance of the entire transit system. The selection of appropriate performance indicators requires the clear definition of goals and objectives for each transit system. Once selected, there exist several different ways in which performance indicators may be implemented and their desired standards defined.

This report suggests techniques for the development of route evaluation procedures and the range of goals which transit might be expected to facilitate. It then reviews the route evaluation procedures used by three transit properties in California and two properties in other states.

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INTRODUCTION

The development and use of performance indicators for public transit has gained increasing attention from government over the past several years and, more recently, from professionals in the transit community. Performance indicators are seen as promoting more efficient and effective transit service and as facilitating public policy decisions concerning transit. Most studies, though, focus primarily on performance indicators as the mechanisms for systemwide evaluation: the data elements collected represent totals for the particular transit property and the indicator values computed are used to evaluate the entire system.

Many indicators, though, can be used on a "micro" level within the transit property to examine the individual routes which comprise the system. While the presence of an unfavorable value on a systemwide indicator does not pinpoint the specific problem area within the property, the existence of an evaluation scheme on the route level allows the property's management to determine which routes are probably the cause of the problem.

This paper will investigate the use of internal route evaluation techniques by transit properties. It will include a discussion of the need for route evaluation schemes and their inherent weaknesses or problems, the development of route evaluation procedures, and the route evaluation techniques presently in use by three public transit properties in California and two transit properties outside of California.

THE NEED FOR EVALUATION AND ITS PROBLEMS

Every transit system, regardless of size, conducts some type of evaluation of its internal operations and route performance. In many cases these evaluations are conducted on a regularly-scheduled basis according to formal guidelines; in others, no such guidelines exist and evaluation is undertaken primarily when significant problems are recognized.

Without formal route evaluation procedures, properties rely upon experience and professional judgment ("feel") as the criteria for measuring performance. For some properties, especially those which are very small and/or well-established, their operations can be adequately managed by feel. Such evaluation schemes fail, however, when the experienced evaluator leaves the operation for some reason, when the operation undergoes extensive modification, or when it is a very new property and has no historical basis for comparison.

Subjective evaluations, however successfully implemented in the past, are not likely to meet future governmental requirements. Government is increasingly oriented toward data collection and quantification of activities and program results. At the federal level, the Urban Mass Transportation Act's Section 15 reporting requirements will most likely lead to external system-evaluation; route evaluation is only a small additional step.

Probably the single most important problem in internal evaluation is the selection of appropriate performance indicators. Each performance indicator, by virtue of its component data elements, focuses on different aspects of transit performance. While some route evaluation indicators

may be the same as those used for systemwide evaluation by government, others should be developed to focus on specific aspects of the property's goals and objectives for its transit service. In the absence of explicit and up-to-date goals and objectives, evaluation schemes can be expected to be either very general or patterned upon those of other properties. In either case, the value of the scheme will be moderate at best and its results often ignored.

A more practical problem for internal evaluation may be obtaining the data which is required. The effort involved in obtaining the necessary reliable internal information may be considerable for some properties. This will be especially true for properties which in the past have spent little time collecting data and attempting to analyze its content. For the evaluation of individual routes, operating and financial data must be maintained at the necessary level of detail and demographic data generated on an individual route basis. Operating data such as passenger statistics, vehicle miles, and vehicle hours will need to be recorded by individual route and procedures developed for the allocation of operating expenses to each transit route.

Effective internal evaluation procedures can be developed, indicators specified, and desired service standards determined, yet the scheme must be tempered with a fundamental flexibility for special conditions and circumstances. The identification of desired levels of performance -- that is, the use of standards -- has seemingly suffered from either too rigid adherence to the developed standards or too readily relaxed enforcement of them. Indicators must be selected and standards established with the realization that certain identifiable conditions may nullify

their application to particular routes. Political concerns, equity considerations, and geographic constraints present reasonable arguments against particular standards, yet these arguments must only be applied against the precise indicators affected and should be reverified as applicable at each evaluation.

DEVELOPING ROUTE EVALUATION PROCEDURES

There exist no uniform, generally applicable route evaluation schemes which may be packaged and sold as one would market computer software or standardized educational tests. Route evaluation procedures must be individually designed for each transit operation (and, in some cases, subareas and subservices within an operation) to accommodate the unique conditions within that area and the defined goals for transit.

While basically valid, the requirement that route evaluation schemes be individually designed must yield to two considerations. First, state and/or federal governments may establish standards of performance to be met by transit systems and individual routes. In such situations as this, the transit property does not have the option of ignoring the specified standards so long as it desires public funds, but may, if it chooses, supplement these measures with others of local importance.

The second consideration with regard to individual design of evaluation systems is that the development need not be pursued in complete ignorance and avoidance of schemes used by other transit systems. Actual case studies, such as those presented below, provide information on possible measures of performance, how they function in practice, and how the evaluation results may be utilized for route and system improvement. The blanket adoption of another operation's evaluation procedure, however,

may carry with it the adoption and pursuit of goals which are inappropriate to one's area and transit operation.

GOALS-OBJECTIVES-PERFORMANCE INDICATORS

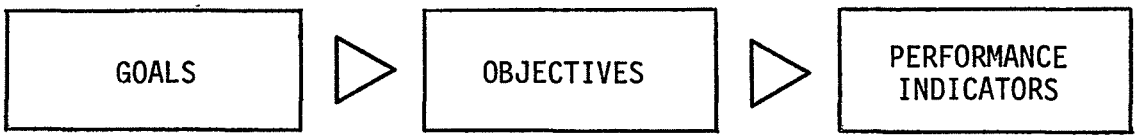
Transit service is held to affect many different areas of modern life, from air pollution and congestion to economic opportunity and well-being. A particular transit system though, cannot aspire to equally affect each and every one of these many issues simultaneously, nor will they all be necessarily salient at the same time. Policymakers, therefore, must determine what issues are important and establish these as property goals for the provided transit service.

Some goals -- accessibility, for instance -- must be further defined before they may be acted on and, later, evaluated. Where this is necessary, the further, more specific definition of a goal is termed an "objective".

Straightforward goals and objectives lead to the development or selection of appropriate performance indicators. Once the indicators are selected, the desired levels of performance on each indicator -- i.e., "service standards" -- may be established.

The progressive development of goals-objectives-performance indicators provides a clear and organized procedure by which multiple and possibly conflicting goals for transit may be presented for consideration and a single goal statement produced for the transit system. The unified goal statement (basically the philosophy of the system) may be next reinterpreted into measurable objectives. Finally, those objectives are used to specify applicable performance indicators. Figure 1 depicts this developmental progression.

Figure 1



Development of an evaluation scheme in this manner facilitates public understanding of (and hopefully, consensus on) the philosophy guiding the provision of transit services. It provides an opportunity for the capabilities, limitations, and costs of transit to be presented to the public and to policymakers. And finally, it minimizes the possibility of implementing conflicting or improper performance indicators.

AN EXAMPLE: ACCESSIBILITY OF SERVICE

One highly desirable goal of any transit system is to insure that its provided services are at least geographically accessible to the area's residents. The goal of insuring accessibility to services, as such, is not very clear or measurable, and requires additional clarification through objectives. If there is to be special emphasis on accessibility of services to a particular target group (youth, elderly, handicapped, or transportation dependent) then the objectives clarifying the goal of accessible special transit must explicitly mention these groups. For example, special emphasis on service to elderly might bring about an objective such as "Transit services will be accessible to 85% of the area's elderly residents during the off-peak hours of service." Two points must be noted in this sample objective: 1) objectives must be realistically

attainable by the system -- thus the objective is stated to be accessibility to 85% of the elderly rather than 100%; and 2) objectives should balance other considerations in the system's management: in this case the desire is to focus elderly service at other than peak periods.

Instead of defining accessibility in terms of residents or groups of residents, it may also be defined in terms of locations; public services, shopping facilities, and employment or educational opportunities. A possible objective under the goal of accessibility in this regard might be "Transit will serve all major public facilities within the service area." If accessibility to employment is considered especially important for its potential economic and social benefits, then another objective might be "Transit will serve 80% of all employment opportunities within the service area." Again, objectives must be realistically attainable.

Once objectives are specified, performance indicators may be developed to evaluate the system's satisfaction of those objectives or progress toward them. The problem of data availability becomes significant in defining indicators. Many desirable measures are simply infeasible given currently available operating and financial data.

Continuing our example of accessibility, the specified objective that "Transit services will be accessible to 85% of the area's elderly residents during the off-peak hours of service" may be evaluated through an indicator such as "Percent of elderly served during off-peak hours." This measure, and other indicators focusing on special population groups, will require detailed analysis of census data and transit routes. The use of such an indicator must recognize the manpower and monetary cost entailed.

RECAP

This section has outlined a process for developing a clear and usable route evaluation scheme for a transit system. Such a scheme can add rationality to system decisions and evaluation of provided services.

In addition to the goal of accessibility discussed above, many other goals exist which may or may not be appropriate for a particular transit property. Among other goals which have been identified for transit service are: to increase the use of transit relative to other transportation modes; to increase the use of transit for work-related or consumer-related trips; and to operate as efficiently and economically as possible. Many variations exist on these several goals, and still more objectives may be developed which clarify those goals.

The cases which follow provide insight into the development and application of comprehensive evaluation processes.

ROUTE EVALUATION PROCEDURES: CASES

Three cases have been selected for detailed examination. The first case, San Diego Transit Corporation, represents a carefully developed, extremely thorough procedure which results in route-by-route evaluations against specific measures and against the measures as a whole. The second case, North County Transit District, is an example of a property in the development stage, where goals and objectives have been set forth but service standards are only loosely established. The third case, Southern California Rapid Transit District, displays an evaluation procedure which results in the identification of routes not meeting the specified standards -- a particularly effective procedure where routes are too

numerous or manpower too scarce to undertake detailed evaluation of each route.

SAN DIEGO TRANSIT CORPORATION

San Diego has developed very clear goals, objectives, and standards to guide the management of its operations and a systematic evaluation process for their implementation.[1] This scheme follows a logical progression of setting forth the property's general philosophy of service and growth within the statement of goals, translating that philosophy into short-range improvements or targets in the objectives, and then establishing operational and service standards through which existing service and progress toward the system's objectives will be evaluated. This progression is depicted in Figure 2.

The goals of the San Diego Transit Corporation are:

1. To provide . . . the highest feasible level of transit service possible.

2. To continue to encourage the general public to use transit more by providing convenient, fast, reliable, safe service and by promoting advantages of using the service.

3. To operate as efficiently and economically as possible . . .

4. To develop an effective alternative to the use of the private auto . . .

5. To maintain as nearly as possible a system that will serve a large majority of riders as energy resources dwindle and become less available.[2]

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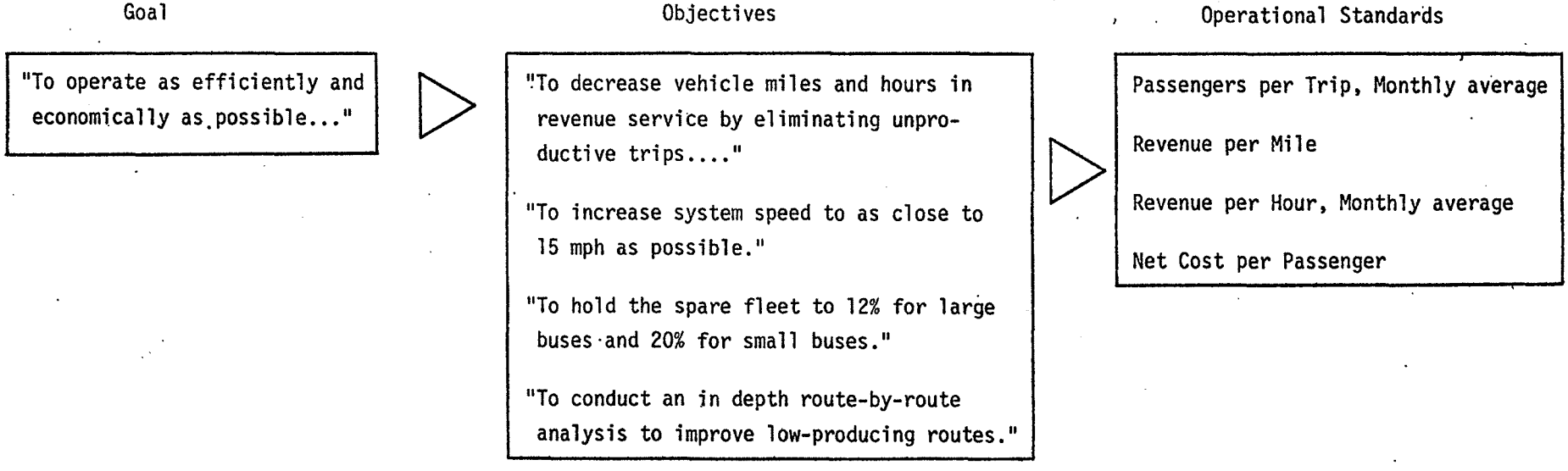
[1]The basic document for this section is San Diego Transit Corporation, Five Year Plan Update, FY 1977-81, Revised December, 1976.

[2]Ibid., p. 4.

Figure 2: Goals-Objectives-Standards



Source: San Diego Transit Corporation, Five Year Plan Update, FY 1977-1981, Revised December, 1976.

These goals are next translated into objectives for use by the property's various departments in executing their operational functions. While established and used on a departmental basis, these objectives are organized into the ten functional categories of ridership, vehicle activity, schedule reliability, travel time, safety, marketing, planning, data processing, customer service, and service and operational standards. The objectives which are found in the "Ridership" category, for example, are:

1. To increase ridership by at least 5% in each of the five years covered in this plan.
2. To increase passengers per mile by at least 10% in each year.
3. To increase the number of senior citizens and handicapped persons carried by 10% each year.
4. To increase the number of students carried by at least 7% in each year.
5. To carry as many riders as possible of all categories when our energy resources become less available.[3]

To guide planning and evaluation of routes in conformance with the system's goals and objectives, San Diego has two different sets of standards: service and operational. Service standards specify the level of service which will be offered within the system. Examples of these standards are that 70% of the dwelling unit(s) . . . in the service area should be within a five minute walking distance (of a transit route), that no more than a maximum of 20% of the riders of the entire system should be required to transfer, and that 100% of the buses in the fleet should be equipped with air conditioning.[4]

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[3]Ibid., p. 5.

[4]Ibid., pp. 9-11.

Operational standards are those which establish efficiency and performance standards within the system and against which individual route evaluations take place. The nine criteria and their standards appear in Figure 3. One particularly important standard is #3, "Percentage Growth," which requires improved performance from all routes, regardless of age or prior performance. Other standards deal with ridership, revenue, convenience and cost.

Once computed, San Diego prepares a graphic presentation of route performance with respect to each of the nine criteria and with respect to all nine criteria together. This approach clearly demonstrates how well the routes are doing against the standards established for each indicator and against all other routes. Figure 4 presents an example of route performance on the criteria, "Revenue Per Hour".

The composite evaluation of individual routes against all nine criteria is computed by adding each route's numerical ranking on the nine individual criteria. The composite scores are shown in Figure 5. The center line, or "0", indicates the equivalent of achieving the desired standard on all nine criteria.

Performance of individual routes against these standards is evaluated twice yearly. A route failing to achieve any one of the nine standards is subject to more detailed inspection and adjustments made in service where action is warranted.[5] Clear recognition, however, is given to

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[5]In this instance, each criterion is given equal weight. Different weights could be assigned to allow certain criteria to be more significant than others.

Figure 3: San Diego Transit Corporation Route Standards

Criteria	Unchanged Routes Over 2 Years Old	New, or Route having Undergone Major Revision in the Last 2 Years
1. Ridership Average monthly revenue passengers	25,000	10,000
2. Ridership Growth Average monthly growth in revenue passengers	450	750
3. Percentage Growth Average monthly growth (in Revenue Passengers)	3%	5%
4. Revenue Capacity	75%	40%
5. Passengers per Trip Monthly average	25	10
6. Revenue per Mile	$0.35	$0.15
7. Revenue per Hour Monthly average	$5.00	$2.00
8. Percent Transfers	20%	20%
9. Net Cost per Passenger	$1.00	$1.75

Source: San Diego Transit Corporation, Five Year Plan Update, FY 1977-1981, Revised December, 1976, Table II-2, p.15.

Figure 4

REVENUE PER HOUR

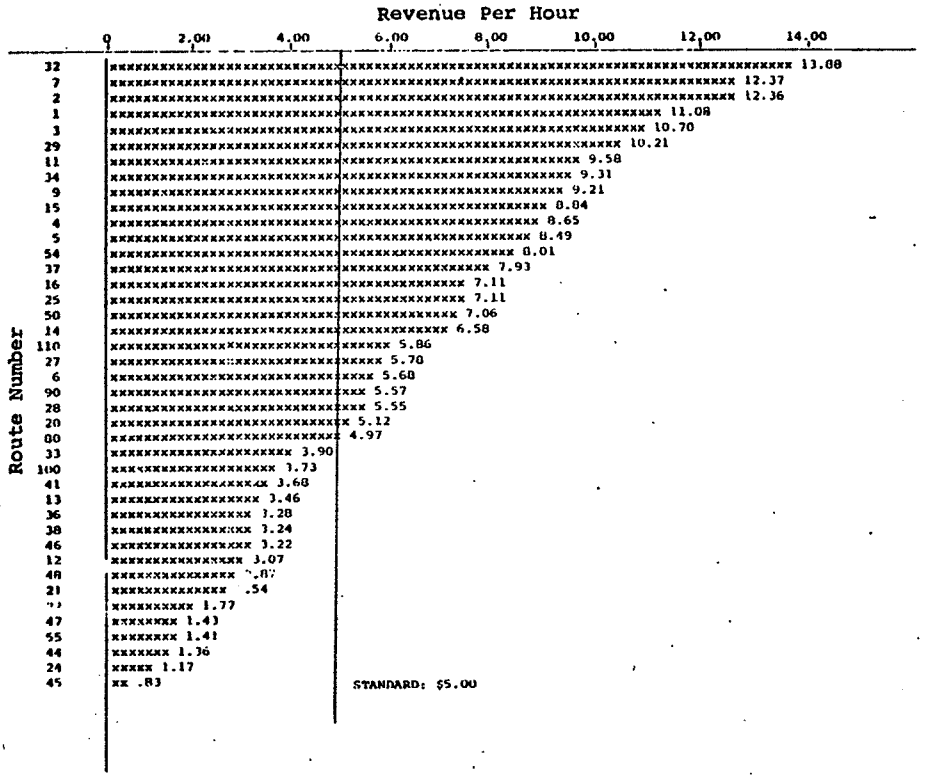
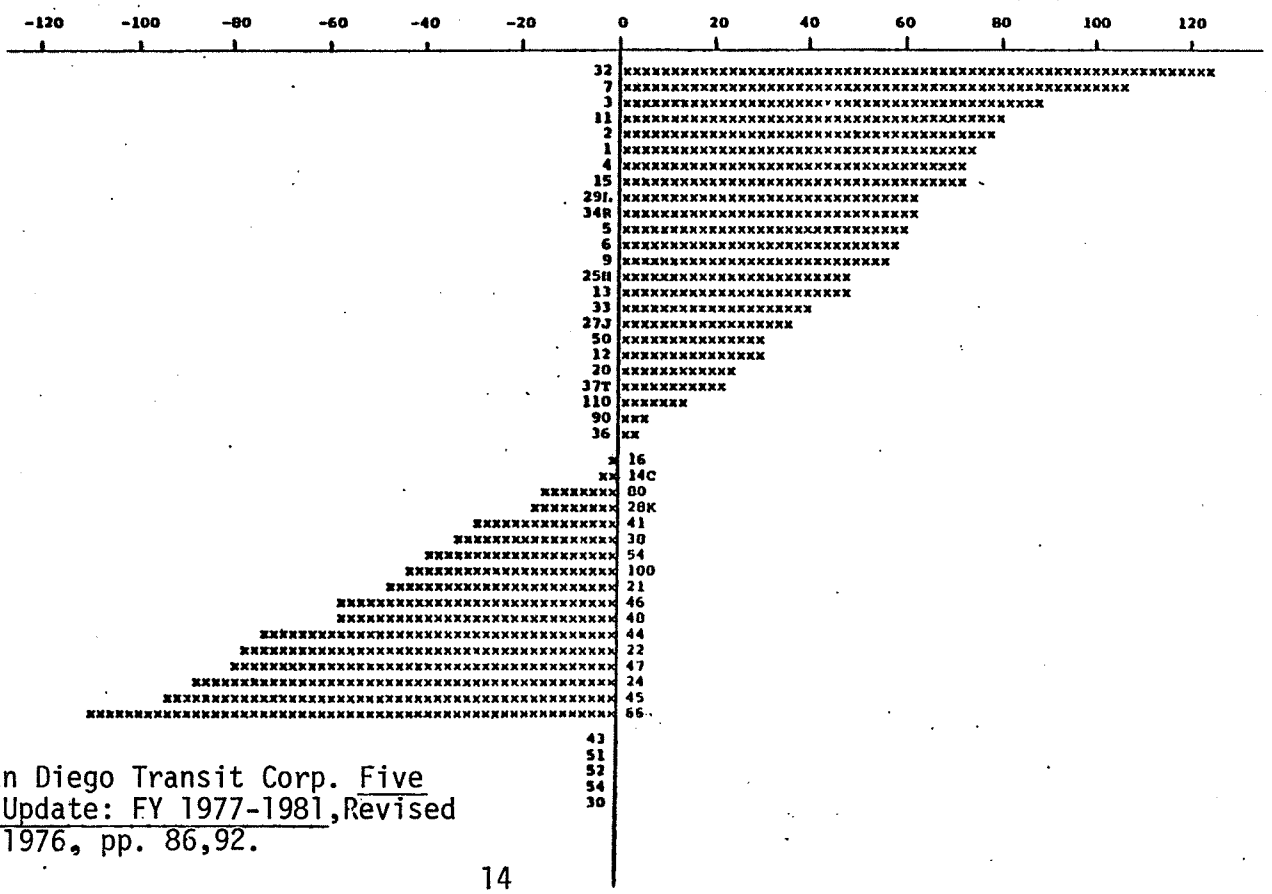


Figure 5

COMPARATIVE ROUTE SCORES



Source: San Diego Transit Corp. Five Year Plan Update: FY 1977-1981, Revised December, 1976, pp. 86,92.

the fact that new routes will not meet the performance levels of established routes for some time after introduction of service (the initial two years, in this case) and that low performance on some routes, for reasons such as social benefit and growth potential, must be tolerated.

NORTH COUNTY TRANSIT DISTRICT (NCTD)

North County is a very new transit district, commencing operations in July, 1976, after the acquisition of two municipal systems, Escondido and Oceanside. It is located in the sprawling coastal zone between San Diego and Orange County and operates fixed-route service.

Like San Diego, NCTD has developed a well-defined system of goals, objectives, and service standards. Some similarity between the basic structures of goals and objectives established by San Diego Transit Corporation and those of North County Transit District is due to the fact that they are both within the jurisdiction of the Comprehensive Planning Organization (CPO), and are therefore guided in developing their individual systems by studies conducted in 1975 by De Leuw Cather and Company for CPO.

While structurally similar in framework to San Diego Transit's scheme, NCTD's basic philosophy of service corresponds to its legal mandate to provide for the transportation needs of its area -- an immense service area of 730 square miles with a population of only about 330,000 people. Recognition of the problems inherent in providing service to such an area as well as the requirements of good management is obvious in these selected goals of NCTD:

1. To develop a transit system that has impact on the development of designated population concentrations while protecting the lower density character of other areas.

2. To provide an effective transit service to the populace of North San Diego County.

3. To provide public transportation in as efficient and economical a means as possible.

4. To develop a system that provides employment, education, recreation and shopping opportunities to the economically disadvantaged.

⋮

6. To complement or revise basic public transit service to meet the particular mobility needs of the elderly and handicapped.

⋮ (6)

The goals of NCTD, in turn, are translated into objectives which provide more explicit definition of terms and intentions. As compared to those of San Diego, described above, these objectives are stated in less quantitative terms. Where, for example, San Diego had the objective of increasing ridership by at least 5% per year, North County states its objective as simply "Increasing ridership for each year covered in this Five-Year Plan."[7] This difference reflects the newness of NCTD (which completed its first full year of service on July 1, 1977), its rapid growth, and absence of accurate historical data on which to base quantitative predictions. Some of NCTD's objectives for transit service are:

1. Increase ridership for each year covered in this Five-Year Plan.

2. Increase system speed where possible so that travel time may be reduced.

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[6]The basic source for this section is North County Transit District, Transit Development Plan and Program, Short Range Transit Plan Update FY 1978-1982.

[7]Ibid., p. 3.

5. Eliminate where possible the need to transfer.

6. Provide transit service to the elderly and handicapped.

7. Reduce accidents during each year covered by this Five-Year Plan.

⋮

11. Attract transit independent individuals through the District's marketing program.

12. Increase the District's overall productivity level.

13. Increase public input into the planning program.

⋮

15. Provide more than adequate service to low income areas.[8]

North County has defined two categories of service standards to correspond to systemwide measures and individual route measures. In specifying values for these standards, NCTD establishes different standards for the two types of service provided: community service and inter-city service. The fundamental differences between these types of service area recognized: "Community services provide for different trips than do inter-city services. These different trip needs are reflected by certain assets and limitations that each have in their design. Community routes provide greater coverage than inter-city routes, while the latter provide faster trip time than the former."[9]

System standards are defined in four areas: direct accessibility measures, indirect accessibility measures, coordination measures, and

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[8]Ibid.

[9]Ibid., p. 4.

other measures. These standards range from specifying the maximum headways for community and inter-city services at peak and off-peak periods, to the maximum average age of the bus fleet (8 years), and that all buses should have air conditioning, heaters and upholstered seats.[10]

Route standards for North County differentiate not only between types of service, but also between areas with different service area densities. The five route standards are listed in Figure 6.

These standards comprise a two-level evaluation procedure in which the service provided by the system as a whole is evaluated using the system measures and the individual routes are evaluated through the route standards. While individual routes are identified for closer examination through the route standards, social needs and minimum service levels are taken into consideration before remedial actions are taken.

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT (SCRTD)

Serving the Los Angeles region with more than 2300 transit vehicles, SCRTD operates about 228 different transit routes. With so many routes to monitor, SCRTD provides a valuable example of effective general evaluation where route-by-route analysis is infeasible due to sheer numbers of routes or shortage of manpower.

The Board of Directors of SCRTD, in July of 1975, adopted a Service Evaluation Program intended to guide service increases and reductions. The program utilizes basic criteria to identify routes for further study. The criteria are designed and implemented in accordance with the

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[10]Ibid., pp. 4-5.

Figure 6: North County Transit District Route Standards

		Passengers per Hour
1.	Ridership	
	a) Community Routes	
	Less dense areas*	6 - 10
	Dense areas	8 - 12
	b) Inter-city Routes	10 - 15
2.	Net Cost per Passenger	$ 1.50
3.	Cost per Mile	$ 1.00
4.	Transfer Percentage	20% max
5.	Average Operating Speed for Inter-community Routes	20 mph

*The standard of 9.9 dwelling units per acre or below in the population center of a sub-regional area represents less dense; 10 or over represents more dense.

Source: North County Transit District, Transit Development Plan and Program, Short Range Transit Plan Update, FY 1978-1982, pp.6-7.

level of service policy guidelines that the Board adopted in May, 1976.[11]

The purpose of the evaluation program is found in the Program's Policy Statement:

> In order to obtain maximum overall effectiveness in the use of public funds, RTD will intensify the examination of its operations on a line-by-line basis, to find those under-utilized resources which can be shifted to other services offering greater potential.[12]

Presently, the Service Evaluation Program functions in the following manner: the service standard "Total Passengers Per Hour" is applied to each route; those routes which do not achieve the desired level -- at least 20 passengers per hour -- are identified for a more detailed analysis. The process is conducted for all routes once each year.

Routes not satisfying the initial criteria are further analyzed on the basis of factors which may be grouped under the categories of operating and financial characteristics, socioeconomic characteristics, and system integrity. Under operating and financial characteristics, for example, various ridership, revenue, and cost statistics would be computed and evaluated. Socioeconomic characteristics would consider the number of households serviced by the route, their levels of income, and the route's service to elderly and handicapped. System integrity refers to the completeness of the transit system in relation to the identified route; i.e., whether discontinuation of the identified route would isolate the area's residents from the remaining transit network.

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[11]Southern California Rapid Transit District. The Five Year Plan: Operational, Capital and Financial Program, Fiscal Years 1978-1982, December, 1976, p. 22-24.

[12]Ibid., p. 25

The evaluation program has basically been an automated procedure using very explicit standards for local and express service. The criteria serve as signals or "flags" to direct attention to particular routes as being below the desired level of performance.

In the future, SCRTD intends to carry out two distinct levels of service evaluation. The first level will examine the operating and financial data and will be conducted two times a year. The second level, done only yearly, will examine the socioeconomic characteristics, system integrity, and a more detailed analysis of operating and financial data than that in the semiannual evaluation. Rather than the single standard "flagging" procedure in use presently, the two level evaluation process will examine each route in detail.

The choice of standards and the establishment of desired service levels are the keys to general "flagging" evaluation schemes such as that presently used by SCRTD. While other events -- such as customer complaints -- must be able to initiate route evaluations, the "automatic" scheme must be able to competently identify unsatisfactory performance. Periodic reexamination of the criteria underlying the "automatic" nature of the evaluation process is necessary to insure that unsatisfactory performance is being identified and that the criteria continue to reflect the goals and policies of the system.

TWO ADDITIONAL CASES: PORTLAND AND SEATTLE

Outside California, two examples of route evaluation processes have been identified for their approach and, in one case, experience in implementing the procedures.

METROPOLITAN TRANSPORTATION DISTRICT OF OREGON (Tri-Met)

Serving the Portland metropolitan area, Tri-Met's Board of Directors in late 1974 adopted an ambitious set of goals and service criteria to guide service development through 1979.[13] The goals adopted focus not only on improving the service already provided by Tri-Met, but also on increasing transit's share of commute trips into the downtown area, service to elderly and handicapped, and transit's impact on traffic congestion, air pollution, energy consumption, and land-use throughout the area. Like San Diego, Tri-Met established definite quantitative goals in the areas of ridership and finances: by mid-1979, Tri-Met aims for a 100% increase in ridership over 1974; and farebox revenues must cover a minimum of 40% of operating costs.

To bring about these goals, service criteria were defined which ". . . spell out where bus lines ought to go, what hours and how often to run, how fast they should reach a given destination and how much is acceptable cost."[14] That is, the criteria focus on four basic areas: accessibility, convenience, cost and speed.

These criteria differentiate between service in urban and suburban areas (urban is defined as over 3,200 persons per square mile versus 1,600 to 3,200 for suburban), and services at different times of day. One interesting aspect of Tri-Met's criteria is that "accessibility" is

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[13]This section is based on Thomas Starr King, "A Rational Approach to Planning: Tri-Met's Criteria for Service," Transit Journal, Vol. 1, No. 1 (Feb. 75), pp. 23-26. Tri-Met's experience since that time is based on an interview between G.J. Fielding, Institute of Transportation Studies, University of California, Irvine, and Thomas Starr King, July, 1977.

[14]Ibid., p. 24.

defined not only in terms of percentage of population which should be within a specified distance of transit routes, but also that accessibility between points in the region should not require travel through the downtown.

These criteria provide Tri-Met with a public rationale on which to base route implementation, modification, or ostensibly, abandonment. They were found to be effective in making the decision processes of the district understandable to its public. Tri-Met planners use these criteria to evaluate requests for service and implement those which meet the required standards. Requests not fulfilling the required standards may be rejected, noting the criteria not satisfied. Experience, however, has proven that the criteria are not so effective in bringing about deletion of service. Community demand has caused continuation of most routes even when the criteria for continuation were not met.

Political and social factors cannot be easily incorporated into quantitative evaluation processes, yet they must be considered as part of any comprehensive evaluation. Where they are allowed to consistently outweigh operating and financial data, the quantitative evaluation loses its significance.

SEATTLE METRO TRANSIT

Seattle Metro is presently developing a route evaluation process which is novel in the manner in which service standard values are defined.[15] Service standards are usually established as a single

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[15]This section is based on Seattle, Municipality of Metropolitan . . . , Transit Department, Metro Transit Service Evaluation Criteria: A Report on System and Route Performance, March, 1977.

numerical value, or possibly several values where different standards are established for peak and base periods or urban and suburban areas. Seattle Metro, though, defines each of its two service standards in the form of a continuous function for peak service and another for midday. The two productivity measures used are passengers per trip (relative to vehicle headway) and passengers per bus hour (relative to service area density).[16] Each of the functions were determined from examination of actual route performance, and will be reevaluated as experience is gained with their application.

The standard for Passengers Per Bus Hour-Peak Period is shown in Figure 7. The standard is described as a function of average population density along each route, thereby recognizing that different routes will have different ridership statistics due to the areas they travel through.

The performance of Seattle Metro's transit routes against this standard is shown in Figure 8. The routes which perform below the established standard are analyzed individually for possible modification. The first priority for examination being those routes which fail both productivity measures at both peak and midday standards, (i.e., four failing scores) followed by routes failing fewer than the four possible tests.

The use of functions to define service standards is a much more complex but much more realistic procedure than setting single-value standards or values for peak and off-peak periods. Much of the complexity

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[16]Standards are also being developed for seat availability and on-time reliability, but have not yet been adopted.

Figure 7

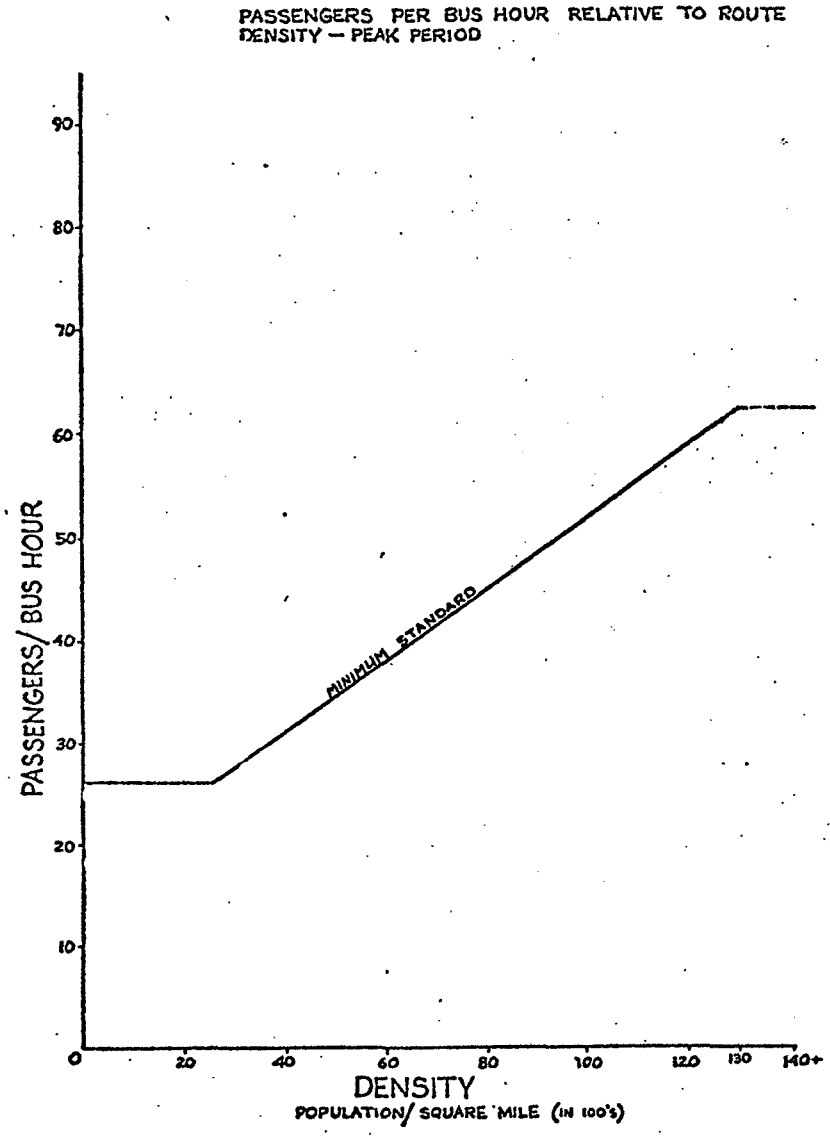
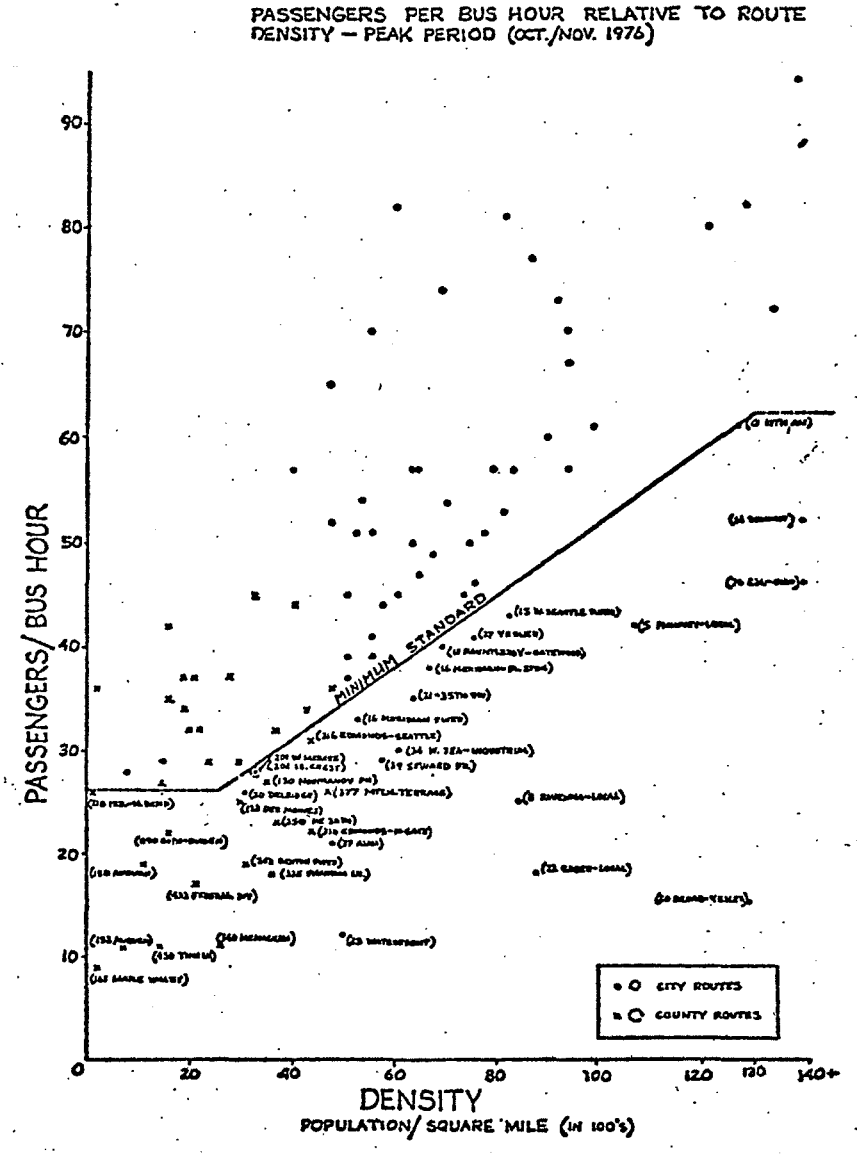


Figure 8



Source: Seattle, Municipality of Metropolitan ____, Transit Department, Metro Transit Service Evaluation Criteria: A Report on System and Route Performance, March 1977, p.5.

of this approach lies in the correct determination of factors against which to define the function. The description of a function which defines the standard's values accounts for differences between areas, no matter how slight, and also provides for automatic adjustment of the standards with changes in the areas covered by the routes.

SUMMARY

This paper has emphasized the developmental relationship between goals, objectives and performance indicators. While a route evaluation scheme could be successfully developed without first explicitly listing the goals and objectives of the system, the selected indicators in themselves would comprise such a statement of goals and objectives.

A major advantage in progressively-developed goals, objectives, and indicators is that conflict between the various elements is prevented. Even more important, such clear development of public policy with regard to transit well suits the requirements of public sector administration, and especially that of a public enterprise which affects many aspects of urban life. Clearly stated policy not only eases the problems of management in the public sector, but provides for varying degrees of political control and input necessary in such a multi-governmental area as transit.

The utilization of well-defined evaluation processes similarly eases the task of public management administratively as well as politically. As transit systems expand in size and services, the volume of data entering the decision process multiplies and becomes incomprehensible. Route evaluation schemes provide a means for simplification of data analysis through predetermined performance indicators.

Goals, objectives, and certainly route evaluation processes are not answers to the problems of transit management, but tools which must be applied correctly. They assist management in identifying problems as well as in making the daily management decisions of the system. They are no substitute for experience or for managerial skill, but are a means of better utilizing those scarce resources.