

CURRENT SHORT-RANGE TRANSIT PLANNING PRACTICE

Outline

- 1. SRTP -- Definition & Introduction**
- 2. Measures and Standards**

Public Transport Planning

A. Long Range (> 3 Years)

Major Capital Investment: Infrastructure
Major Institutional Changes

B. Medium Range (1 - 3 Years)

Bus Network Structure
Network Size
Fleet Size
Fare Policy and Technology

C. Short Range (< 1 Year)

Route Structure
Service Frequency
Vehicle and Crew Scheduling

D. Control (Real Time)

Revise Route of Specific Vehicle
Revise Schedule of Specific Vehicle

Major Planning Elements

Data Collection

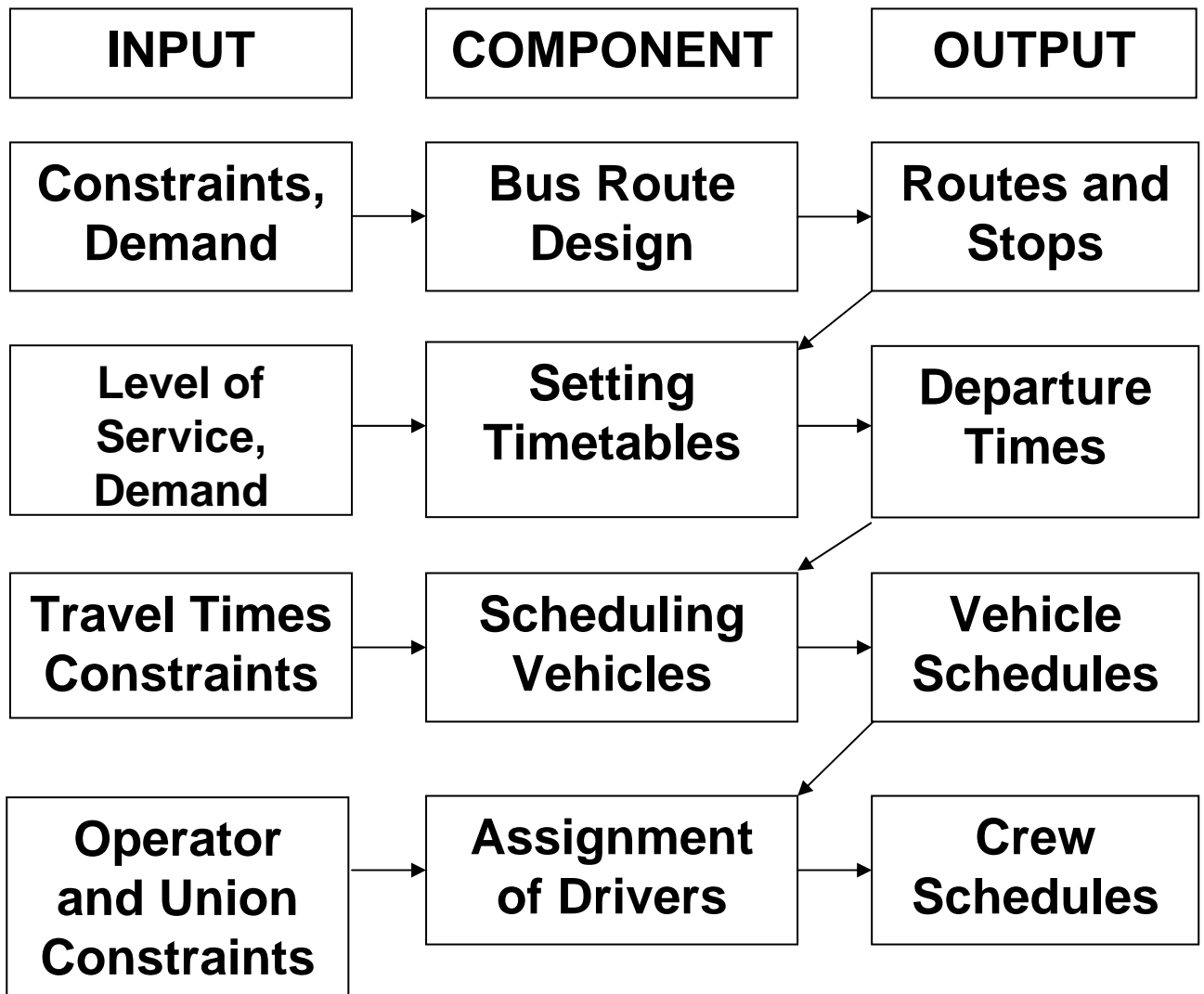
Problem/Opportunity Identification

Design Options/Strategies

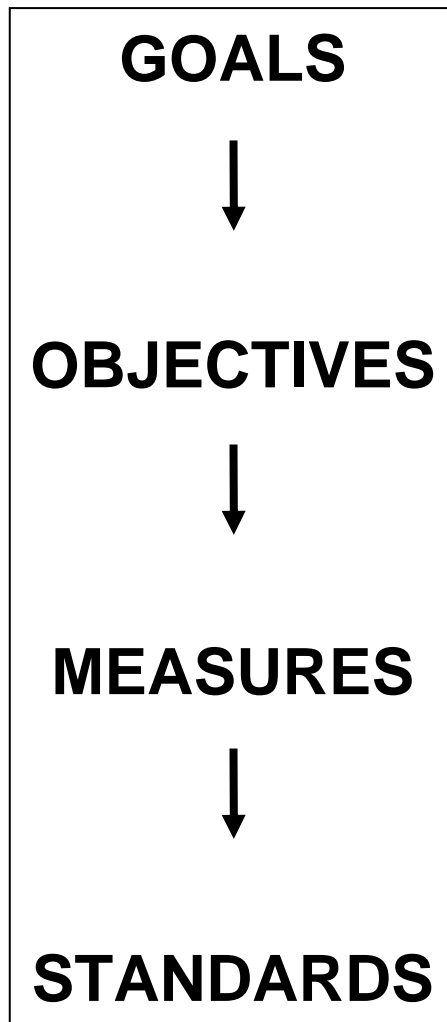
Cost Estimation

Ridership/Revenue Estimation

Operational Planning Process



Evaluation Structure



Use of Formal Guidelines*

- **73% of agencies use some form of formal guidelines**
- **75% of these agencies use guidelines adopted by governing board**
- **Otherwise typically adopted by Executive Director/General Manager**

****Source: Synthesis of Transit Practice 10 "Bus Route Evaluation Standards," Transportation Cooperative Research Program, Washington, DC, 1995.***

Aspects of Service Covered

Service Design

Operating Performance

- **Service Quality**
- **Economic/Productivity**

Service Design -- Route Design

Most agencies with route design guidelines include:

- Population density
- Employment density
- Spacing between routes

Other primary concerns in route design:

- Service to unserved areas
- Direct, non-circuitous routing

Coverage Example:

MBTA: The MBTA has a policy objective to provide transit service within walking distance (defined as 1/4 mile) of all residents living in areas with population densities greater than 5,000 people per square mile.

Typical Stop Spacing (by system)

<u>Stops per mile</u>	<u>% of systems</u>
< 4	9
4	21
6-8	51
10-12	13
> 12	6

Service Design -- Schedules

Most agencies have guidelines for scheduling based on:

- **Maximum (policy) headways**
- **Maximum passenger crowding**

Policy Headway Example

MBTA: Maximum headway on all local routes should be 30 minutes in the peak and 60 minutes at other times. For express service there should be at least 3 trips in each peak period.

Maximum Passenger Crowding Example

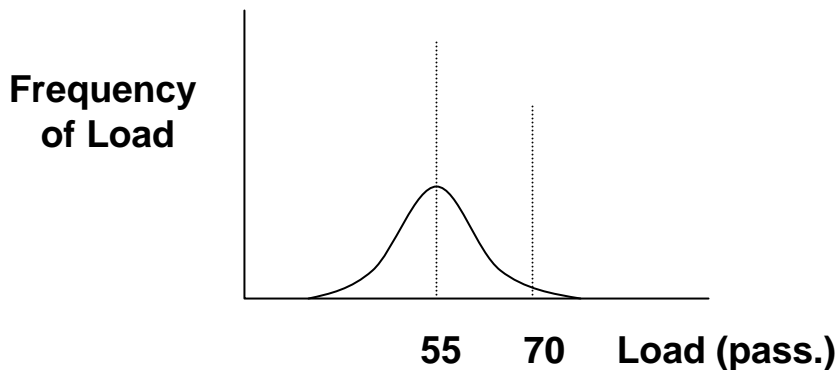
MBTA: On the Green line (light rail) the maximum passengers per car should be no more than 220% of the seats in the peak period. In the off peak the maximum passenger per car should be no more than the seated capacity except in the central subway where it should be no more than 140% of the seated capacity.

Setting Standards

A. PEAK LOAD

1. **Peak Half-Hour:** avoid such high loads that:
 - passengers frequently cannot board the first vehicle to arrive;
 - vehicles encounter high dwell times.

Maximum acceptable load ~70 passengers for a standard 40' bus.



So acceptable average observed load (at maximum load point) is 55.

2. **Other times:** normally expect to provide a seat for all passengers.

Acceptable average load ~40 for a standard 40' bus.

TTC Loading Standards

Acceptable Maximum-Hour Average Vehicle Loads at Peak Flow Point (Passengers Per Vehicle)

	Peak Periods	Off-Peak Periods	
Vehicle Type	All Routes	Frequency: Once Every 10 Minutes or Greater	Frequency: Less Than Once Every 10 Minutes
40-ft Bus	50-57	35-49	28-39
50-ft Streetcar	74	58	46
75-ft Articulated Streetcar	108	76	61
6-car Subway Train	1100	400-500	--

Service Design: Span of Service

Most agencies have guidelines covering span of service.

Example: MBTA

The first trip should arrive no later than, and the last trip should depart no earlier than, the times shown below (for local bus service):

Weekdays 7 a.m. - 6 p.m.

For high density areas only:

Saturdays 8 a.m. - 6 p.m.

Sundays 10 a.m. - 6 p.m.

Service Quality

Most agencies have formal procedures for monitoring service delivery focussing on on-time performance, typically defined as 0 minutes early to 5 minutes late.

About two-thirds of agencies report rush hour on-time performance of 90% or above.

Example: MBTA

Local low frequency (headways > 10 minutes) bus service:

- **75% of trips should depart 0-5 minutes after scheduled terminal departure times and arrive 0-5 minutes after scheduled terminal arrival times.**

Local high frequency (headways \leq 10 minutes) bus service:

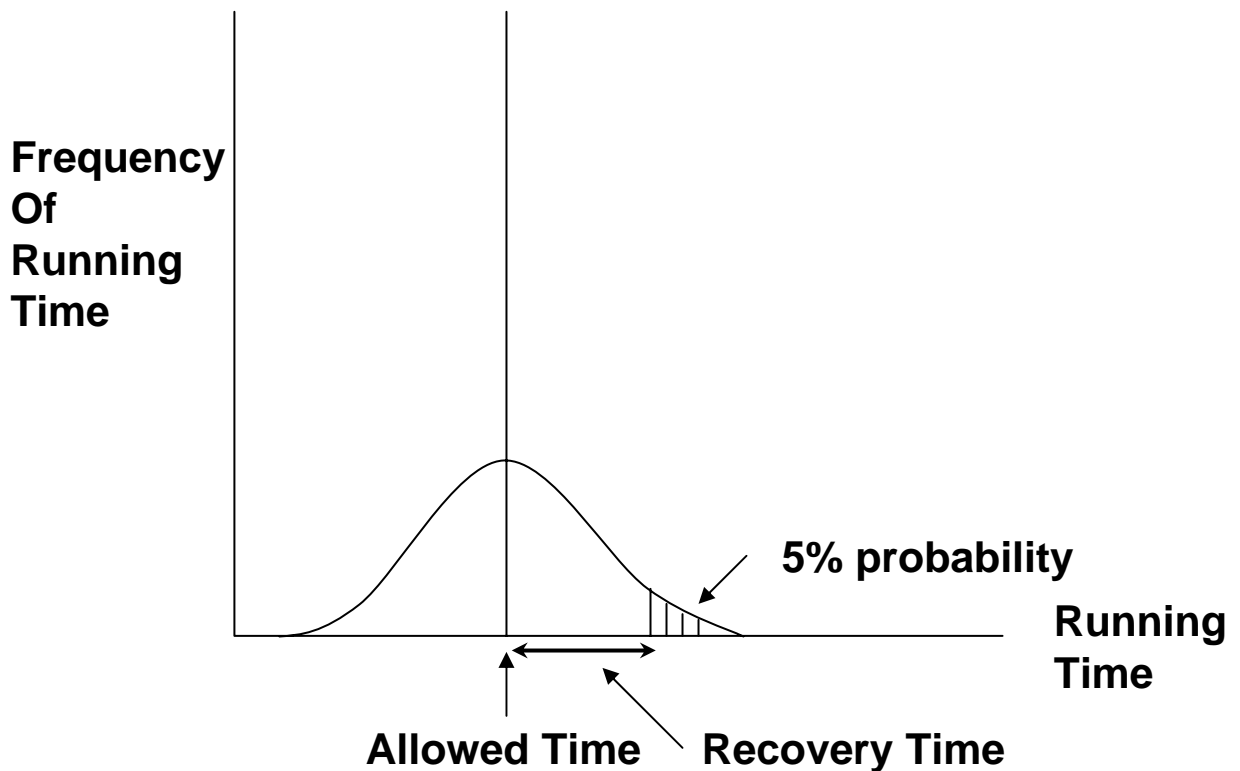
- **85% of trips should have headways no greater than 150% of scheduled headway.**
- **95% of trips should have travel times no more than 5 minutes above scheduled times.**

Most agencies also keep route level information on:

- **Passenger complaints**
- **Missed trips**
- **Accidents**

Reliability

Want 95% of departures to be on-time



Implies a recovery time of (2x standard deviation of running time)

$$\text{where std dev.} = \sqrt{\frac{\sum (t_1 - t_{mean})^2}{n - 1}}$$

Economic/Productivity Measures

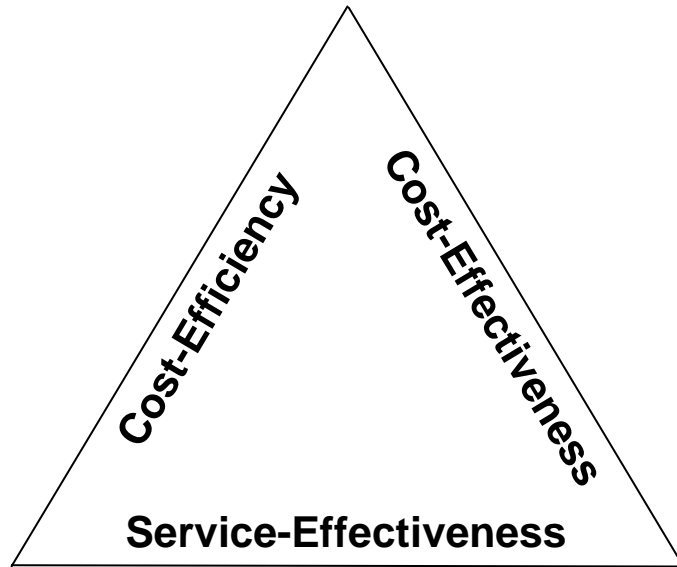
<u>Measure</u>	<u>% of Agencies Using Measure</u>	<u>Minimum Standard (Median)</u>
Passengers/veh hr	78%	11-35 pass/veh hr
Cost/Passenger	63%	3 x system average
Passengers/veh mile	58%	1-3 pass/veh mile
Passengers/trip	53%	---

Two most critical measures in assessing route performance:

- passengers/veh hour
- subsidy/passenger

SERVICE INPUTS

**Labor
Capital
Fuel**



SERVICE OUTPUTS

**Vehicle Hours
Vehicle Miles
Capacity Miles
Service Reliability**

SERVICE CONSUMPTION

**Passengers
Passenger Miles
Operating Revenue
Operating Safety**

Alternative Benefit Measures

REVENUE

PROS: - relevance to financial concern
- related to willingness to pay

CONS: - discounts value of reduced fare trips
- favors higher income users

PASSENGERS

PROS: - reflects number of people who benefit
- values each passenger equally

CONS: - doesn't reflect trip length

PASSENGER MILES

PROS: - weights longer trips more
- most reflective of some benefits

CONS: - hardest to measure
- favors higher income passengers

Alternative Cost Measures

NET COST (Subsidy)

PROS: - usually most directly constrained

CONS: - hardest to estimate

COST

PROS: - may also be directly constrained

CONS: - hard to estimate

VEHICLE MILES

PROS: - easy to measure

CONS: - directly reflects only 30% of bus costs
- penalizes fast services

VEHICLE HOURS

PROS: - easy to measure
- related to >50% of bus costs

CONS: - doesn't reflect cost differences between
peak and off-peak services