Outline:

1. Measures and Standards (cont’d)
2. Current Practice in SRTP
3. Possible Improvements
4. Service Quality Monitoring
Service Quality

Most agencies have formal procedures for monitoring service delivery focusing 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 ≤ 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)

\[ \text{std dev.} = \sqrt{\frac{\sum (t_i - t_{\text{mean}})^2}{n-1}} \]
## Economic/Productivity Measures

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

Two most critical measures in assessing route performance:

- passengers/veh hour
- subsidy/passenger
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
Issues in Setting Up a Short-Range Transit Planning Process

• Role of budget constraints in the process
  => before budget is set
  => after budget is set

• Role of standards and constraints vs investing resources to obtain best ridership results

• Consideration of new service options vs protection of existing services

• Allocation of analysis/planning effort to “problem” routes vs other routes

• What form of standards/guidelines to use

• Focus on individual routes or route as component of system
TTC Service Standards
Process: Overview

Continuous Monitoring of Ridership and Loads

Annual Route Efficiency Review for all Routes

New Service Proposals - Municipal Requests - Staff Suggestions

Evaluation Based on System Guidelines

Estimate Ridership, Costs and Benefits

Comparative Evaluation

Recommendations

Commission Approval and Review Process

Implementation

Formal Review After 6 Months of Operation

Identify Service Changes

Assess Passenger Impacts

Major Impact

Minor Impact

Approval and Implementation

Major Cost

Minor Cost
TTC Service Standards Process: Ridership Monitoring and Service Adjustment

1. Regular Ridership Counts
2. Customer Communications
3. Planning Staff Observations
4. Operations Report
5. Availability of Vehicles and Budget
6. Comparison of Ridership to Load Standards
7. Staff Recommendations for Service Changes
8. Review of Recommendations by Operating Personnel
9. Staff Approval of Service Changes
10. Implementation of Approved Service Changes
TTC Service Standards Process: Route Efficiency Review Program

- New Riding Count on Route
- Operating Experience Review
  - Complaints
  - Service Regularity
- Year-End Financial Performance
- Route Economic Performance Review
- Route Structure Review
  - Branch Alignment
  - Time Period Service Levels
- Time Period Service Review
  - Surge Loading
  - First/Last Trips
- Minor Route and Service Changes Recommended
- Major Route and Service Changes Recommended
- Implementation
- Referred to Comparative Evaluation
TTC New Services Criteria

1. Must serve people beyond 300 meters from current TTC service

2. Must maximize interconnections with rapid transit

3. Must result in a net benefit for customers
   - net benefit is measured by change in weighted travel time with

   \[
   \text{weighted travel time} = A \times \text{in-vehicle time} + B \times \text{waiting time} + C \times \text{walking time} + D \times \text{transfers}
   \]

   and \( A = 1.0, \ B = 1.5, \ C = 2.0, \ D = 10.0 \)
Single measure used to evaluate service change proposals is:

customers gained (lost) per dollar spent (saved)

Used for evaluating:
- new service proposals
- possible service reductions
- fare changes

The financial unit is the net cost (cost-revenue) associated with the change.

Currently, the threshold for new service is 0.23 new customers per dollar spent.

Services with performance of less than 0.23 customers per dollar spent are examined for possible cost reduction annually.
Service Change Process

- Major service changes evaluated twice per year resulting in a ranking against other proposals and productivity for existing services.

- Board provided with recommended service changes and ranked list of all other proposals evaluated and system average performance.

- Experimental services are designated and evaluated after six months operation.
A Critique Of Current Practice

- Focus is on poorly-performing routes.
- Data limitations -- both type and quality.
- Measures not always closely tied to objectives.
- Focus on individual route performance rather than network contribution.
Important Factors

- Multiple Goals of Agency
- Constraints on Planning Resources
- Limitations of Technical Analysis
Suggested Modifications

- Action-Centered Screening
- Explicit Recognition of Multiple Objectives
Summary of Generic Actions
By Level

A. Area Coverage Level
1. New route
2. Route extension
3. A small set of routes replaced by a new set
4. Route abandonment
5. Shortening a route
6. Route realignment

B. Route Structure Level
1. Route splitting
2. Zonal service
3. Express/local service
4. Linking two routes

C. Scheduling Level
1. Changes in route frequency
2. Changes in departure times of individual trips
3. Changes in layover time, positioning time, etc.
4. Modify running times
5. Partial deadheading
## The Problem-Centered Approach

<table>
<thead>
<tr>
<th>Problem</th>
<th>Indicators</th>
<th>Possible Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Poor productivity</td>
<td>Rev/cost</td>
<td>Decrease frequency</td>
</tr>
<tr>
<td></td>
<td>Pass/veh hr</td>
<td>Eliminate route or route segments</td>
</tr>
<tr>
<td></td>
<td>Load</td>
<td>Modify schedule</td>
</tr>
<tr>
<td>B. Overcrowding</td>
<td>Load</td>
<td>Increase frequency</td>
</tr>
<tr>
<td>C. Unreliable Service</td>
<td>% of trips late</td>
<td>Increase allowed time</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Modify route</td>
</tr>
</tbody>
</table>
## The Action-Centered Approach

### GENERIC ACTION FAVORABLE ROUTE CONDITIONS

#### A. Area Coverage Level
1. **Eliminate Route Segment**
   - Low ridership generation on segment
   - Vehicle savings possible from elimination
   - Higher frequency possible from elimination

#### B. Route Structure Level
1. **Split Route**
   - Low productivity
   - Uneven load profile
   - Long route

2. **Zonal**
   - Tapering load profile
   - Long route
   - High ridership

3. **Express/Local**
   - High ridership
   - Tapering load profile
   - Long route
   - Large time differential local/express

#### C. Scheduling
1. **Increase Frequency**
   - Overcrowding
   - Moderate rather than high ridership
   - Even load profile

2. **Decrease Frequency**
   - Low productivity and loads
   - Headway below policy levels

3. **Eliminate Trips**
   - Low ridership on trips
   - High cost savings from elimination

4. **Increase Running/Layover Time**
   - Poor schedule adherence
   - High loads

5. **Partial Deadheading**
   - Large imbalance in flows
   - Large time differential in service/deadhead
   - High frequencies
Proposed Short-Range Transit Planning Process

Support Functions

Data Collection
- Ridership & Cost Data Collection
- Driver Participation Program
- Planners Informal Data Collection
- Operations & Maintenance Data
- Data Analysis
  - Data Summaries
  - Performance Measures

Decision Tasks
- Problem Identification
  - problem-centered
  - action-centered
- Design of Actions
- Analysis of Each Action
- Recommendations
- Decision
- Implementation

Interface with Other Agency Units
- Scheduling
- Operations
- Marketing and Community Relations
- Interaction with Decision Makers
- Scheduling
- Operations
- Marketing and Community Relations
## Techniques Used to Collect Route Level Information/Data from Riders

<table>
<thead>
<tr>
<th>Method</th>
<th>Under 50 Buses (42)</th>
<th>51 to 200 Buses (34)</th>
<th>201 to 500 Buses (16)</th>
<th>501 to 1000 Buses (9)</th>
<th>Over 1000 Buses (10)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focus groups</td>
<td>7</td>
<td>9</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>31</td>
</tr>
<tr>
<td>General market research</td>
<td>12</td>
<td>18</td>
<td>8</td>
<td>3</td>
<td>5</td>
<td>46</td>
</tr>
<tr>
<td>On-board surveys</td>
<td>33</td>
<td>29</td>
<td>13</td>
<td>7</td>
<td>8</td>
<td>90</td>
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<tr>
<td>Media-based surveys</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>10</td>
<td>10</td>
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<tr>
<td>Meetings with organized riders’ groups, community councils, etc.</td>
<td>13</td>
<td>13</td>
<td>7</td>
<td>5</td>
<td>6</td>
<td>44</td>
</tr>
</tbody>
</table>

Nigel H.M. Wilson

Lecture 5, 2003
# Techniques Used to Collect Route Level Information/Data from Operators

<table>
<thead>
<tr>
<th>Techniques</th>
<th>Under 50 buses (42)</th>
<th>51 to 200 buses (34)</th>
<th>201 to 500 buses (16)</th>
<th>501 to 1000 buses (9)</th>
<th>Over 1000 buses (10)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operator quality circles</td>
<td>8</td>
<td>7</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>23</td>
</tr>
<tr>
<td>TQM (Total Quality Management)</td>
<td>9</td>
<td>5</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>20</td>
</tr>
<tr>
<td>Special union-management meetings</td>
<td>10</td>
<td>12</td>
<td>5</td>
<td>5</td>
<td>7</td>
<td>39</td>
</tr>
<tr>
<td>Route or garage-based teams or task forces</td>
<td>4</td>
<td>8</td>
<td>6</td>
<td>5</td>
<td>6</td>
<td>29</td>
</tr>
<tr>
<td>Employee suggestion plans or comment processes</td>
<td>29</td>
<td>30</td>
<td>13</td>
<td>9</td>
<td>7</td>
<td>88</td>
</tr>
</tbody>
</table>
Service Quality Monitoring

Increasing recognition of importance of monitoring and reporting service quality and customer satisfaction on a regular basis:

- **Customer Satisfaction Index**
  
  5 agencies (Akron, Chicago, Minneapolis, Philadelphia and Portland) attempted to develop a CSI for the transit industry (funded by IDEA Program)

- **MBTA Service Quality Report Card**
  
  It would include measures of:
  
  => Comfort -- passenger crowding
  => Communications -- response time to complaints, waiting time for information calls, calls completed successfully
  => Convenience -- population coverage, service frequencies, trip times
  => Customer Satisfaction -- complaints
  => Reliability -- elevator and escalator availability, schedule adherence, missed trips, vehicle breakdowns
  => Security -- crime, passenger injuries
  
  plus results of Customer Satisfaction Survey

**Issues:**

Is information meaningful at system level?
Will results help identify areas where improvement can be achieved?
Can the additional data collection and analysis be justified?