

# PERFORMANCE MEASUREMENT

## Outline

1. Roles for Performance Measures
2. Alternative Approaches
3. Fielding's Approach
  - Framework
  - Steps in Analysis
  - Initial Measures
  - Factor Analysis Results
  - Recommended Measures
  - Peer Groups

# Possible Roles for System-Level Performance Measures

- **Identify major problems in agency for further analysis**
- **Generate information for policy formulation**
- **Measure goal attainment**
- **Determine funding allocation**

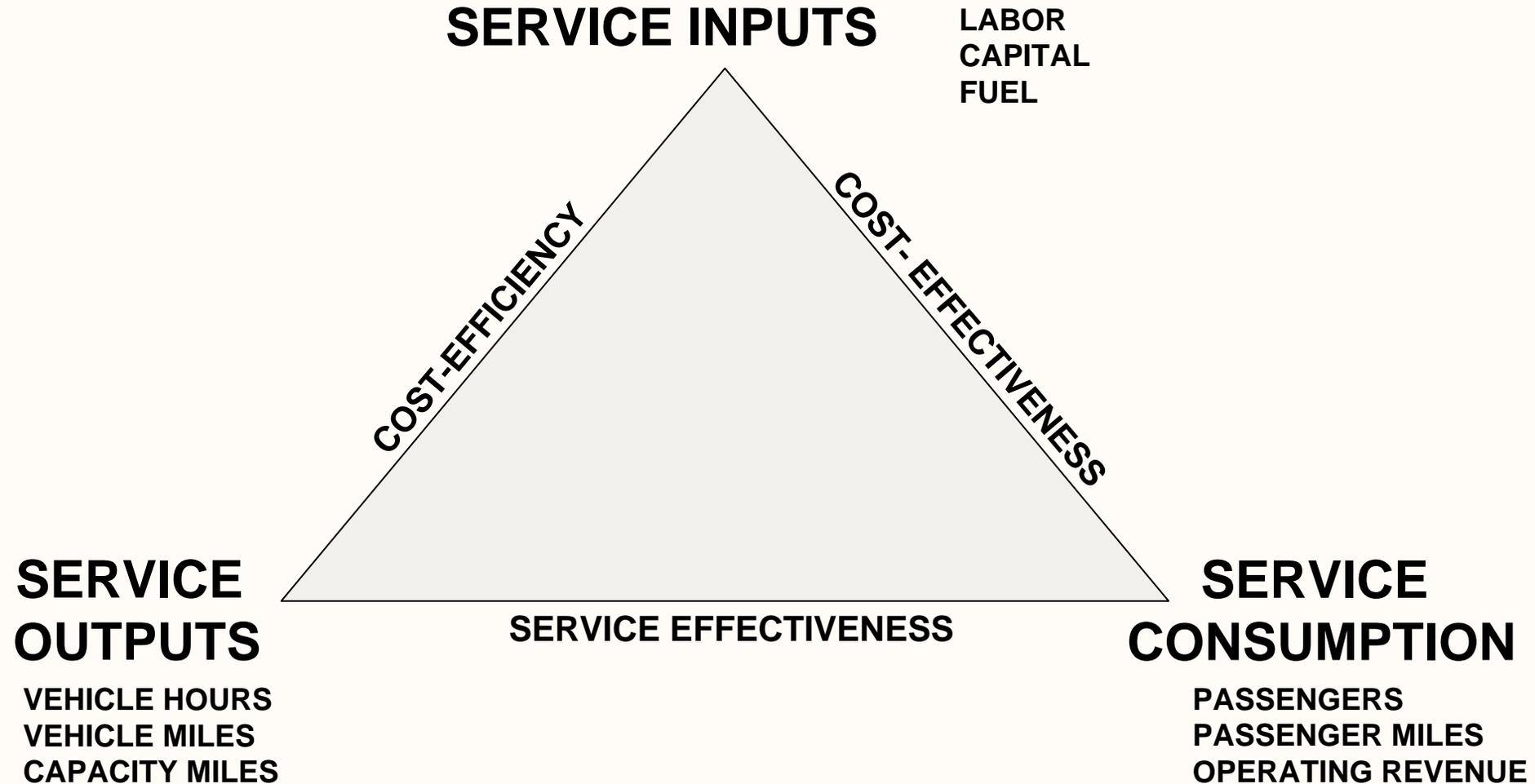
# Basis for Comparison

- **Time series**
- **Cross-sectional/peer group**

**Performance measures derived from:**

- **Statistical analysis (e.g. Fielding)**
- **Hierarchical and direct mathematical relationships (e.g. Lee)**

# Fielding's Framework



# Fielding's Approach: Steps in Analysis

- 1. Start out with long list of potential measures: 48**
- 2. Eliminate measures with suspect data and those highly correlated with other measures: 30 remaining**
- 3. Apply factor analysis to identify common factors explaining performance measure variation; each successive factor added explains less of the variation**
- 4. For each factor, select "marker" variable (i.e. performance measure) to represent it, based on correlation, reliability, ease-of-understanding, etc.**

# Cost Efficiency Measures (22)

<b>LABOR EFFICIENCY</b>	
Vehicle Hours per Employee	TVH/EMP
Revenue Vehicle Hours per Operating Employee Hour	RVH/OEMP
Vehicle Miles per Employee	TVM/EMP
Peak Vehicles per Executive, Professional, and Supervisory Employees	PVEH/ADM
Peak Vehicles per Operating Personnel	PVEH/OP
Peak Vehicles per Maintenance, Support, and Servicing Personnel	PVEH/MNT
<b>VEHICLE EFFICIENCY</b>	
Vehicle Hours per Active Vehicle	TVH/AVEH
Vehicle Hours per Vehicle Requirement	TVH/PVEH
Vehicle Miles per Active Vehicle	TVM/AVEH
Vehicle Miles per Vehicle Requirement	TVM/PVEH
Revenue Vehicle Miles per Vehicle Miles	RVM/TVM
<b>FUEL EFFICIENCY</b>	
Revenue Vehicle Miles per Gallon Diesel	RVM/FUEL
Vehicle Miles (Bus) per Gallon Diesel	TVM/FUEL
<b>MAINTENANCE EFFICIENCY</b>	
Total Vehicle Miles per Maintenance Expense	TVM/MEXP
Vehicle Miles per Maintenance Employee	TVM/MNT
1,000,000 Vehicle Miles per Roadcall	TVM/RCAL
<b>OUTPUT PER DOLLAR COST</b>	
Revenue Vehicle Hours per Operating Expense	RVH/OEXP
Vehicle Miles per Operating Expense	TVM/OEXP
Revenue Vehicle Hours per Total Labor and Fringe Expenses	RVH/TWGG
Revenue Vehicle Hours per Operations Labor and Fringe Expenses	RVH/OWAG
Revenue Vehicle Hours per Administrative Labor and Fringe Expenses	RVH/VMWG
Revenue Vehicle Hours per Administrative Labor and Fringe Expenses	RVH/ADWG

# Service Effectiveness Measures (19)

<b>UTILIZATION OF SERVICE</b>	
Passenger Trips per Revenue Vehicle Hours	TPAS/RVH
Passenger Trips per Revenue Vehicle Mile	TPAS/RVH
Passenger Trips per Peak Vehicle	TPAS/PVH
Passenger Trips per Passenger	PASM/TPS
<b>OPERATING SAFETY</b>	
1,000,000 Vehicle Miles per Accident	TVM/ACC
Revenue Vehicle Hours per Accident	RVH/ACC
<b>REVENUE GENERATION</b>	
Passenger Revenue per Peak Vehicle	REV/PVEH
Passenger Revenue per Revenue Vehicle Hour	REV/RVH
Operating Revenue per Revenue Vehicle Hour	OREV/RVH
Passenger Revenue per Passenger	REV/TPAS
<b>PUBLIC ASSISTANCE</b>	
Revenue Vehicle Hours per Local Capital and Operating Assistance	RVH/LSUB
Revenue Vehicle Hours per State Capital and Operating Assistance	RVH/SSUB
Revenue Vehicle Hours per Total Operating Assistance	RVH/OSUB
Revenue Vehicle Hours per Total Capital and Operating Assistance	RVH/TSUB
Passengers per Local Operating Assistance	TPAS/LOA
Passengers per Total Capital and Operating Assistance	TPAS/TSUB
Passenger Revenue per Total Capital and Operating Assistance	REV/TSUB
Passenger Revenue per Total Operating Assistance	REV/OSUB
Passengers per Total Operating Assistance	PAS/OSUB

# Cost Effectiveness Measures (7)

<b>SERVICE CONSUMPTION PER EXPENSE</b>	
Passengers per Operating Expense	PAS/OEXP
Passenger Miles per Operating Expense	PASM/OEX
Passengers per Total Labor and Fringe Expenses	PASM/TWAG
Passengers per Gallon Diesel Fuel	PAS/FUEL
Passenger Miles per Total Expense	PASM/TEX
<b>REVENUE GENERATION PER EXPENSE</b>	
Ratio Operating Revenue to Operating Expense	OREV/OEXP
Ratio Total Revenue to Total Expense	TREV/TEX

# Factor Analysis Results

FACTOR 1 OUTPUT PER DOLLAR COST	
TVM/OEXP	.90**
RVM/TWG	.87
RVH/OEXP	.87*
RVH/OWAG	.83
TVM/MEXP	.71
RVH/OSUB	.61
RVH/VMWG	.58
Percent of Variance Explained:	25.7

FACTOR 2 UTILIZATION OF SERVICE	
PAS/OEXP	.93
PAS/TWAG	.86
TPAS/RVH	.86*
TPAS	.84
PVHRVM	.83**
TPASPAS/OSUB	.67
Percent of Variance Explained:	16.6

FACTOR 3 REVENUE GENERATION/EXPENSE	
REV/OSUB	.92**
OREV/OEXP	.91*
OREV/RVH	.84
REV/PVEH	.77
REV/TPAS	.70
RVH/OSUB	.66
PAS/OSUB	.61
Percent of Variance Explained:	12.6

FACTOR 4 LABOR EFFICIENCY	
TVH/EMP	.91*
RVH/OEMP	.88**
TVH/PVEH	.53
TVM/EMP	.51
Percent of Variance Explained:	9.1

**TOTAL AMOUNT OF VARIANCE EXPLAINED: 83%**

# Factor Analysis Results

FACTOR 5 VEHICLE EFFICIENCY	
TVMP/PVEH	.92*
PVEH/OP	-.77
TVH/PVEH	.77**
Percent of Variance Explained:	7.2

FACTOR 7 SAFETY	
TVM/ACC	.93*
RVH/ACC	.93**
Percent of Variance Explained:	5.6

FACTOR 6 MAINTENANCE EFFICIENCY	
TVM/MNT	.94*
PVEH/MNT	.90
Percent of Variance Explained:	6.6

**NOTE:**

\* = First marker variable

\*\* = Second marker variable

A cut-off value of .5 used throughout

**TOTAL AMOUNT OF VARIANCE EXPLAINED: 83%**

# Recommended Measures

<b>FACTOR</b>	<b>PERFORMANCE CONCEPT</b>	<b>BEST MARKER P.I.</b>	<b>ALTERNATE MARKER P.I.</b>
1	Output per \$ Cost	RVH/OEXP	TVM/OEXP
2	Utilization of Service	TPAS/RVH	TPAS/RVM
3	Revenue Generation per Expense	OREV/OEXP	REV/OSUB
4	Labor Efficiency	TVH/EMP	RVH/OEMP
5	Vehicle Efficiency	TVM/PVEH	TVH/PVEH
6	Maintenance Efficiency	TVM/MNT	PVEH/MNT
7	Safety	TVM/ACC	RVH/ACC

# Peer Groups

**Question:** how to identify "peer" properties for comparison with specific agency performance?

**Fielding's approach:** perform cluster analysis to identify clusters of similar agencies, and select agency characteristics for classification.

**Selected characteristics were:**

- 1. Agency size: # of peak vehicles**
- 2. Peaking: Peak/Base ratio**
- 3. Speed: average operating speed**