TASK VI

AUSTIN ITS PLAN

ASSESSMENT/EVALUATION CRITERIA

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INTRODUCTION

Evaluation procedures are essential to establish ITS program support among the public, elected officials, and transportation professionals. The public maintains a vested interest because any expenditure of public funds requires documentation of benefits to those supplying the funds. Elected officials are involved because of their interest in the benefits that their constituents derive from the public fund expenditures. They are the ones that will have to decide funding priorities among a variety of competing programs. And finally, transportation professionals also need to be aware of the effectiveness of new approaches addressing traditional transportation problems. Since they make recommendations to elected officials, if they can demonstrate the benefits to the traveling public through public expenditures, funding is much more easily secured. In addition, transportation professionals must be the stewards in the expenditure of those public funds. Evaluation results will also allow them to prioritize the implementation of ITS projects that show the greatest benefits early during implementation.

Evaluation procedures should not only quantify ITS program effectiveness, but they should also aim to present results in terms that are clearly understood by each of the above mentioned groups. , These groups can not be expected to lend their support if the effectiveness of an ITS program is not quantified and clearly presented to each of them. Clearly defined evaluation procedures prior to implementation will provide a means to document and present those benefits.

When defining the evaluation procedure, it is important to remember that evaluation is a continuous process. The first step is to define the goals and performance objectives of the project in question. It is critical to establish realistic expectations appropriately fitted to the situation. One way to accomplish this is to examine the results that other cities have been able to produce on similar projects. Also, computer simulation programs can be used to produce reasonable order of magnitude assessments. And finally, judgment of transportation system operators can provide valuable insights as to how certain changes might effect the system.

Using these references as an initial evaluation, the goals can be more realistically defined. Then, once the project has been completed, the actual evaluation takes place. Its results are compared to the redefined goals to see what benefits the project provided.

Once again, it is critical to keep the public informed throughout the entire process. They need to know what is being done for them and the value of it. They must be provided information about the project and its expected benefits prior to implementation, continuously throughout the implementation, and upon project completion.

Due to daily travel time variations, the public may have a difficult time perceiving the benefits of an individual project. For this reason, keeping the public continuously informed and involved is mandatory. The public must be assured that they are having an impact on the evaluation process.

The next section of this chapter will define various traffic study evaluation techniques, both quantitative and qualitative, that can be used to provide measures of effectiveness for an ITS program. It will then go on to match the measures of effectiveness with specific ITS strategies. And finally, it will define more specific techniques that can be used to increase public awareness on

ITS efforts and benefits.

EVALUATION TECHNIQUES

The first step is determining what each evaluation technique requires as inputs and what measures of effectiveness it produces as outputs. It is important to chose an evaluation technique that does not exceed available input resources, but still produces the desired output measurement.

The evaluation techniques have been divided into three categories. The first of these is surveys. This section typically requires a higher input of personnel time interacting with the user to discover their opinions. It also dictates the use of a properly designed set of questions to solicit comments relating to the proper measure of effectiveness. Opinion surveys can be used in nearly every situation, but survey methods must be very carefully applied. The second category is computer simulation models. This section requires personnel with extensive training on the particular computer software plus the actual hardware, software and input data. It does not necessarily produce real world results, but can be used to make accurate before and after comparisons. Computer simulation is dependent on model calibration of the model. A well calibrated model will produce accurate results, but there will always be some skepticism which needs to be considered. The final category is observation. This typically requires more infrastructure and personnel effort, but typically produces robust data.

Each of these categories contains a number of specific evaluation techniques that are described on the following pages. The resource or data requirements are listed along with the measures of effectiveness that the technique provides. The personnel resource requirement defines the number of people necessary to complete the task. There are three personnel levels: low meaning zero to one person, moderate requiring two to three people, and high encompassing four or more. **Table VI-1** shows a summary of each technique and the corresponding measures of effectiveness.

Techniques	Measures of Effectiveness								
	Travel Times	Traffic Volumes	Speeds	Delay	Fuel Consumption	Emissions	Vehicle Occupancy	Response Time	User Satisfaction
Surveys									
Interviews	Opinion		Opinion	Opinion			X		X
License Plate	X		X				X		X
Post Cards	Opinion		Opinion	Opinion			X		X
Telephone	Opinion		Opinion	Opinion			X		X
Travel Log	X		X	X			X		X
Model									
CORFLO	X	X	X	X			X		
DYNASMART	X	X	X	X	X	X			
FRESIM	X	X	X	X	X	X			
NETSIM	X	X	X	X	X	X			
FREQ	X	X	X	X	X	X			
PASSER II				X	X				
PASSER III				X					
TRANSYT-7F	X			X	X				
Observation									
ATR Stations		X							
AVI	X		X						
Pneumatic Tubes		X	X						
Radar			X						
Screen Line		X							
Test Car	X		X	X	X	X			
Video Tape		X		X					

Traffic Study Techniques Used to Provide Measures of Effectiveness_Table VI-1

Surveys

Interviews

An interview survey involves personal interviews with a target audience. The audience could be motorists, transit riders, pedestrians, bicyclists, or commercial vehicle operators. Interviews are typically conducted along the roadside, at signalized intersections, at parking facilities, or other locations where the target audience is accessible. The interview sample size should be based upon the variability of the target population.

MOEs Provided: *vehicle occupancy, origin, destination, and possible personal opinions on travel times, speeds, and delay.*

Resource Requirements*: interview questions, traffic control plan.*

Personnel Requirement: *high.*

License Plate

Two license plate survey techniques exist. The first technique requires recording several or all digits of vehicle license plate numbers at predetermined stations by observers. The recorded license plate numbers are used to trace vehicles through the study area determining origins, destinations, and travel times. This method is advantageous for studies of single routes. This method is not practical for large study areas due to the manpower requirements. This technique usually does not permit more than 60 percent of the vehicles to be traced through the study area. The second technique involves recording the entire license plate number either manually or by videotape, identifying vehicle ownership from registration records, and sending a survey to each owner with return postage prepaid.

MOEs Provided: *travel times, speeds, vehicle occupancy, origin, destination.*

Resource Requirements: *data collection form, possibly video camera and tapes.*

Personnel Requirement: *high.*

Post Cards

This technique is similar to the interview technique, but facilitates data collection under heavy traffic conditions where vehicles cannot be stopped long enough for an interview. Post card questionnaires are handed to drivers as they pass the survey stations. Drivers complete the return-addressed, stamped post card and drop it in the mail. Typical return rates average between 25 and 35 percent.

MOEs Provided: *occupancy, origin, destination (trip purpose, frequency, departure and arrival times, vehicle classification) and opinions on travel times, speeds, and delay.*

Resource Requirements: *post card survey, traffic control plan.*

Personnel Requirement: *high.*

Telephone

Telephone surveys can provide similar information as the previous techniques.

MOEs Provided: *vehicle occupancy, origin, destination and opinions on travel times, speeds, delay.*

Resource Requirements: *target audience telephone numbers, telephone, survey questions.*

Personnel Requirement: *high.*

Travel Log

Travel logs can be completed in several ways. The first method would be to select a group of participants who are willing to record all trips made in a day or week∗s time in a travel log. Information should include the location of origin, destination and all stops made in between and the corresponding time of each, the total trip time and length, vehicle occupancy, and any problems or delays that were encountered along the way and their duration. A second method would procure the same type of information, but would select the participants by targeting a large company or office complex and asking all occupants to keep a log of their travels for one day.

MOEs Provided: *travel times, speeds, delay, vehicle occupancy, origin, destination.*

Resource Requirements: *pre-printed log sheets.*

Personnel Requirements: *high.*

MODELS

CORFLO

CORFLO is a component model of TRAF simulation system designed for the integrated urban network or corridor analysis at a macroscopic level with traffic assignment capabilities. The program models automobiles, trucks, buses, and car pools on freeways and surface streets in a single, integrated environment.

MOEs Provided: *travel times, volumes, speeds, delay.*

Data Requirements: *link and turning movement volumes (%), saturation flow rates, intersection geometrics, link speeds, intersection spacing, signal timing data--cycle length, green times, phase sequence, offsets, yellow and all-red interval, intersection and link geometrics.*

DYNASMART

Dynasmart was developed for studying the effectiveness of alternative information-supplying strategies, as well as alternative information/control system configurations for urban networks. The simulation program models the response of the drivers to the information/control, the nature of the traffic flow that results from drivers responses and applied network control, and the dynamics of the routes in the network that affect the driver and control system decisions.

MOEs Provided: *travel times, volumes, speeds, delay, fuel consumption, emissions, origin, destination.*

Data Requirements: *network data including number of nodes, zones, links, etc.; number of loading intervals and associated time (O-D matrix); type of intersection control; signal timing data--cycle length, phasing, max green, min green, yellow and all-red interval; link data--speeds and number of lanes; ramp data; variable message sign data; and allowable movements data.*

FREESIM

FREESIM is a component model of the TRAF simulation system designed of microscopic freeway simulation. A microscopic simulation model is one in which each vehicle is modeled as a separate entity. The behavior of each vehicle is represented in the model through interactions with its surrounding environment, which is the freeway geometry and other vehicles. The program is capable of modeling 1-5 thru lanes, 1-3 lane ramps, grades, curves, superelevation, lane additions, lane drops, incidents, work zones, and auxillary lanes. The programs operational features include lane-changing, ramp metering, surveillance system, different vehicle types of 2 passenger and 4-truck, heavy vehicle lane bias of restriction, different driver habits, and warning signs for lane drops, incidents and off ramp. However, the model will not model HOV�s or reduced lane width.

MOEs Provided: *travel times, volumes, speeds, delay, fuel consumption, emissions.*

Data Requirements: *time period classification, link geometry, link operation, freeway turning movements, surveillance specification, incident specification, lane additions or drops, metering* *strategy, location of meter detectors, flow rates, percent trucks and car pools, incident detection specification, incident detection specification, incident detection algorithm.*

<u>*NETSIM*</u>

NETSIM is a component model of the TRAF simulation family designed for microscopic simulation of individual vehicle flow for each vehicle type and their assigned lanes. It has the capabilities of simulating existing and evaluating improvements made to a network of intersections along with their type of control (e.g., yield signs, stops signs, fixed-time signals, actuated signals, and signals with different cycle lengths). The program is also capable of simulating and evaluating bus routes and the location of the bus station.

MOEs Provided: *travel times, moving times, delay, efficiency, stopped time, queue time, queue lengths, speed, link volume occupancy, link storage, fuel economy, emissions, bus station capacity, empty bus station time, bus dwell time, number of buses serviced, bus trips on route, bus travel time on route.*

Data Requirements: *approach length for each intersection, number of lanes, allowable movements, vehicle turning volumes, signal cycle length, phase length, phase sequence, signal offset, phase sequence, minimum and maximum green time, and vehicle extensions for actuated-signal control.*

<u>FREQ</u>

FREQ consists of a family of demand-supply models of freeway corridor operating environments. The latest versions of FREQ is FREQ10PL, a freeway priority lane simulation model and FREQ10PE, a priority entry model

.

MOEs Provided: *travel times, travel distance, ramp delay, length of ques, average speed, emission rates, contour maps of traffic performance, fuel consumption, and cost-benefit performance index for different HOV operational designs.*

Data Requirements: *subsection lengths, subsection capacities, subsection speed-flow curves, position and capacities of on and off ramps, grades, number of lanes, origin-destination data, occupancy distribution at each on-ramp, geometric connection to alternative routes and percent of vehicles turning off the arterial, HOV lane design and position.*

<u>PASSER II</u>

Passer II is a microcomputer program that was developed to improve signalized intersection operations and arterial progression. It has the capabilities of evaluating existing conditions through simulation or optimization of any configuration from an individual signalized intersection to the progression along an arterial system.

MOEs Provided: *delay, fuel consumption, capacity.*

Data Requirements: *turning movement volumes, saturation flow rates, intersection geometrics, phase sequence, link speeds, intersection spacing, signal timing data--cycle length, green times, offsets, yellow and all-red interval.*

PASSER III

Passer III can be used to analyze pre-timed or traffic-responsive, fixed sequence signalized diamond interchanges. The program can evaluate existing or proposed signalization strategies, determine signalization strategies which minimize the average delay per vehicle, and calculate signal timing plans for interconnecting a series of interchanges on one-way frontage roads.

MOEs Provided: *delay, capacity.*

Data Requirements: *turning movement volumes, saturation flow rates, intersection geometrics, phase sequence, link speeds, intersection spacing, signal timing data--cycle length, green times, offsets, yellow and all-red interval.*

TRANSYT-7F

TRANSYT-7F is a traffic flow simulation and signal timing optimization program. The program has the capabilities of coordinating a signal system for an arterial of a network.

MOEs Provided: *travel times, speeds, delay, fuel consumption.*

Data Requirements: *turning movement volumes, saturation flow rates, intersection geometrics, phase sequence, link speeds, intersection spacing, signal timing data--cycle length, green times, offsets, yellow and all-red interval.*

OBSERVATION

Automatic Traffic Recorder (ATR) Stations

ATR stations are permanently installed recorders at representative locations on various highway systems throughout the state with both rural and urban traffic characteristics represented. The continuous data that is collected from these recorders is the basis for development of future traffic trends and volumes that are essential for highway planning and design. There are currently 7 ATR stations located within the Austin study area. They collect daily information such as traffic counts and vehicle classification.

MOEs Provided: *traffic volumes, capacity (if saturated).*

Resource Requirements: *ATR station.*

Personnel Requirement: *low*.

Automatic Vehicle Identification (AVI)

Automatic Vehicle Identification systems use vehicle-based transponders that can be read by equipment at fixed points to identify the vehicles

MOEs Provided: *travel times, speeds, origin, destination.*

Resource Requirements: *AVI system--transponders, readers, communication infrastructure, map database (some type), software, and probe vehicles.*

Personnel Requirement: *low*.

Pneumatic Tubes

Pneumatic tubes are placed across a roadway and used to record the number of crossing axle pairs. This information can be used to estimate the number of vehicles passing that location over a designated time period. This technique can easily be implemented for 24 hour periods.

MOEs Provided: *volumes, capacity (if saturated).*

Resource Requirements: *pneumatic tubes, recorders.*

Personnel Requirement: *low.*

Radar

Use of radar requires an individual to be at one specific location on a roadway and use a radar device to gather and record spot speeds.

MOEs Provided: *speeds.*

Resources Required: *radar device, data collection form.*

Personnel Requirement: *low.*

Screen Line

A screen line intersecting a defined boundary of the study area at two points, is established to divide the internal study area into two parts. Classified, hourly volume counts are made at the crossing of the screen line. A comparison is then made between the number of trips having their origin on one side of the screen line and their destination on the other. Historically, the Colorado River has been used as a screen line for Austin origin-destination surveys.

MOEs Provided: *volumes, capacities (if saturated).*

Resources Required: *traffic volume recorder device.*

Personnel Requirement: *low*.

Test Car

A test car would require a vehicle with specially equipped fuel consumption and emissions monitoring gauges. Specially trained drivers would operate the test car over a predetermined path in order to test the variances in travel times, speeds, and delay.

MOEs Provided: *travel times, speeds, delay, fuel consumption, emissions, origin, destination.*

Resources Required: *test vehicle, stop watch, distance measuring instrument, data collection form, fuel consumption and emission monitoring devices.*

Personnel Requirements: *moderate.*

Video Tape

Video taping requires an individual to stand at a designated area and video the flow of traffic passing that point. The video should contain an automatic time stamp on the film. The tape can later be examined to count volumes and observe delays in that particular area. A disadvantage would be that data could only be collected at one particular spot at a time without using multiple people, each with their own camera.

MOEs Provided: *traffic volumes, delay, capacity (if saturated).*

Resources Required: *video camera.*

Personnel Requirement: *moderate to high.*

ITS STRATEGIES

Having matched measures of effectiveness with available evaluation techniques, it is now possible to examine the ITS user services and recommend the measure of effectiveness that best evaluates the ITS strategies for each user service. The following pages separate the ten groups of ITS services into the strategies that fall under them and then briefly describe how surveys, models, or observation techniques can be used to determine the corresponding measures of effectiveness. This information is summarized in **Table VI-2** thru **Table VI-6**.

It is important to realize that surveillance is considered to be an integral part of all other ITS systems and therefore could not be separately evaluated. It should be implemented as a foundation for all user services and then be used to assist in evaluating them.

Travel and Traffic Management ITS User Service ITS Strategy	**Measures of Effectiveness**								
	Travel Times	Traffic Volumes	Speeds	Delay	Fuel Consumption	Emissions	Vehicle Occupancy	Response Time	User Satisfaction
En-Route Driver Information									
Commercial Radio	S		S	S			S		
Changeable Message Signs	S		S	S			S		
Highway Advisory Radio	S		S	S			S		
On-board Computer (w/real time traffic information)	S,M	M	S,M	S,M	M	M	S		
Traffic Control									
Adaptive Signal Control	S,M,O		S,M,O	S,M,O	M	M			
Ramp Metering	S,M,O	M,O	S,M,O	S,M,O	M	M			
Changeable Message Signs	S	O	S	S					
Lane Control Signals	M,O	M,O	M,O	M,O					
Incident Management									
Courtesy Patrols	S	O	S	S					S
Incident Management Plan				S,M,O					

Note: Assumes that surveillance systems are in place. Legend : S = surveys, M = model, O = observation

Measures of Effectiveness for Evaluating Travel and Traffic Management ITS Strategies_Table VI-2

En-Route Driver Information

Commercial Radio

The effectiveness of commercial radio would probably be best determined using travel logs to compare the difference between a controlled group who received information on congestion and incidents via the radio versus those who received no en-route information. It would also be important to log the reaction of the user to the information received.

MOEs to determine: *travel times, speeds, delay, vehicle occupancy.*

Technique: *Survey.*

Changeable Message Signs (CMS) - Fixed

Fixed changeable message signs are used to alert drivers to tune into highway advisory radio (HAR) for information on roadway conditions ahead. A survey point placed after the CMS, or travel logs, will best determine what percentage of the users paid attention to the sign and sought further information.

MOEs to determine: *travel times, speeds, delay.*

Technique: *Survey.*

Highway Advisory Radio (HAR)

This would best be evaluated by travel logs with a designated percentage of the participants tuned into the HAR and changing their travel plans accordingly.

MOEs to determine: *travel times, speeds, delay.*

Techniques: *Survey.*

On-board Computer System with Real-time Information

Survey techniques can be used as above with the added possibility of mail outs or telephone surveys to a pre-determined list of users with equipped vehicles. Simulation can be used in the from of Dynasmart to assign certain percentages of the population to receive the information and test for all of the MOE∗s above.

MOEs to determine: *travel times, volumes, speeds, delay, fuel consumption, emissions.*

Techniques: *Survey and model.*

Traffic Control

Adaptive Signal Control

In order to evaluate changes made in the signal timing plan for a particular situation, all three evaluation techniques can be used. The appropriate computer simulation model can be used in advance to optimize the signal timing based on the estimated or previously experienced changes in volumes, while observation and survey techniques are more appropriate after the timing changes have been implemented to test their impact.

MOEs to determine: *travel times, speeds, delay, fuel consumption, emissions.*

Technique: *Survey, model, and observation.*

Ramp Metering

Similarly, ramp metering effects can be pretested using a modeling package like Dynasmart to determine all the listed measures of effectiveness. Observation and survey techniques should be used once the service is active to determine public perception as well as actual changes in travel times, speeds, and delays.

MOEs to determine: *travel times, volumes, speeds, delay, fuel consumption, emissions.*

Technique: *Survey, model, and observation.*

Changeable Message Signs (CMS) - Portable

Portable CMS∗s could be used to warn of a lane closure ahead or possibly detour traffic. The best measure of its effectiveness would be found through surveying the users to see if they were impacted by the sign∗s message. Observation techniques such as video tape or pneumatic tubes can also be used to note changes in traffic volumes in areas before and after the CMS∗s.

MOEs to determine: *travel times, volumes, speeds, delay.*

Technique: *Survey and observation.*

Lane Control Signals

Simulation models can be used to some extent for a very general picture of how traffic flows would change, however it is difficult to simulate actual driver behavior and their reaction to the lane control signals. Driver behavior plays a major role in this evaluation, so the preferred method would be observation, using primarily pneumatic tubes and video tape to capture the changes in volumes, speeds, and delay.

MOEs to determine: *travel times, speeds, delay.*

Technique: *Model and observation.*

Incident Management

Courtesy Patrol

This strategy could best be evaluated by having some information on the length of delays cause by incapacitated vehicles before the courtesy patrol was instituted. Surveys given to the users of the service could give their opinion on changes in travel times, speeds, and delay and most importantly their satisfaction after being assisted by the courtesy patrol. In this instance, observation could be used to report the volume, or number of people, taking advantage of the service

MOEs to determine: *travel times, volumes (users), speeds, delay, user satisfaction.*

Technique: *Survey and observation.*

Incident Management Plan

All three techniques can be used to determine reductions in delay on a before and after basis. Surveys would procure optimal results if they were issued to the police officers on the scene instead of to the general public who would have no concept of a reduction in their delay due to the plan.

MOEs to determine: *delay.*

Technique: *Survey, model, and observation.*

Travel Demand Management ITS User Service ITS Strategy	Measures of Effectiveness								
	Travel Times	Traffic Volumes	Speeds	Delay	Fuel Consumption	Emissions	Vehicle Occupancy	Response Time	User Satisfaction
Pre-Trip Travel Information									
Television	S,O	S,O	S,O	S,O	M,O	M,O			
Computer	S,O	S,O	S,O	S,O	M,O	M,O			
Radio	S,O	S,O	S,O	S,O	M,O	M,O			
Newspaper	S,O	S,O	S,O	S,O	M,O	M,O			
Kiosks	S,O	S,O	S,O	S,O	M,O	M,O			
Demand Management and Operations									
Alternative Work Hours	S,M,O	S,M,O	S,M,O	S,M,O	M,O	M,O			
Telecommuting	S,M,O	S,M,O	S,M,O	S,M,O	M,O	M,O			

Note: Assumes that surveillance systems are in place. Legend: S = surveys, M = Model, O = observation

Measures of Effectiveness for Evaluating Travel Demand Management ITS Strategies_Table VI-3

Pre-Trip Travel Information

Television, Computer, Commercial Radio, Newspaper, Kiosks

All of the strategies listed above can be evaluated by the use of computer models, but that does not differentiate between the alternatives from which the user can receive the information. Surveys, such as travel logs, produce the most accurate information by allowing the user to specify which source he received the information from and then indicate how that information affected his trip, be it a change in time of departure, mode, or route. Modeling the system can be used to determine if the information is resulting in reduced fuel consumption and emissions. Observation can be used to determine if the information is getting out by measuring changes to suggested alternate routes and/or a reduction of traffic on the route in question.

MOEs to determine: *travel times, volumes, speeds, delay, fuel consumption, emissions.*

Technique: *Survey, model, and observation.*

Demand Management and Operations

Alternate Work Hours

Alternate work hours include flex time, compressed work weeks, or any other variations in the weekly schedule that brings at least some employees into work at times different than the peak. All three techniques would be effective in measuring the changes as long as a large enough sample is effected. The most practical methods would be survey and observation techniques performed at the site participating in the alternate work hours program.

MOEs to determine: *travel times, volumes, speeds, delay, fuel consumption, emissions.*

Technique: *Survey, model, observation.*

Telecommuting

Similarly, surveys to the telecommuters and observations at participating sites would yield the most accurate results because sample sizes will likely be too small to create a significant impact throughout the rest of the system. Simulation models can be used to determine effects on the system if significant levels of telecommuting were to ever be achieved.

MOEs to determine: *travel times, volumes, speeds, delay, fuel consumption, emissions.*

Technique: *Survey, model, and observation.*

Other **Demand Management and Operations** Strategies can be found under **Public Transportation Management.**

En-Route Transit Information

Kiosks

This strategy could be evaluated through opinion surveys of the users indicating their feelings on changes in travel times or delays after using the kiosks. Observation techniques could measure the volume of users who access the kiosk as an indication of their reliance on it.

MOEs to determine: *travel times, volumes, delay, user satisfaction.*

Technique: *Survey and observation.*

Annunciators

Once again, various forms of the survey technique could be used to assess the users perceived changes in their travel times and/or delays with the assistance of annunciators. Survey responses have the potential of being higher with a more captive audience and personal contact by the surveyor.

MOEs to determine: *travel times, delay, user satisfaction.*

Technique: *Survey.*

LED Message Sign

The same measures apply as with the annunciators.

MOEs to determine: *travel times, delay, user satisfaction.*

Technique: *Survey.*

Public Travel Security

On-board Cameras and Silent Alarms

These work together to increase safety for the user. Their effectiveness can really be measured by surveys to the passengers regarding any increase in travel security they may have experienced since the systems were installed. Because most passengers may not notice a difference, surveys to the drivers regarding differences before and after the system installations may also be useful.

MOEs to determine: *user satisfaction.*

Technique: *Survey.*

Other **Public Travel Safety** Strategies can be found under **Public Transportation Management.**

Public Transportation Operations ITS User Service ITS Strategy	**Measures of Effectiveness**								
	Travel Times	Traffic Volumes	Speeds	Delay	Fuel Consumption	Emissions	Vehicle Occupancy	Response Time	User Satisfaction
En-Route Transit Information									
Kiosks	S	O		S					S
Annuciators	S			S					S
LED Message Signs	S			S					S
Public Travel Security									
On-Board Cameras									S
Silent Alarm									S
Public Transportation Management									
AVI/AVL	O		O	O					
Automatic Passenger Counting							O		
Mechanical Systems Monitoring				O	O	O			
Transit Signal Priority	M,O	M,O	M,O	M,O	M	M	S,O	O	
Ridesharing/Vanpooling	S,M,O	S,M,O	S,M,O	S,M,O	M,O	M,O	S,O		S

Note: Assumes that surveillance systems are in place. Legend: S = surveys, M = Model, O = observation

Measures of Effectiveness for Evaluating Public Transportation Operations ITS Strategies_Table VI-4

Public Transportation Management

Automatic Vehicle Identification (AVI)/Automatic Vehicle Location (AVL)

By equipping the vehicles with AVI and/or AVL systems, it is possible through observation to know their exact location at any moment. This makes it possible to determine travel times, speeds, and delays for the vehicles to insure on-time performance.

MOEs to determine: *travel times, speeds, delay.*

Technique: *Observation.*

Automatic Passenger Counting

This strategy uses observation to determine vehicle occupancy by keeping track of the number of boarding and deboarding passengers at each stop.

MOEs to determine: *vehicle occupancy*.

Technique: *Observation.*

Mechanical Systems Monitoring

This strategy employs gauges that are attached to the mechanical systems to determine if there are any malfunctions or loss of fluids. Observation techniques similar to a test car situation are used to test these systems.

MOEs to determine: *delay, fuel consumption, emissions.*

Technique: *Observation.*

Transit Signal Priority

Simulation models and observation can be used to determine the effects on both busses and opposing street vehicles if the transit vehicle is given priority. Surveys can also be used to determine vehicle occupancy in order to compare the number of persons moved with and without the transit signal priority.

MOEs to determine: *travel times, volumes, speeds, delay, fuel consumption, emissions, vehicle occupancy.*

Technique: *Survey, model, and observation.*

Ridesharing/Vanpooling

This uses all three techniques to measure every type of effectiveness. Simulation models provide results in theory, while survey and observation bring out user reactions and actual numbers for reductions in vehicles on the road which will hopefully lead to reductions in travel times and delay.

MOEs to determine: *travel times, volumes, speeds, delay, fuel consumption, emission, vehicle occupancy, user satisfaction.*

Technique: *Survey, model, and observation.*

Commercial Vehicle Operations **ITS User Service** ITS Strategy	Measures of Effectiveness								
	Travel Times	Traffic Volumes	Speeds	Delay	Fuel Consumption	Emissions	Vehicle Occupancy	Response Time	User Satisfaction
Commercial Fleet Management									
AVI/AVL	O		O	O					
Weigh-In-Motion	O		O	O					

Note: Assumes that surveillance systems are in place. Legend: S = surveys, .M = model, O = observation

Measures of Effectiveness for Evaluating Commercial Vehicle Operations ITS Strategies_Table VI-5

Commercial Fleet Management

Automatic Vehicle Identification/Automatic Vehicle Location

Same as **Public Transportation Management**

Weigh-in Motion

Uses observation techniques such as AVI to determine if the commercial vehicles are being processed faster in order to reduce travel times and delays and increase productivity.

MOEs to determine: *travel times, speeds, delay.*

Technique: *Observation.*

Emergency Vehicle Management

Emergency Vehicle Preemption Signal

Most of the measures of effectiveness can be found through simulation models by adjusting the signal timing to represent an emergency vehicle receiving extra green time and examining the effects on the rest of the system. Observation can also be used as long as there is a database for comparison of the travel times of the emergency vehicle in the before and after case. Reduction in delay can be measured by changes in travel times.

MOEs to determine: travel times, speeds, delay, fuel consumption, emissions

Technique: Model and observation

Automatic Vehicle Identification/Automatic Vehicle Location

Same as **Public Transportation Management**

Emergency Management ITS User Service ITS Strategy	Measures of Effectiveness								
	Travel Times	Traffic Volumes	Speeds	Delay	Fuel Consumption	Emissions	Vehicle Occupancy	Response Time	User Satisfaction
Emergency Vehicle Management									
Emergency Vehicle Signal Preemption	M,O		M,O	M,O	M	M		O	
AVI/AVL	O		O	O					

Note: Assumes that surveillance systems are in place.

Legend: S = surveys, .M = model, O = observation

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PUBLIC AWARENESS

Many of the strategies outlined above will produce results that are tailored towards the understanding of the transportation engineer. However, as was mentioned earlier, when designing the evaluation procedures there is a need to not only pick the most appropriate measure to quantify the benefits, but to also make sure that the results are easily understood by the public. Customer expectations and perceptions should be tied back into the evaluation loop and possibly even be used to redefine the goals and objectives of the project. In fact, public opinion is so important that what is most easily understood by the public may be what guides the selection of a specific evaluation technique in the end.

Once the results of any evaluation of an ITS project have been compiled into a format that the general public can understand, there are a variety of ways to get that information to them. Below is a list of some techniques that can be used to inform the public about upcoming ITS efforts and already realized benefits.

News Releases

These can be broadcast over television, radio, or in the newspaper. It is important to gain the support of the media early on so that they will report enthusiastically on the benefits of ITS.

Media Meetings

Meetings can be scheduled with the media to disseminate information on planned or completed ITS projects. At these meetings the MOE's resulting from the projects are released.

Public Access Television Stations

This allows more in depth coverage on local projects already existing and those that are being planned. It enables the transportation system designers and managers more time and more control over what messages are being relayed through more comprehensive interviews.

Radio Commercials

Radio commercials succinctly stating benefits realized by a new project can be broadcast on all the major radio stations throughout the day. They have the advantage of repetition.

✌Fun Facts✍ on the Changeable Message Signs

When the static CMS signs are not being used to relay freeway congestion information, they can intermittently display quick facts on transportation improvement projects.

Presentations to Boards and Commissions

This would help to generate the support needed among elected officials. The only requirement would be a short presentation as to the latest standings of the ITS projects.

Survey people in attendance at Board/Commission Meetings

Even if there were no presentation at a particular meeting, this would be the ideal place to distribute surveys as everyone exited in order to ascertain their knowledge about or interest in the latest transportation projects.

Telephone Prerecorded Messages

A prerecorded menu could be developed to send a caller to one place for complaints, another for compliments, and yet another for general information and facts. If they were on hold waiting to speak with someone, instead of piping music in, transportation facts could be recited in the background.

Brochures/Videos

Brochures capitalizing on the positive aspects should be made available to various groups and organizations or at meetings, conferences, and other events. Videos could also be borrowed to help inform the public.

Any of these options can be used alone, or in some combination, with the goal of educating everyone about ITS in order to generate more support. There are a lot of improvements that can be made, but they all require funding. In order to get that funding, the public needs to know what is going on and be able to add some input as to how they think things should be handled.