

Real Evaluations

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Sample Scenario

- In this section we will take a proposed ITS project, and consider the:
 - project objectives
 - systems/technologies
 - evaluation objectives
 - appropriate evaluation techniques
 - appropriate performance measures

for evaluating the project

Who does evaluations?

- ... those in a project ... self evaluation ...
- ... those tasked to evaluate a project external to the project team ... independent evaluation
- Remember, there is NO right or wrong answer as to what to evaluate ... just guiding principles ...

Scenario

- You ... are those tasked with independent evaluation of the project

The Problem

- The Inter-urban road network is reaching capacity
- It is not practical to increase the overall capacity with infrastructure investments, i.e. increase number of lanes
- The network suffers flow breakdown regularly
- The network owner cannot identify problems until it is too late, i.e. enormous congestion level(s)

Supporting Information

- The network has inductive loops installed but there are high maintenance costs for associated with these and other in-ground based telematics infrastructure
- A Traffic Control Centre (TCC) that has an advanced traffic management system exists complete with extensive coverage of Variable Message Signs
- Therefore, the Network Operator is considering putting in an above-ground Automatic Incident Detection (AID) system

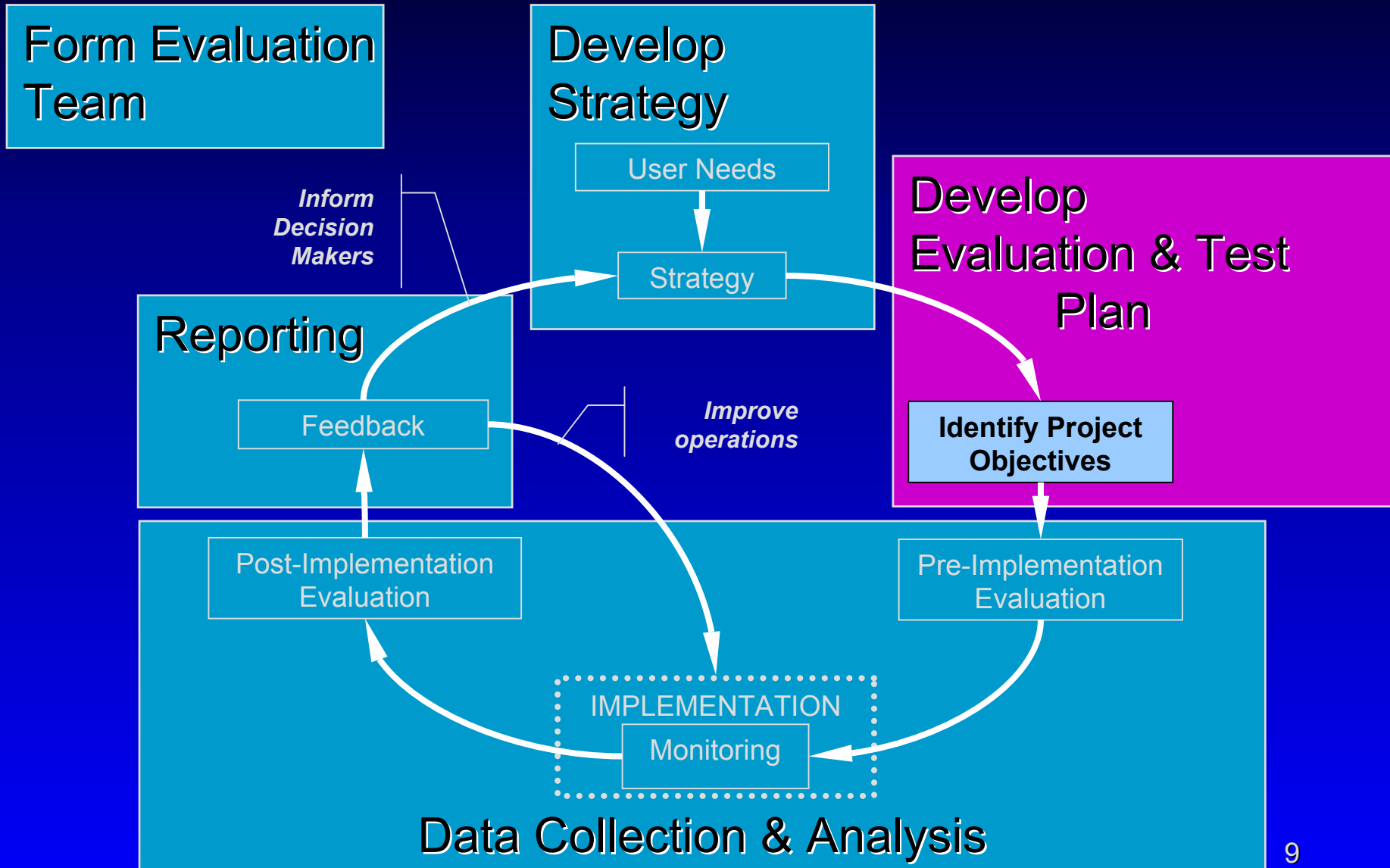
The Proposed Site

- The site is an Inter-urban dual carriageway with recurrent congestion associated with an interchange
- Incidents occur as a result of the congestion, which adds to congestion on the network with adverse impacts on the local environment and on overall safety
- Inductive loops are in use for traffic monitoring but are becoming increasingly unreliable
- Diversion away from congestion / incidents would be possible if the network operator could implement a system to identify flow breakdown within a short period of time

Issues to be Addressed

- Main Issues
 - Safety
 - Congestion/Delay
 - Associated environmental impacts
- Next level issues
 - Failing, expensive infrastructure (barrier to solving the main issues)
 - Communication
 - Emergency response – reactivity

Evaluation Process



Sample Scenario

Project Objectives

- Systems/technologies to be applied
- Evaluation Objectives
- Appropriate Evaluation Techniques
- Appropriate Performance Measures

Identify Project Objectives

Model Project Objectives

- Safety
 - Reduce accidents (primary and secondary)
 - Reduce accident severity
 - Improve survivability of those involved in accidents
- Economy/Efficiency
 - Reduce Delay/Congestion costs
 - Reduce accident costs
 - Reduce vehicle operating costs
 - Reduce Network management costs
 - Reduce costs associated with monitoring infrastructure
- Environment and Social
 - Reduce vehicle emissions (environment)
 - Reduce driver stress (social)

Sample Scenario

- Project Objectives

 Systems/technologies to be applied

- Evaluation Objectives
- Appropriate Evaluation Techniques
- Appropriate Performance Measures

Systems/Technologies to be Applied

Model Systems/Technologies to be Applied

- Above ground queue and incident detection using Automatic Incident Detection cameras
- Existing Variable Message Signs used to convey information and warnings to motorists
- Plans and procedures to enable the swift diversion of traffic when incidents occur

Sample Scenario

- Project Objectives
- Systems/technologies to be applied

Evaluation Objectives

- Appropriate Evaluation Techniques
- Appropriate Performance Measures

Evaluation Objectives

Model Evaluation Objectives -1/2

Objectives in “white” can be assessed at project planning stage in order to justify the scheme

- Technical

- Performance of the AID algorithms considering:

- adverse weather conditions
 - performance of queue and incident detection
 - performance in low flow conditions

- Impact

- Safety

- Impact of the scheme on accident rates including secondary accidents
 - Impact of the scheme on accident severities

Model Evaluation Objectives - 2/2

- Impact (continued)
 - Economy/Efficiency
 - Impact of the scheme on average journey times
 - Impact of the scheme on journey time variability
 - Impact of the scheme on overall delay and costs
 - Impact on traffic monitoring costs
 - Overall scheme costs and benefits
 - Environment
 - Impact on vehicle emissions (including CO₂)
 - Impact on driver stress
- User Acceptance
 - Impact on control room operations
 - Impact on perception of traffic management

Model Expected Impacts

The scheme's expected impacts are:

Safety

- 3% reduction in accident rates
- 8% reduction in fatal accidents

Economy

- 10% reduction in average journey times
- Reduced standard deviation of journey times
- Reduced traffic monitoring costs
- Reduced traffic management costs compared with alternative replacement of inductive loops

Environment and Social

- Reduced vehicle emissions
- Reduced driver stress

External Factors & Other Issues

- User education period
- General traffic growth
- Seasonal variations
- Extreme weather conditions
- Incidents elsewhere on the network
- Major events

Sample Scenario

- Project Objectives
- Systems/technologies to be applied
- Evaluation Objectives

 **Appropriate Evaluation Techniques**

- Appropriate Performance Measures

Data Analysis Approach

Model Data Analysis Approach - 1/2

At ex-ante evaluation stage:

- Observation / or Document Review
 - Collect before data for
 - Accident rates and severities (minimum 3 year period)
 - Journey times over a number of weeks
- Modelling – based on observed before data
 - Model anticipated change in average journey time
 - Model accident reduction
 - Model anticipated reduction in standard deviation of journey times
- User needs and perception survey

Model Data Analysis Approach - 2/2

At ex-post evaluation stage:

- Observation
 - Technical
 - Incident Detection Rate
 - False alarm rate
 - Mean Time to Detect an Incident
 - Accident rates and severities (e.g. over a 3 year period)
 - Journey times over a number of weeks
- Modelling – based on observed after data
 - Impact on emissions
- User Acceptance Survey
 - Levels of changes in driver stress
 - How well drivers are informed
 - Impact on control room operations
 - Impact on traffic management

Sample Scenario

- Project Objectives
- Systems/technologies to be applied
- Evaluation Objectives
- Appropriate Evaluation Techniques

 **Appropriate Performance Measures**

Performance Measures

Model Performance Indicators

- Technical
 - % of incidents detected
 - % of false alarms
 - Mean Time to Detect an Incident in seconds
- Impact
 - All personal injury accidents per million vehicle km
 - Number of fatal accidents per million vehicle km
 - Change in average journey times in minutes
 - Change in peak hour journey times in minutes
 - Change in SO_x, NO_x, PM₁₀ (or PM_{2.5}), CO, CO₂ levels
 - Change in daily total vehicle hours on the network
 - Change in daily total vehicle costs on the network

Model Performance Indicators

- User Acceptance Survey
 - Perception of changes in driver stress
 - Perception of changes in how well drivers are informed
 - Perception of impact on control room operations
 - Perception of impact on traffic management

Agenda

- Introductions and Overview
- Background – US perspective
- Background – European perspective
- The Evaluation Process
- Evaluation Techniques & Performance Measures
- Real Evaluations
- **Wrap-up and Conclusions**