Evaluating the impacts of cooperative ITS

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IBEC 3
Terminology: Assessment, Evaluation, Impact

- The term "assessment" tends to be used by most authors when forward looking (also called ex-ante).
- "evaluation" is more used when referring to the effects based on actual data rather than forecasts (also called ex-post).
- “Impact” is used here as a more general term also in an ex-post and more strategic sense of impact on society as a whole.
"Cooperative ITS: is a subset of overall ITS that communicates and shares information between ITS-stations to give advice or facilitate actions with the objective of improving safety, sustainability, efficiency and comfort beyond the scope of stand-alone systems."

Technology
- V2X and V2V
- DSRC ITS G5 and Cellular

Impact
- Better informed travellers
- More efficient network operations
C-ITS – Example “Day 1” Services

- **I2V:**
  - Floating Vehicle Data
  - Road works warning
  - In-vehicle signage
  - Automatic Crash Notification
  - Signal phase and time

- **V2V:**
  - Hazardous location warning
  - Traffic Jam ahead warning
  - Stationary vehicle warning
  - Emergency brake light
  - Emergency vehicle warning
Cooperative ITS – a multi-layered topic

Individual
Accessibility
Society

Economy
Environment

People

Location

Connected Vehicle

Infrastructure
Digital
Physical

Communications

Technology

Use cases
Suitability

Interactions

Legal
Insurance
Licensing
Vehicles
R&D
Step 1: Clarifying the background

Step 2: Considering the nature of the interventions

Step 3: Mapping the intervention logic

Step 4: Defining the purpose and framing the questions

Step 5: Deciding on the best research approach

Step 6: Refining the approach

General Investigation approach supported by the UK DfT

Step 3: Mapping the intervention logic

Exploring the causal chain between Intervention X its expected outcomes and longer term impacts, identifying both intended and unintended consequences, and how they might be measured. The process involves defining the content of four components:

- **Inputs** - what is being invested in terms of resources and activities
- **Outputs** - e.g. target groups reached, equipment installed, software developed
- **Outcomes** - short and medium-term results, such as changes in traffic flows, reduced driver uncertainty
- **Impacts** - long-term results such as increased safety, environmental benefits etc.

These can be developed as a table with the four components considered in sequence for each aspect of the intervention.
Socio-economic evaluation of C-ITS

Choices concerning impacts and values

- Safety: e.g. reduced accident costs
- Mobility: e.g. congestion journey time reliability
- Environment: e.g. CO2, NOX, fuel saved
- Other
- Costs: investment operation maintenance

Choices concerning e.g. time period, discount rates

Calculation of results: e.g. BCR, NPV
Why evaluating C-ITS is *particularly* challenging

- Bundling of services
- Implementation use cases
Bundling of services and use cases

**Bundles**: Applications of cooperative systems can be clustered in several ways:

- By technology, particularly by communications technology
- By data flows (V2V, V2I)
- By service/application areas (e.g. safety applications or information applications)
- By geographic context/road type

**Use cases**: A single cooperative application/service can be achieved in a number of ways. For example, using on-vehicle sensors the service “slippery road warning” could be achieved:

- By a V2V message directly to following vehicles
- By a V2I message then re-transmitted to vehicles using cellular or broadcast digital radio
- By a V2I message and the Road Operator setting a Variable Message Sign
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## Example C-ITS Service Potential Overlap

<table>
<thead>
<tr>
<th>Example C-ITS Service</th>
<th>Potential Overlap</th>
</tr>
</thead>
<tbody>
<tr>
<td>Floating Vehicle Data</td>
<td>Loops, Bluetooth, Number-plate matching</td>
</tr>
<tr>
<td>In Vehicle Signage (static &amp; dynamic)</td>
<td>Static signs, Variable Message Signs</td>
</tr>
<tr>
<td>Road Works Warning</td>
<td>Static &amp; dynamic signage, radio reports</td>
</tr>
<tr>
<td>Freight Lorry Parking</td>
<td>Signage, Fleet management information systems, radio/phone contact with base or colleagues</td>
</tr>
<tr>
<td>Freight Slot Availability</td>
<td>Fleet management information systems</td>
</tr>
<tr>
<td>eCall automatic crash notification</td>
<td>Video surveillance and processing, Static vehicle sensors</td>
</tr>
</tbody>
</table>
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- Overlap with existing infrastructure
- Size of the effect
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- “Hotspots” transferability and scaling up
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- Driver acceptance and compliance
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- Bundling of services
- Implementation use cases
- Overlap with existing infrastructure
- Size of the effect
- “Hotspots” transferability and scaling up
- Driver acceptance and compliance
- Time horizon for evaluation
Thank You

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