Data collection and evaluation methods in the fields of ITS technologies for VRUs

Discussion
In view of technological innovations in the transport sector that are deployed on a broad scale the following factors are becoming more and more important:

- High heterogeneity of different stakeholder groups
- Lack of qualitative and quantitative data for scenario development
- Limited resources for user need assessment and evaluation
- Actual impacts on VRUs (not only on traffic safety but on general mobility and comfort)
What’s needed?

- Identifying needs and barriers of different road user groups
  - basis for understanding critical scenarios and actual mobility needs
- Involving stakeholders in the development and evaluation phase
  - essential for usable/sustainable solutions in the transport area

What’s needed?

- Application of both qualitative and quantitative research methods and evaluation of the actual ‘applicability’ of available data sources
- Impact assessment of measures need to be based on methodologies adapted to actual safety and mobility needs of VRUs
**Recent Projects**

- *TrafficCheck*
  - Urban Sensing
- *Ways2Navigate*
  - Provide (AR/audio/map-based) navigation and location based information to pedestrians
- *TellMeTheWay*
  - Provide (audio) navigation and location based information to pedestrians and users of public transport
- *VRUITS – Vulnerable Road Users and ITS*
  - Vulnerable road user needs and issues towards ITS

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**Exemplary Research Design**

General research process in course of the development of an intermodal (smartphone-based) routing system for VRUs (*TellMeTheWay*):

1. Identification of potential user groups
2. Development/Design of a test scenario/methodology
3. Sampling
4. Field testing (collecting qualitative and objective data)
5. Assessment
6. (Re-)Iteration
7. Final evaluation
**Benefits I**

User centred design approaches have proven to yield sustainable and technologically feasible results → solutions for specific target groups.

Especially iterative processes allow for integration of qualitative user input and adaption/improvement early on in the development phase.

**Benefits II**

Research designs allowing for a comprehensive evaluation phase close the gap between user need assessment and actually developed output.

Subjective assessments vs. objective data from tracking, sensor and usage → improve interaction based on stakeholder involvement vs. improved efficiency and error rate.
Example: **VRUITS – Vulnerable Road Users & ITS**

- Assess societal impacts of selected ITS,
- Provide recommendations for policy and industry regarding ITS in order to improve the safety and mobility of VRUs;
- Provide evidence-based recommended practices on how VRU can be integrated in Intelligent Transport Systems and on how HMI designs can be adapted to meet the needs of VRUs, and
- Test these recommendations in field trials

**ITS Potential & Hazards**

- In critical scenarios in traffic:
  - (car) speed
  - complexity
  - communication
  - visibility
- Potential hazards & barriers:
  - distraction
  - responsibility
  - reliability
- Potential benefits and positive effects on VRUs:
  - support
  - efficiency
  - comfort
Field trials & evaluation

To complement explorative user need assessment an evaluation phase will provide insight into:

- Assess **system usability** and user **workload** impacts
- Potential for **technological adaptations** and **improvements**
- Expected **safety, mobility** and **comfort** impacts (subjective user assessments)

Shortcomings

Lack of **representativity** and **inference** of found results for scenario development and assessment of impacts

Results often only applicable for **specific systems, regional characteristics** and **use cases**

Additional **quantitative data** for CBA usually needed (with it’s inherent limitations...)
**Mobility & Accident Data Limitations**

Especially in regards to availability, consistency and comparability:

- Limited detail on VRU specific mobility and accident data (i.e.: in depth accident characteristics to identify causes for single-vehicle, single pedestrian accidents)
- Limited representativity of available scenarios → measures may not be applicable across different countries
- Overall national datasets are not detailed enough to allow discrimination of specific circumstances and causal factors that are evident in PTW accidents

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**Accident Data (VRUIS)**

<table>
<thead>
<tr>
<th>CARE data analysis findings</th>
<th>Spanish data consistency</th>
<th>Austrian data consistency</th>
<th>UK data consistency</th>
<th>Finnish data consistency</th>
<th>Sweden data consistency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Far more males than females involved in the accidents</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Mostly Urban environments</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Between 30-50kmh</td>
<td>N/a - didn't specify speed</td>
<td>Unknown</td>
<td>Yes</td>
<td>Unknown</td>
<td>Yes (50kmh)</td>
</tr>
<tr>
<td>At crossroads</td>
<td>N/a -</td>
<td>Yes</td>
<td>Yes – partially (junctions)</td>
<td>Unknown</td>
<td>Unknown</td>
</tr>
<tr>
<td>Between 12pm and 6pm</td>
<td>Yes</td>
<td>Yes</td>
<td>Unknown</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Similar number of incidents on all days of week</td>
<td>Yes- slight dip at weekends</td>
<td>No- slight dip at weekends</td>
<td>Unknown</td>
<td>No-</td>
<td>Yes</td>
</tr>
<tr>
<td>In daylight conditions</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>In warmer months of May to September</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>In fine weather</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Majority wore a helmet</td>
<td>Yes</td>
<td>No- majority did not wear</td>
<td>Almost certainly</td>
<td>Unknown</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Conclusions

- User involvement is essential for sustainable development of measures (especially in view of ITS):
  - Qualitative research methods
  - Participatory processes
  - Iterative Research Designs
- Solutions not solely based on individual technical applications
  - Education
  - Training

Thank you very much!

Contact:
daniel.bell@factum.at