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Assessment of C-ITS Impacts on Users and the Transport System

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Online /
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Co-funded by
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Evaluation of C-ITS / Outline

- Evaluation methodology
- Impact on transport system
- Impact on users
- Summary & conclusions

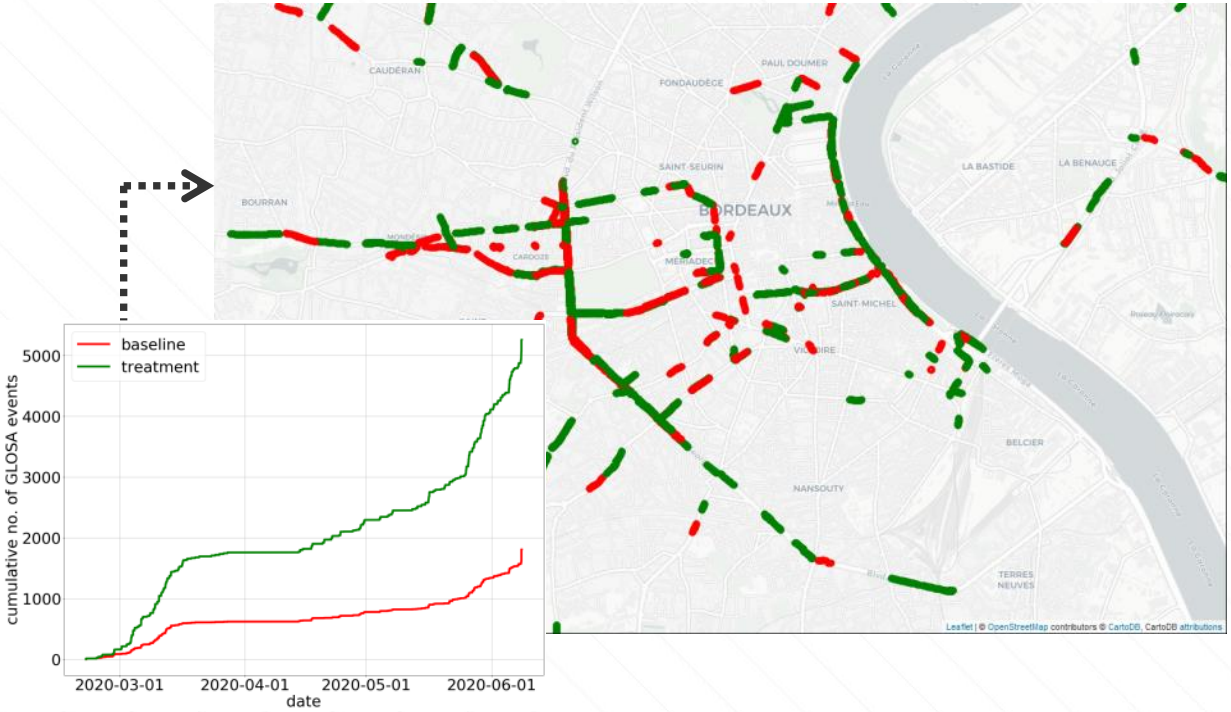
Impact on transport system / Methodology

Merging CAM (traces) and HMI (advice) data

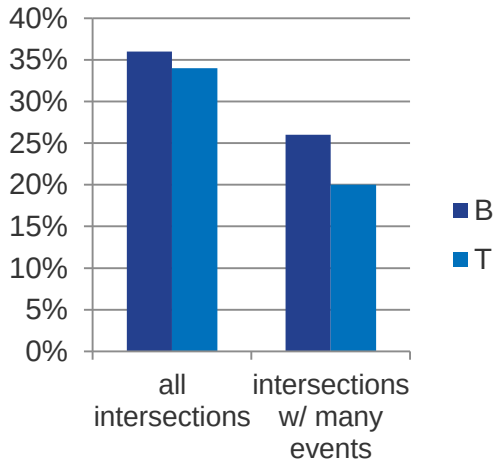
EVALUATION PLANS (baseline and treatment)

LOG DATA COLLECTION

INDICATORS AND KPIs

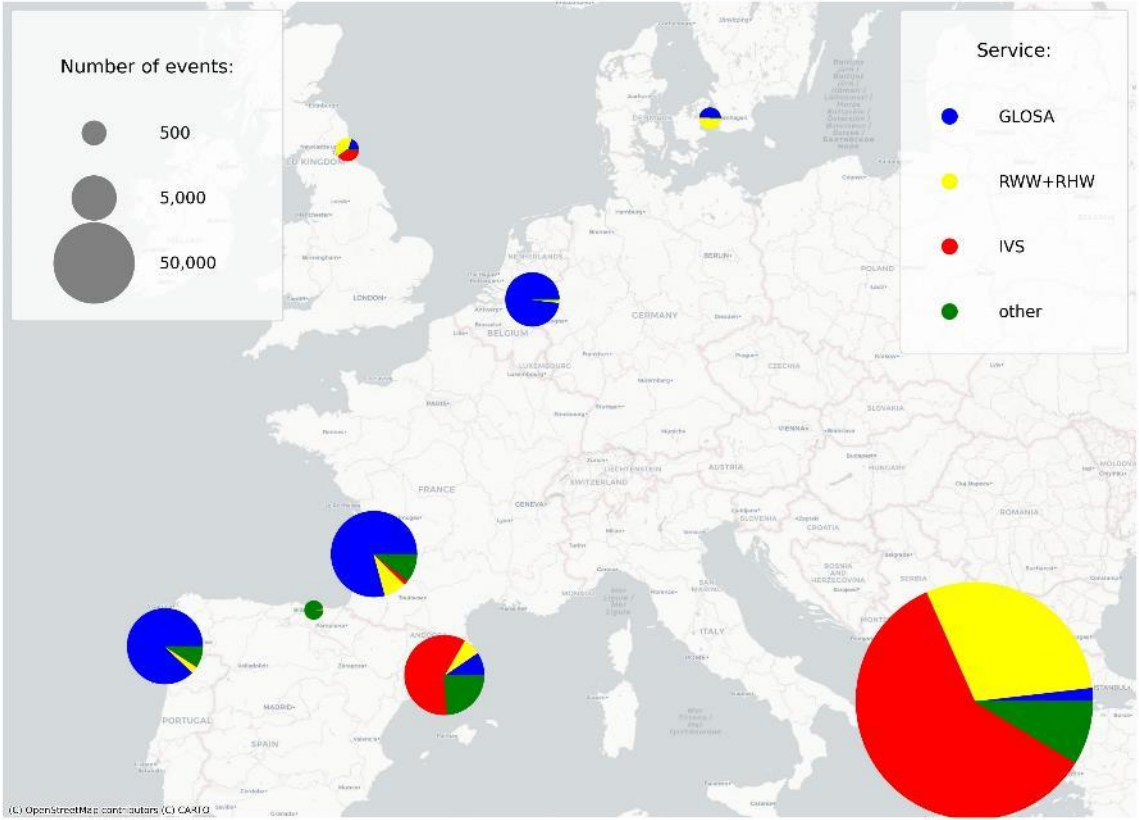


GLOSA EXAMPLE:
/ Percentage of vehicles stopping while approaching intersection:



Impact on transport system / Results

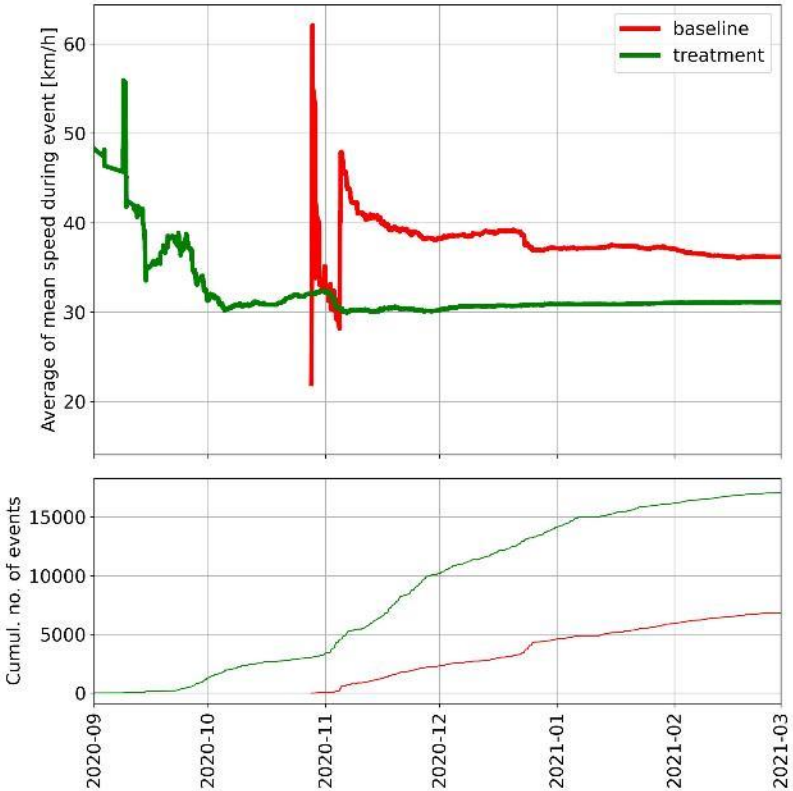
No. of events logged for evaluation purposes (selected cellular services)



- GLOSA and IVS (speed limit) are predominant
- Thessaloniki: very large amount of data due to Taxi drivers recruitment
- In addition: ITS-G5 deployment in North Brabant and Newcastle

Impact on transport system / Results

Convergence & stability of results through large-scale deployment & usage



- **The large number of events recorded in some deployment sites reveals solid results on the impact of the services on traffic under naturalistic driving conditions**
- **Example (left): mean speed of IVS events in Barcelona**
  - Stability of indicator reached after logging ca. 20,000 events

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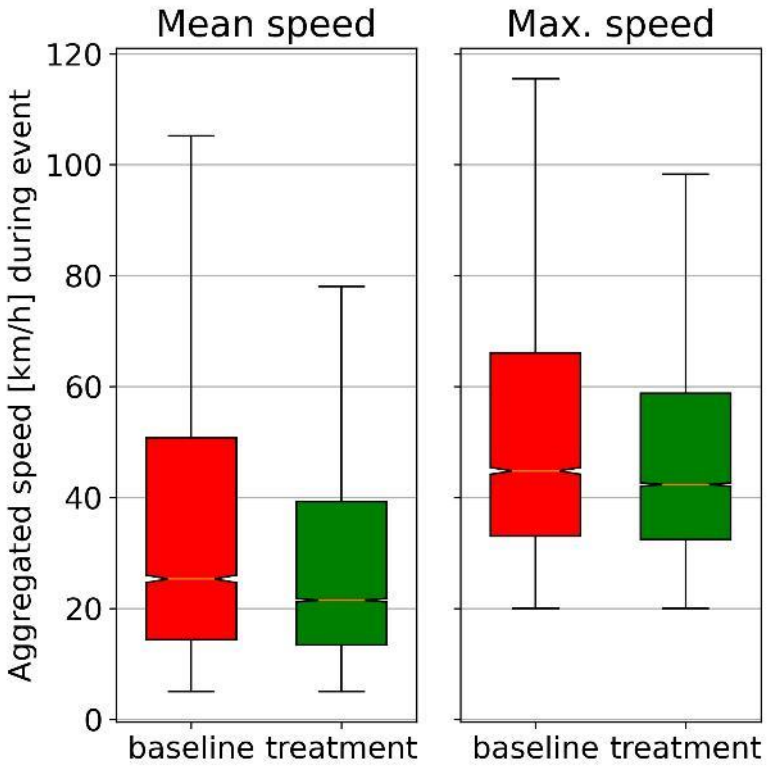
Impact on transport system / Results

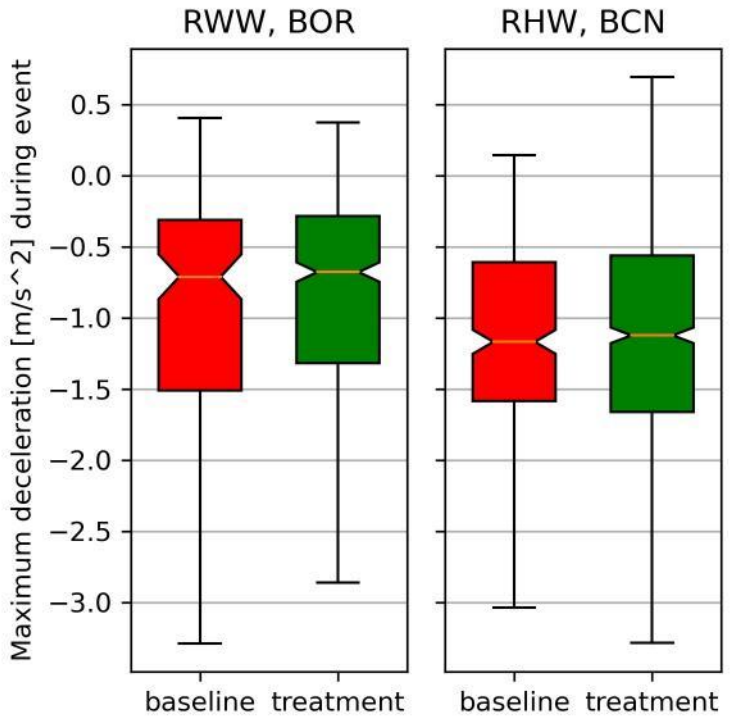
In-Vehicle Signage (speed limit) selected indicator(s)



- **Using IVS (speed limit) leads to lower driving speeds of up to 14%**
  - Mean speeds in Barcelona events went down from an average of 36 km/h to 31 km/h
  - Maximum speeds also went down from 52 km/h to 48 km/h
- **Speed limit violations also occurred 14% less frequently**

Impact on transport system / Results

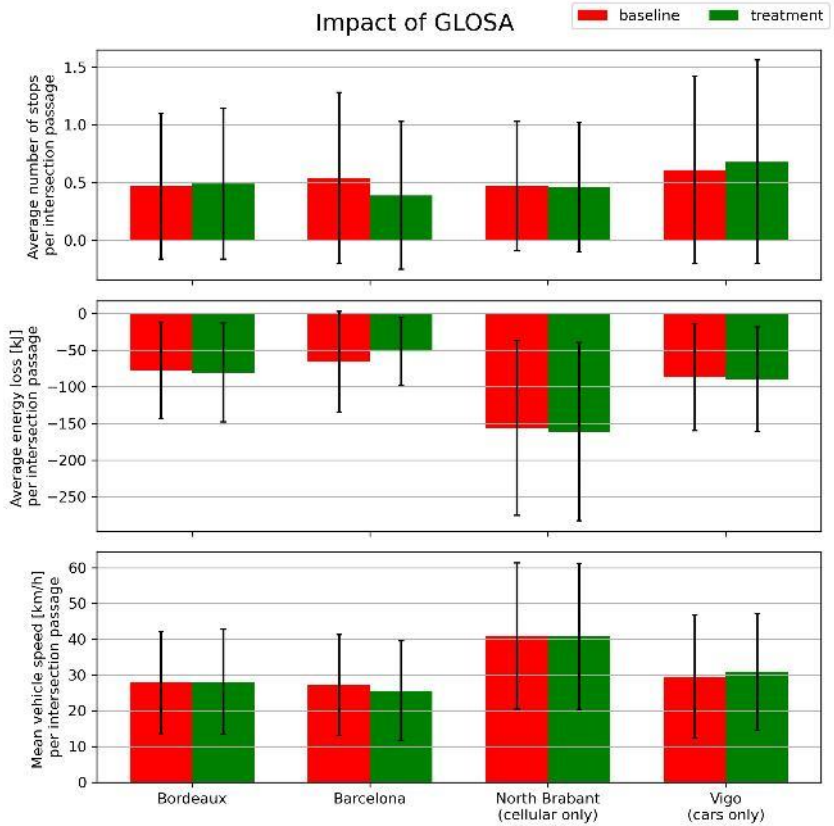
Road Works Warnings, Road Hazard Warnings selected indicator(s)



- **Using RWW and RHW leads to a slight decrease in hard braking**
  - Average of maximum deceleration per event decreased by 9% in Bordeaux and 4% in Barcelona
  - Hard braking events (>3m/s²) occured 57% less often in Bordeaux and 30% less often in Barcelona when using the service

Impact on transport system / Results

Differences between results across Deployment Sites (GLOSA example)



- **Differences stem from…**
  - …app implementation (e.g. speed advice and/or time-to-green)
  - …road network layout and types of intersections
  - …user groups and driving habits
- **GLOSA has a (slightly) better impact…**
  - …in off-peak (uncongested) traffic
  - …in intersections with a longer ingress
  - …in intersections with fixed signal timing

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Impact on transport system / Results

Preliminary findings from other services

- **Using Green Priority reduces the number of stops and delays at signalized intersections**
  - Emergency vehicles in North Brabant are granted priority on up to 93% of requests
- **Emergency Vehicle Warning (EVW)**
  - Reduction in mean speeds of up to 10% and drivers slowing down immediately when warned
- **Signal Violation Warning (SVW)**
  - Slight tendency of drivers to brake harder when warned
- **Motorcycle Approach Indication (MAI) and Warning System for Pedestrians (WSP)**
  - Slight reduction in mean speeds and delayed acceleration observed

- ***Impact assessment results to be consolidated once the market penetration (→ frequency of event occurrences) will have increased***

Impact on users / Questionnaire results

No. of users (downloads) & responses (cellular services)

Deployment site	Users (Downloads)	Responses
Barcelona	778 (2024)	49
Bilbao	20	20
Bordeaux	ca. 40 (418)	21
Copenhagen	10	6
Newcastle	37	5
North Brabant	40	29
Thessaloniki	ca. 1000 (taxis)	39
Vigo	80	68

- **Recruited user groups vs. general public**
- **Subsample size depending on actual service experience**
- **Distribution of questionnaires**
  - Push message
  - Social media
  - E-mail

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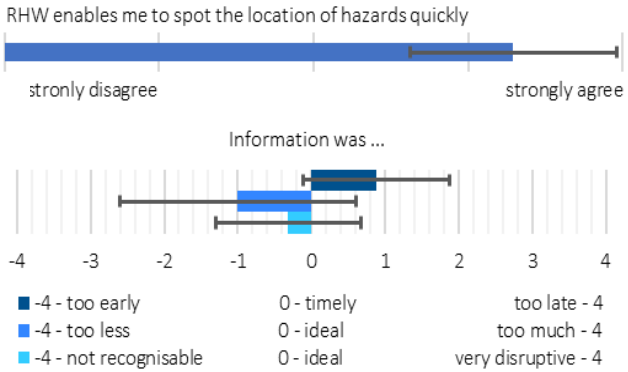
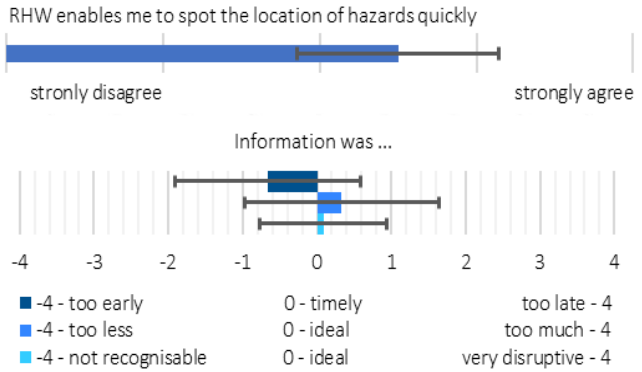
Impact on users / Questionnaire results

Service acceptance – RHW

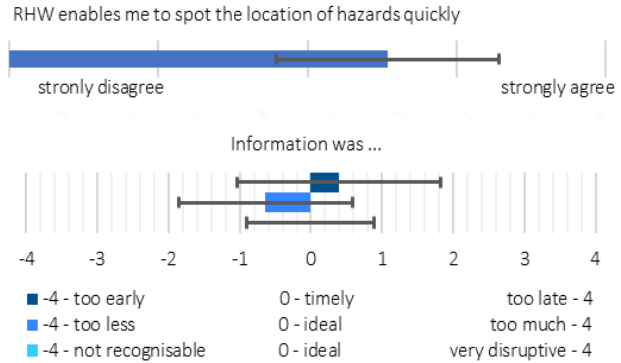
BCN (N=17)



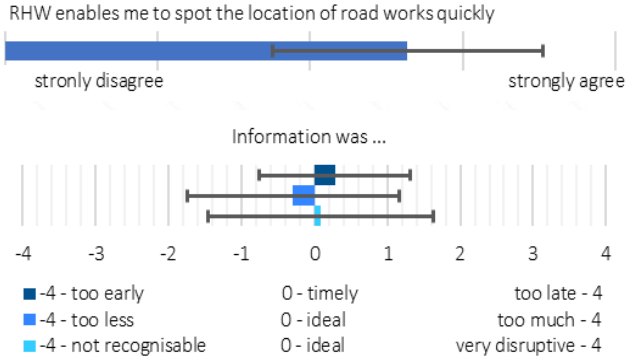
BOD (N=12)



NBR (N=13)



VIG (N=41)



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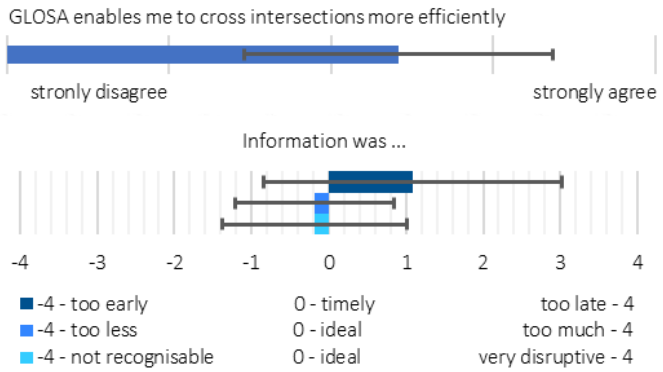
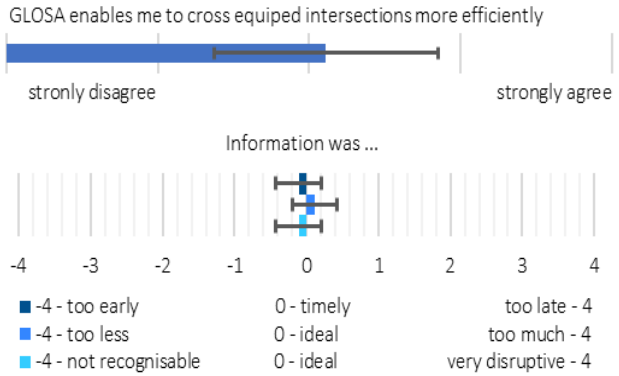
Impact on users / Questionnaire results

Service acceptance – GLOSA

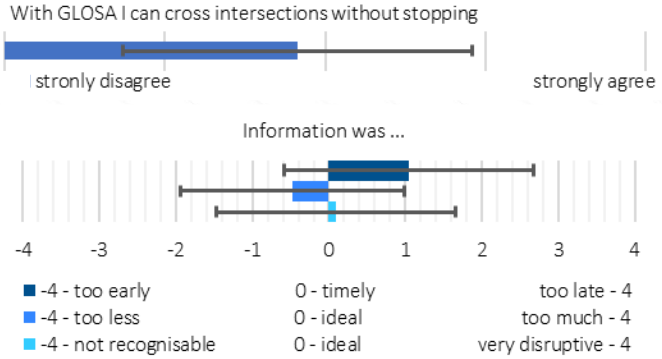
BCN (N=11)



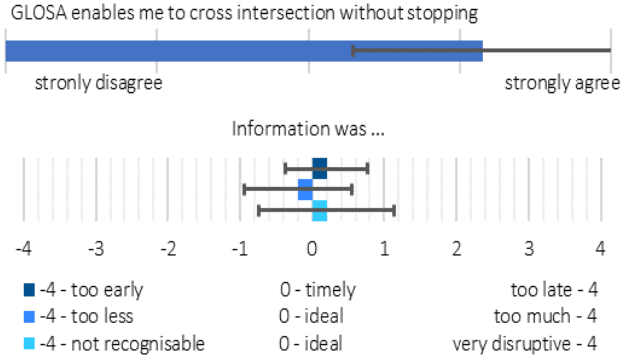
BOD (N=9)



NBR (N=22)



VIG (N=25)



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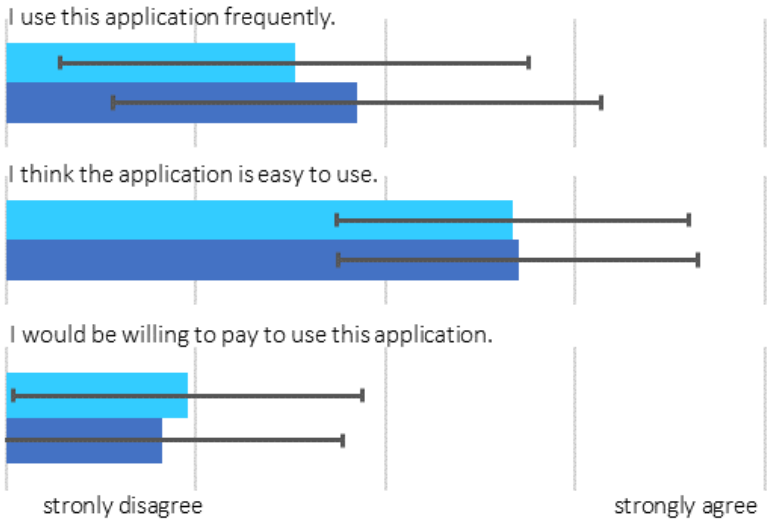
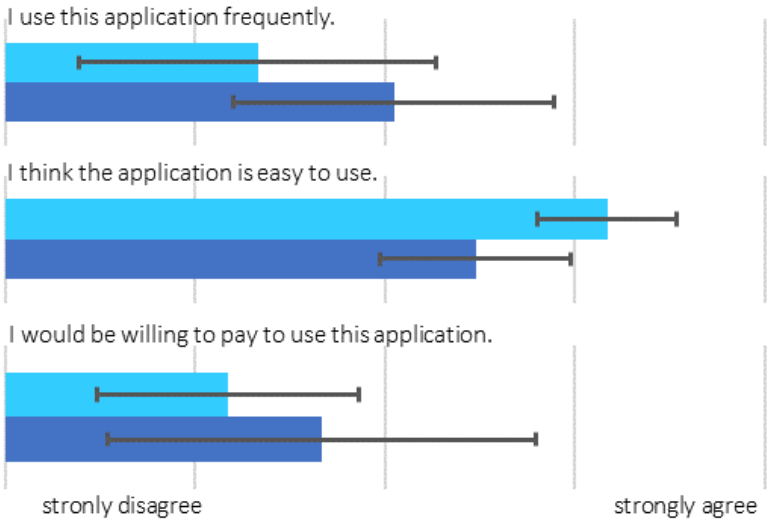
Impact on users / Questionnaire results

App evaluation – Use, usability, and willingness to pay

IDIADA app



NeoGLS app



NBR (N = 27)

BCN (N = 40)

BIL (N = 6)

BOD (N = 21)

Summary & Conclusions

C-ITS impact

- **Some services yield positive impacts at certain deployment sites**
- **Effects might increase under more favorable conditions (e.g. lower traffic density)**
- **Good acceptance of services and apps but low willingness to pay**

Lessons learned for future C-ITS impact assessment

- **Naturalistic impact assessment requires a very large number of users and a long deployment period**
- **Logging (format) and evaluation plans should be further unified in order to ensure a higher comparability of results**
- **Social media can help to increase user engagement but does not guarantee a sufficient amount of survey responses**

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Thank you

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