C-ROADS

Antwerp-Helmond

Pilot 1:
Intelligent Speed Assistance (ISA)

V-Tron

October 2024

Co-funded by
the European Union

ISA developments during the project

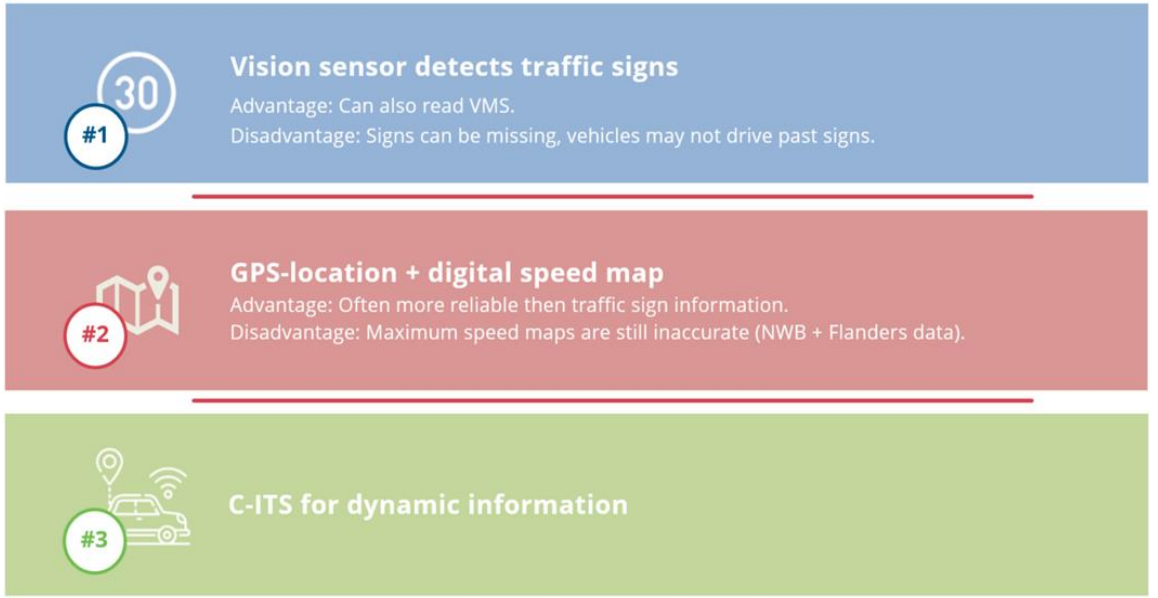
V-Tron, based in the Netherlands (Deventer), is an In-car Service Provider, focused on smart vehicle innovations.

- (Aftermarket) Intelligent Speed Assistance (ISA), and C-ITS with own (hybrid) Onboard-Unit.
- Collaborates with local-, regional-, and national road authorities, and OEMs
- Within the project focus on:
  - Further development of their ISA system
  - Multiple improvements tested and demonstrated
  - Integration between C-ITS and ISA systems achieved and showcased
- End-users participated in extensive testdrives, providing valuable feedback for further improvements
- Developments succesfully tested and demonstrated in Helmond and Antwerp
- Cross-border functionality proven

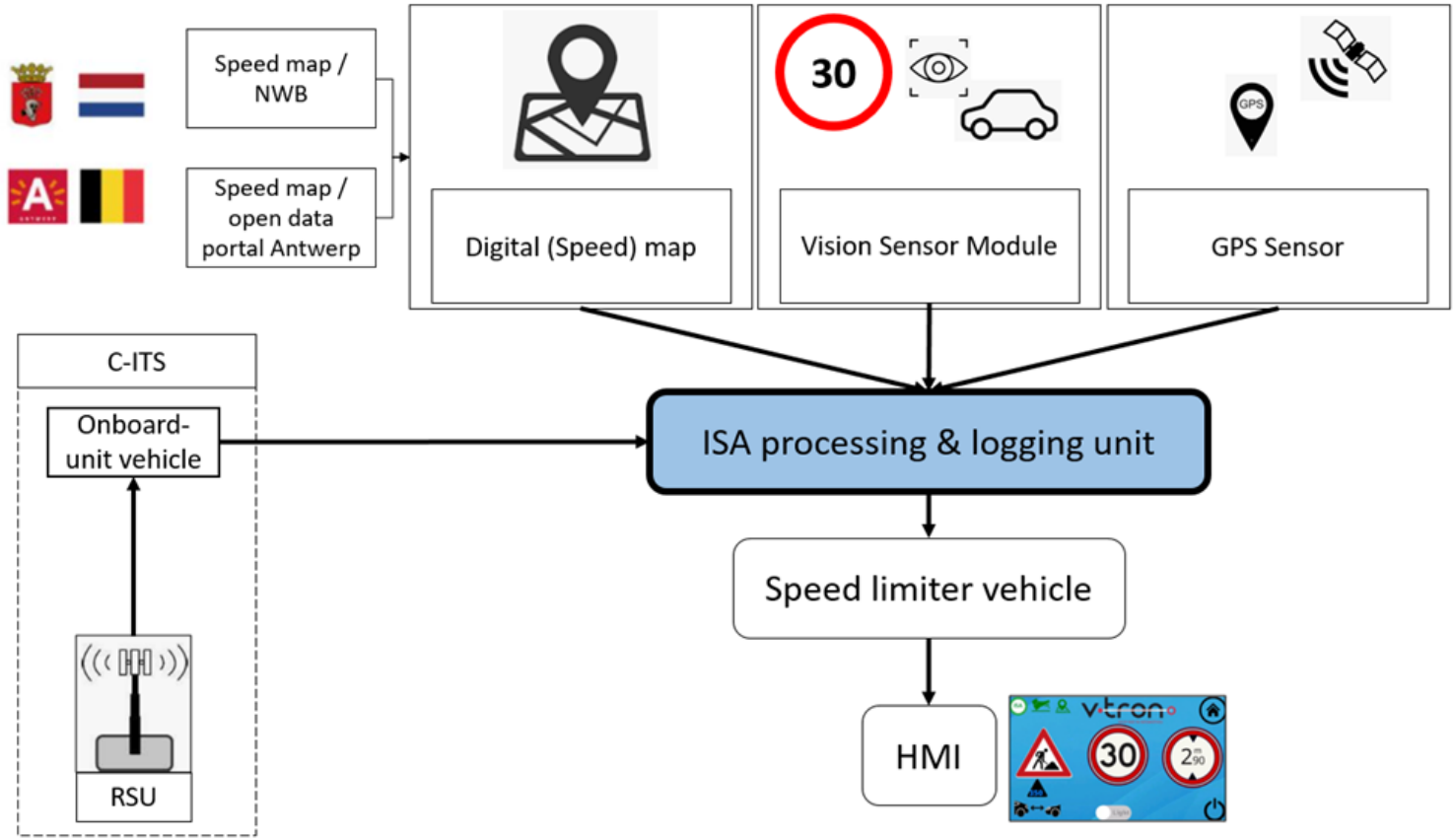
What is ISA?

Intelligent Speed Assistance

- Can, as aftermarket system, be retrofitted in almost all vehicles
- Limits the vehicle on the maximum allowed speed
- Based on vision-sensor, GPS + digital speed map and C-ITS



ISA


Speed map / NWB
Speed map / open data portal Antwerp
Digital (Speed) map
30
Vision Sensor Module
GPS
GPS Sensor
C-ITS
Onboard-unit vehicle
RSU
ISA processing & logging unit
Speed limiter vehicle
HMI


30
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ISA developments during the project

Developments during the project:

- Enhanced ISA algorithm for improved funtionality of ISA
- Improving and combining Digital Speed Maps, enabling cross-border funtionality
- Improved HMI, better user interface, enabling C-ITS combined UCs
- Extended ISA logging, enabling better analysis
- ISA feedback-loop; enabling automated updates of the digital speed map based on discrepances between vision sensor and digital speed map
- Combining C-ITS and ISA

ISA Workshop week

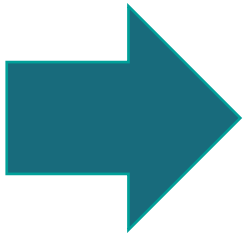
New ISA HMI

ISA developments during project

- **ISA and C-ITS combination**
  - Inform the driver about hazardous situations on the road
  - Based on C-ITS, ETSI IVI & DENM messages
  - Demonstrated with Roadworks Warning & Tunnel Height Warning

Data logging in Antwerp

- Taxi vehicle equipped with inactive ISA
- Allows for analysis of discrepancies between digital map and camera observations
- 8,822 data points



- 3269 camera observations
- 1126 discrepancies (speed limit registered by both digital map & camera)
- Most common discrepancies (digital map vs camera)
  - 70-50
  - 100-70
  - 50-30

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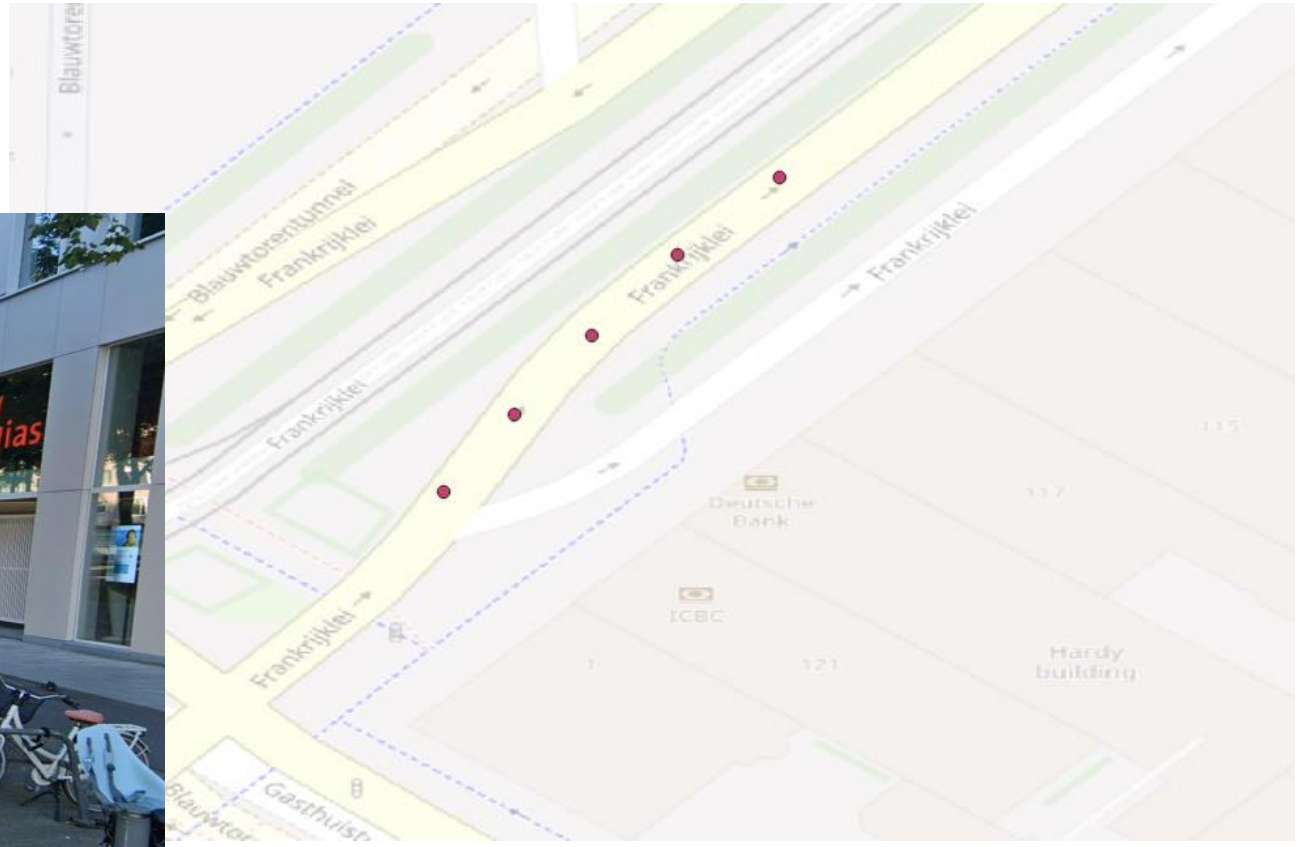
Data logging in Antwerp

- Example of a 50-30 deviation



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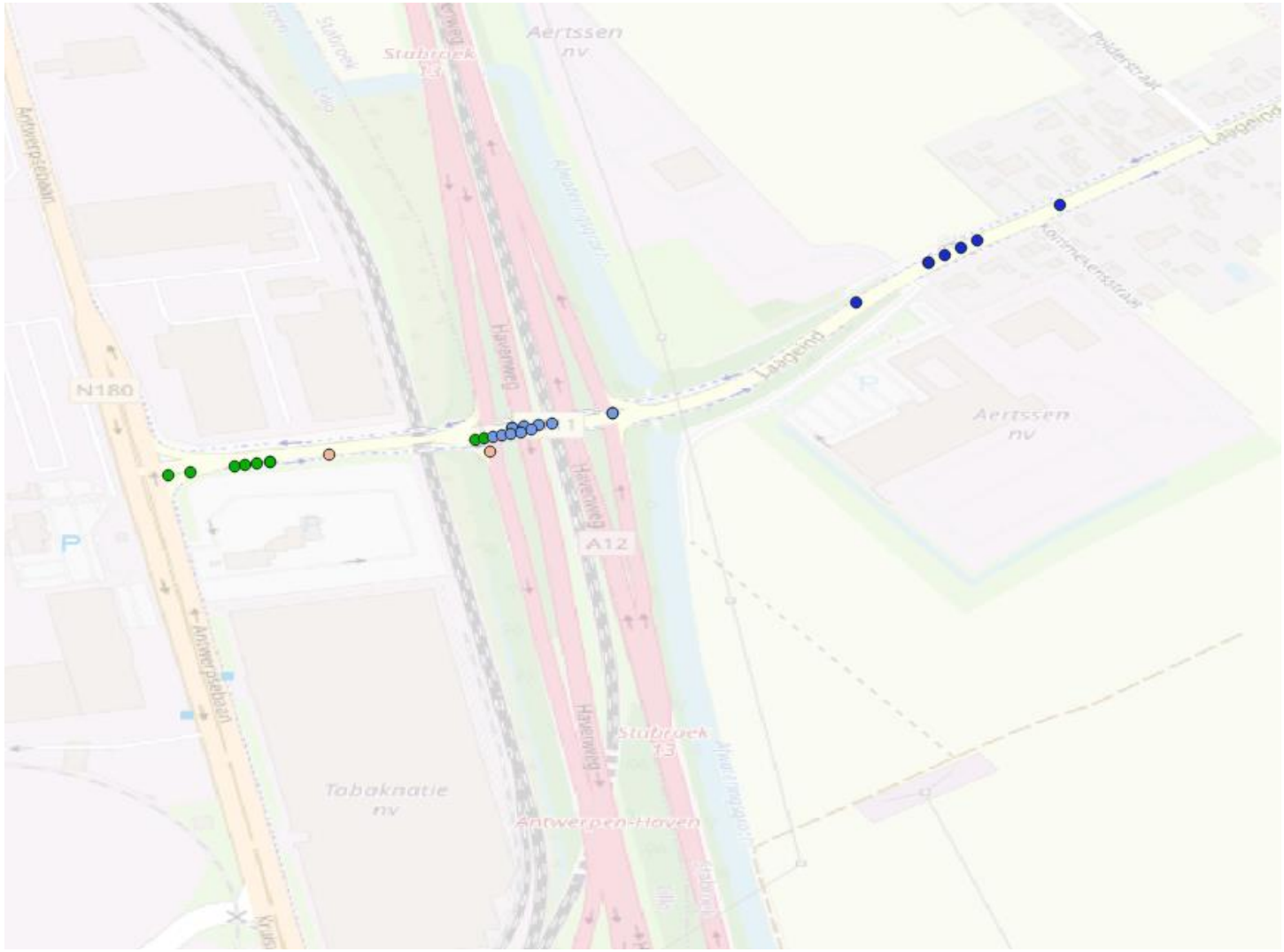
Data logging in Antwerp

- Example of multiple deviations on an overpass
  - 0-50
  - 70-0
  - 70-50
  - 120-50
- Speed limit is 50 km/h



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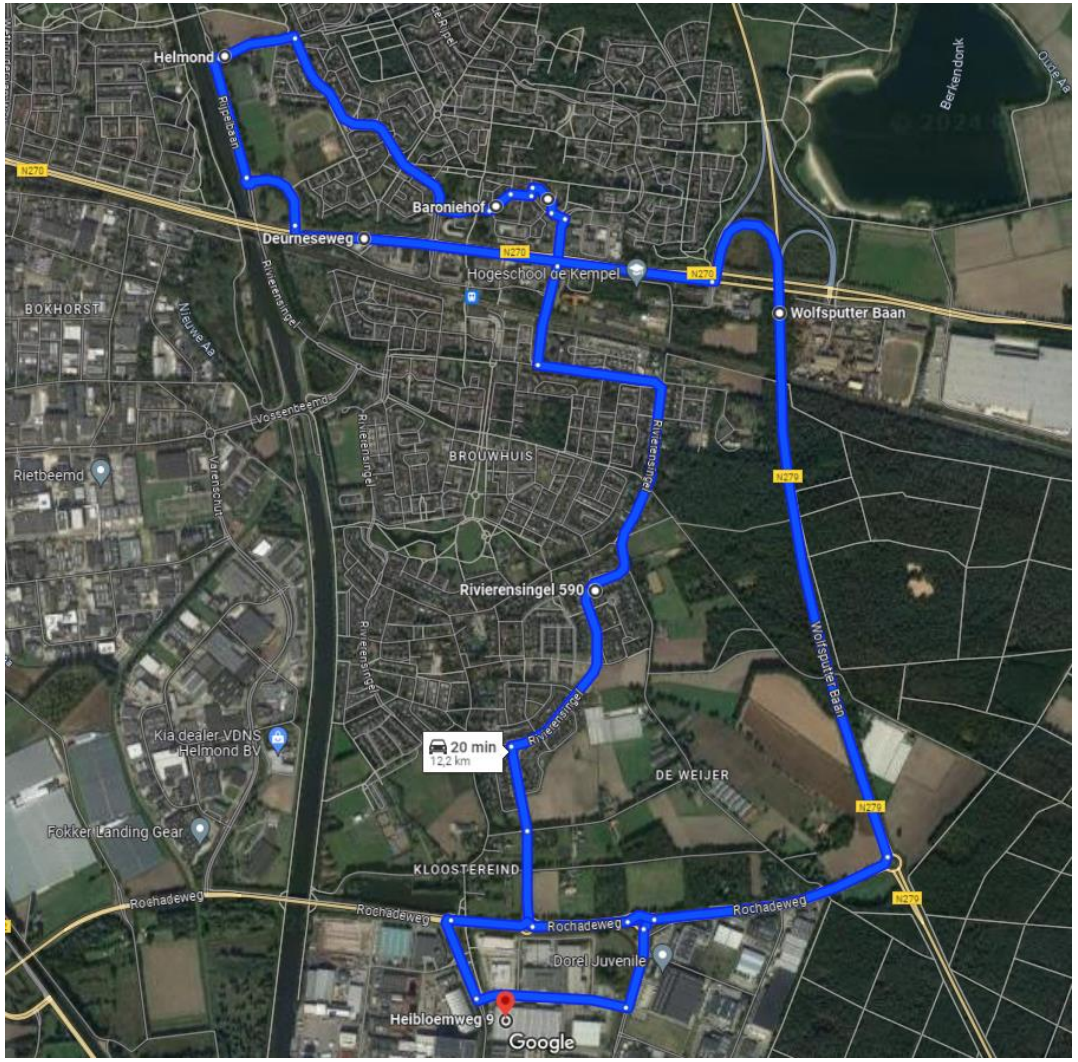
ISA User Acceptability-Acceptance Test

- Aim
  - Testing user acceptability
  - Testing real-world acceptance
- Method
  - Primary tool: surveys before/after the test drive
  - Short interviews after the test drive
- Test drive:
  - Helmond, city in the Netherlands
  - varying speed limits (30 km/h, 50 km/h, and 70 km/h)



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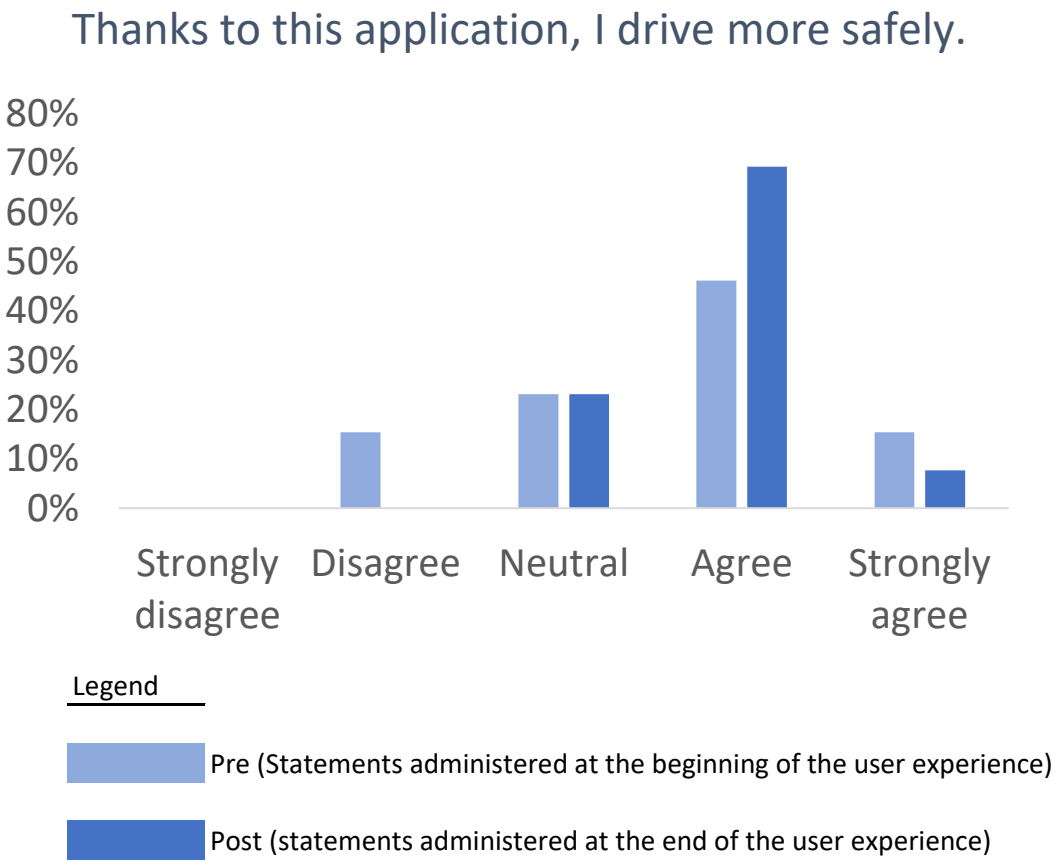
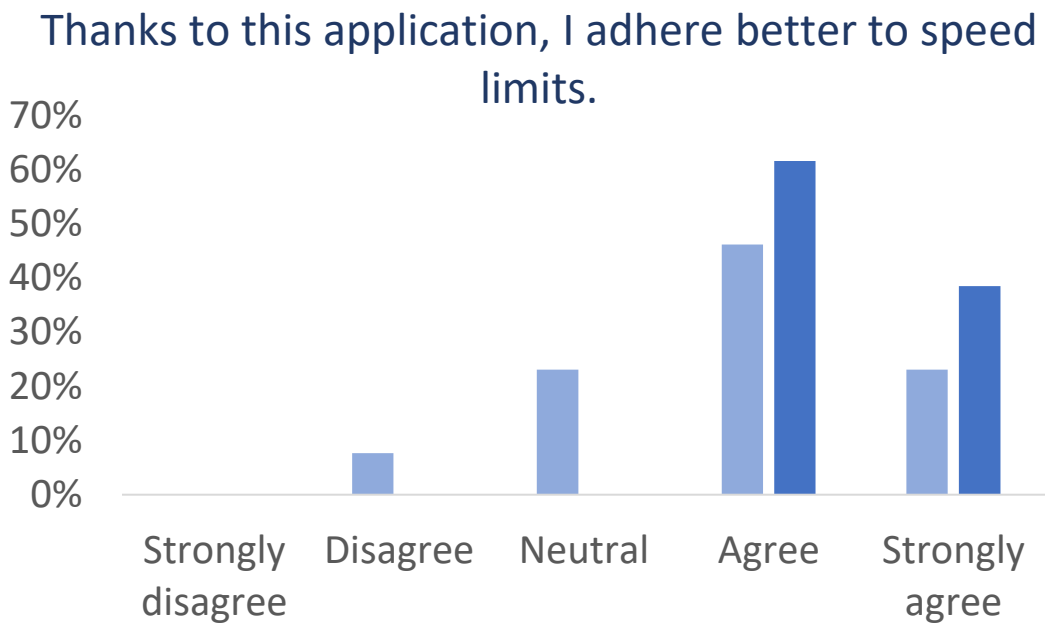
Road Safety Impact (1/2)

- Participants reported driving more safely with ISA
- They responded they follow speed limits better with ISA





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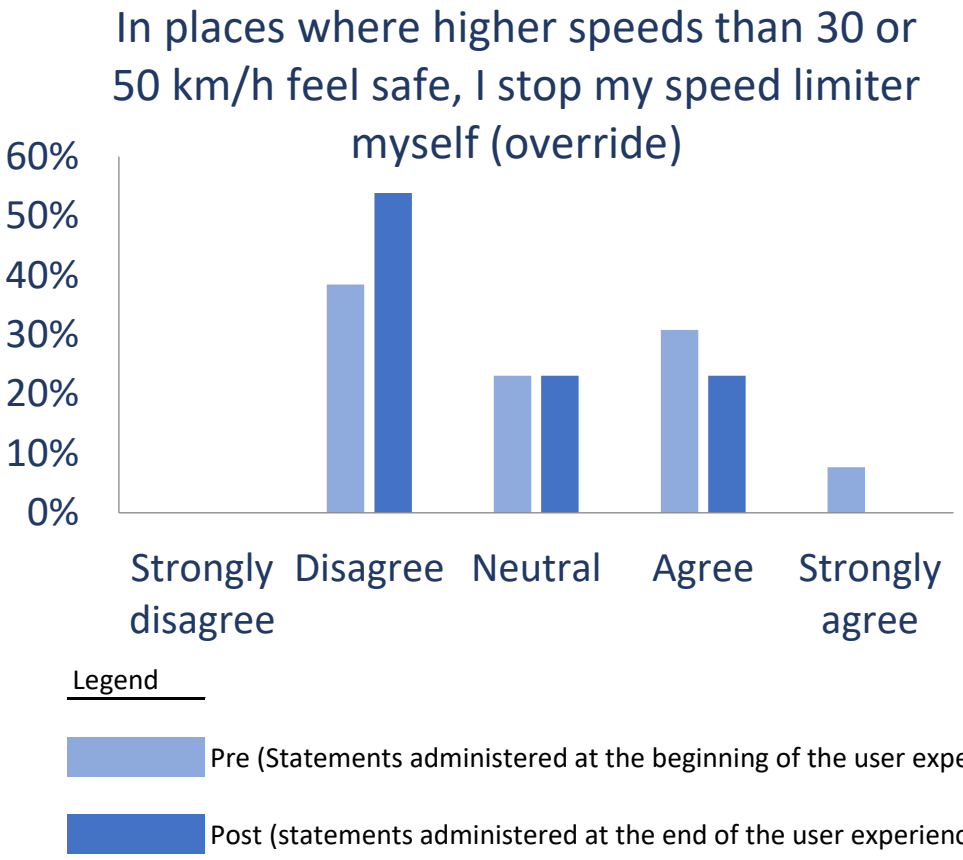
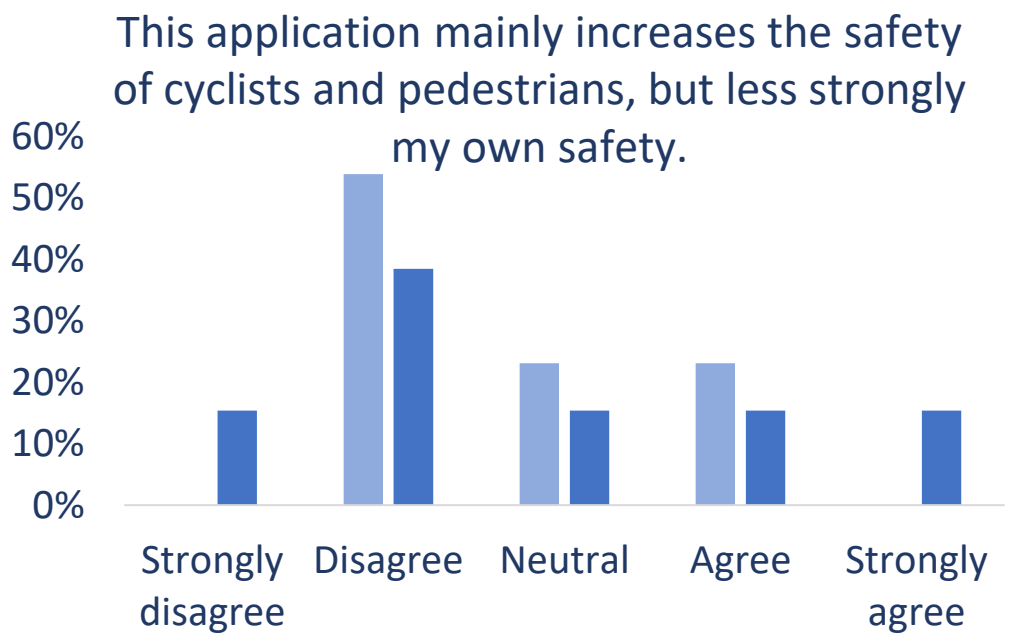
Road Safety Impact (2/2)

- Some indicated they might override it in safe conditions
- Most people recognised the safety benefit for themselves





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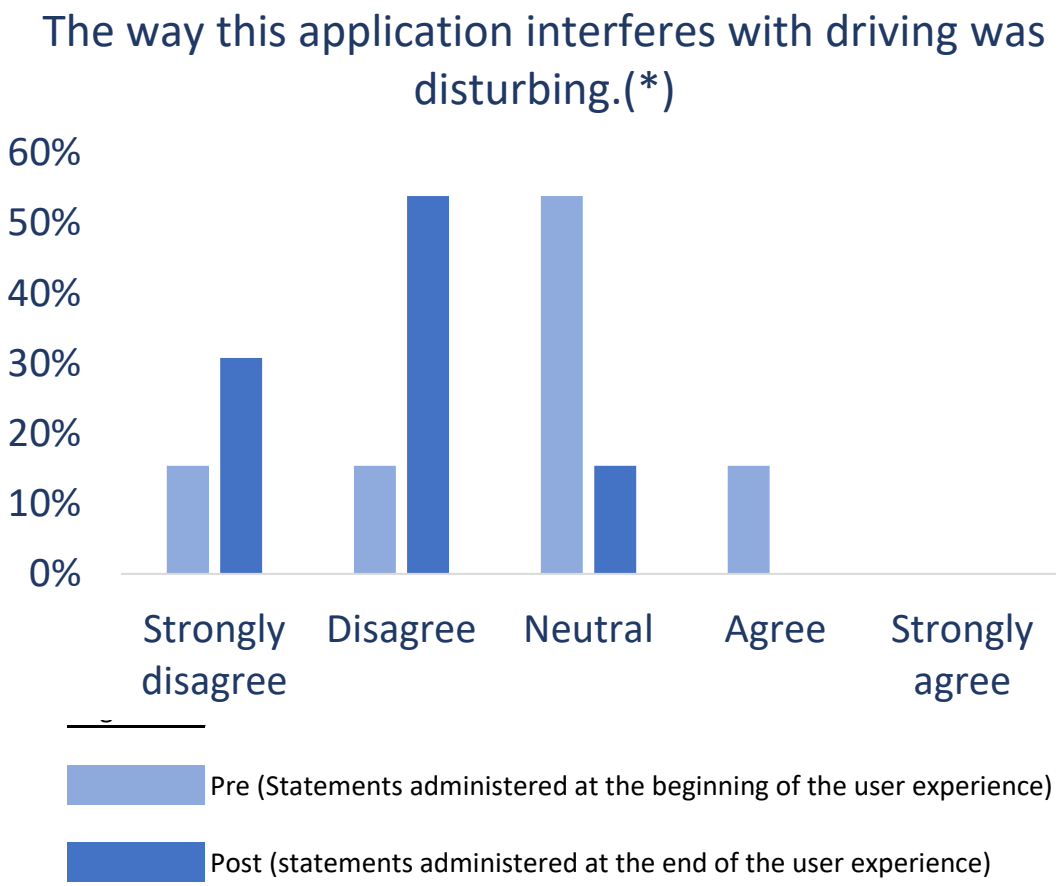
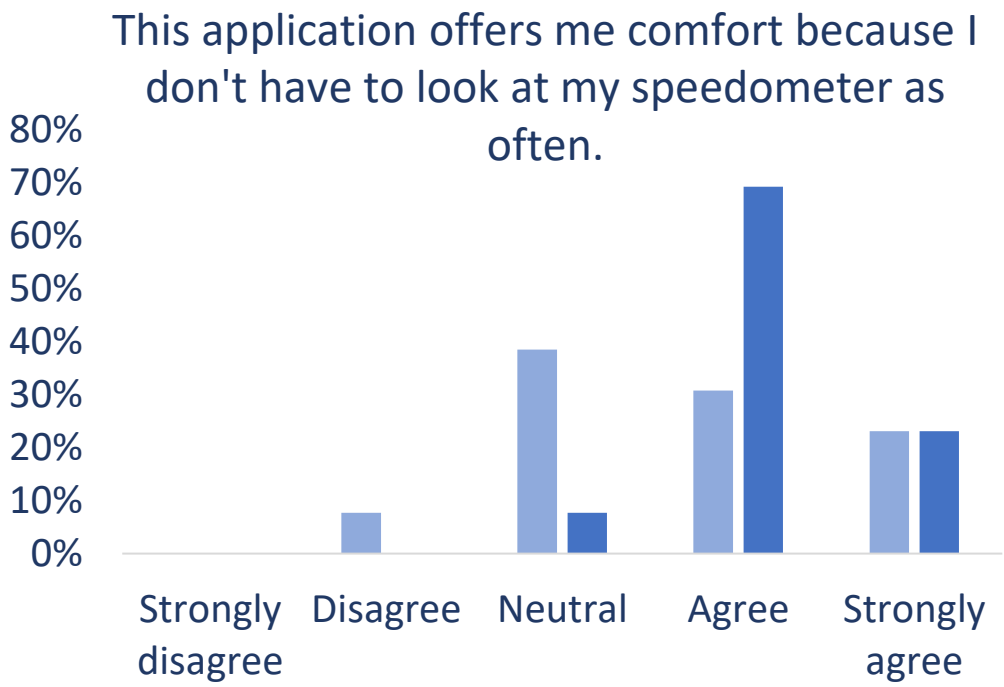
Focus and Distraction

- After the test drive, participants felt fully confident that it would not distract them while driving.
- They reported to look less to the speedometer.





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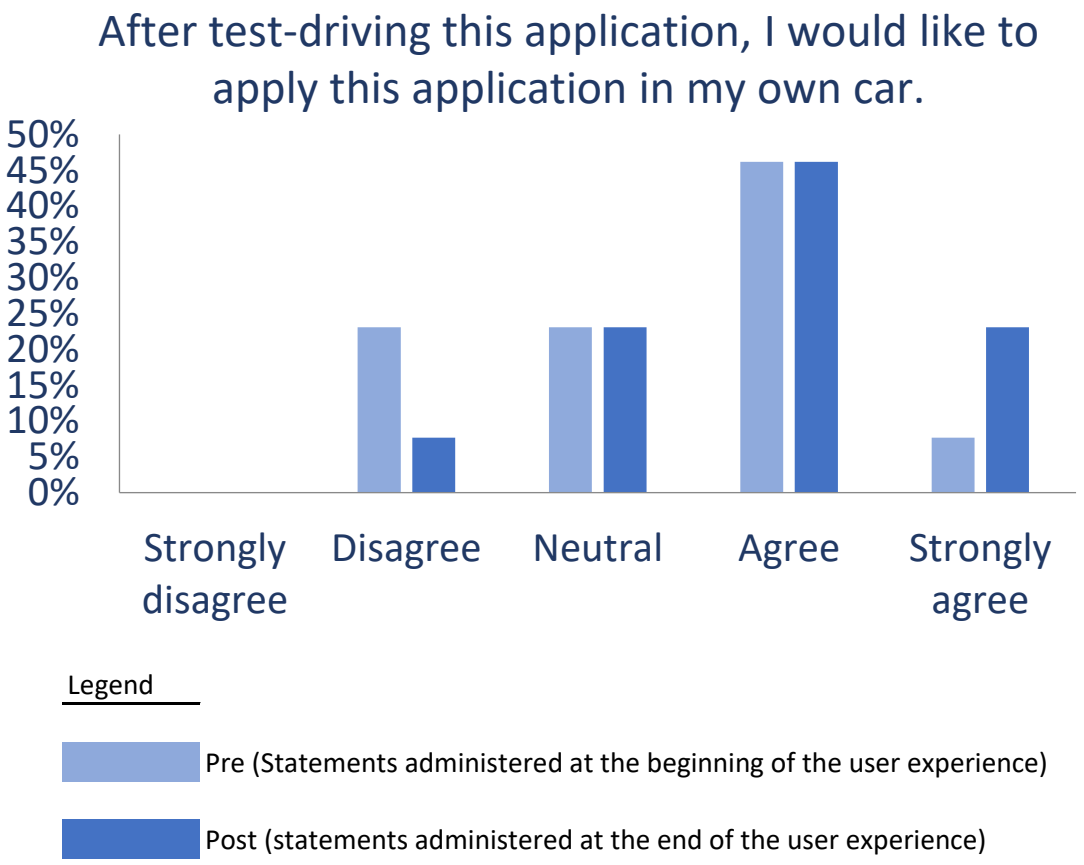
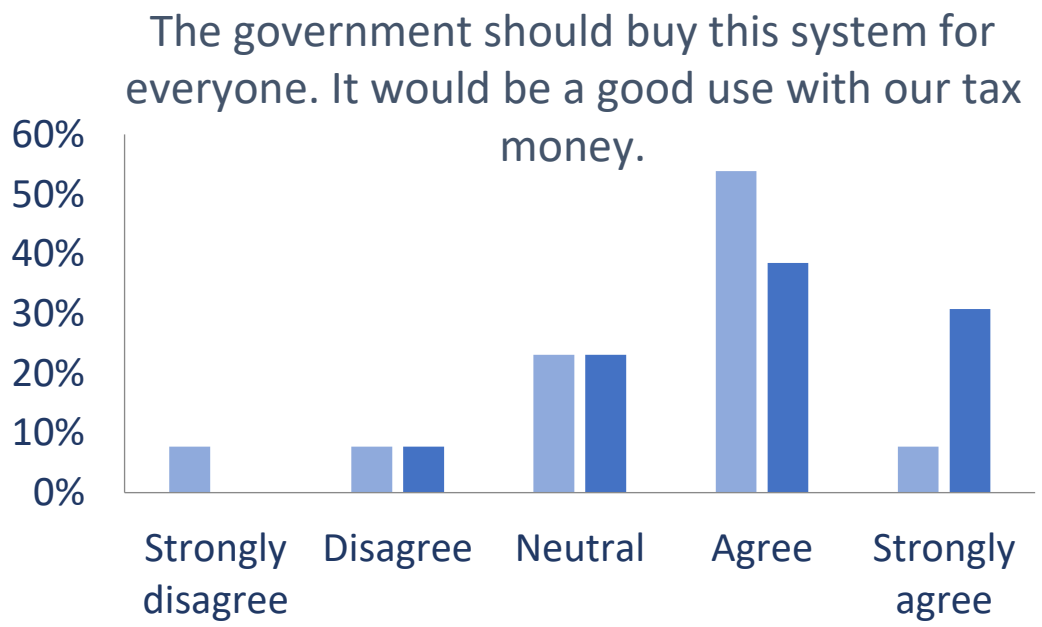
Future Use and adoption

- Most participants found the system useful and would like to adopt it in the future.
- Support for government promotion of ISA technology.





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Overall Evaluation Acceptance

- 90% of participants found ISA useful.
- There was a generally positive expectation about the system. Unfortunately, people with negative expectations are less likely to volunteer. Despite the positive prior expectations, participants became even more positive after the test drive.
- Initially, some participants were reluctant about an intervening system that reduces their driving control, but once they tested it, it, they said in the interview that it felt natural.
- Remark: ISA systems are now mandatory for new cars in Belgium and the Netherlands, following European directives.

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Antwerp-Helmond

Pilot 2: Real-time traffic information via Flitsmeister

Lisa De Winter (Be-Mobile)

October 2024

Co-funded by the European Union

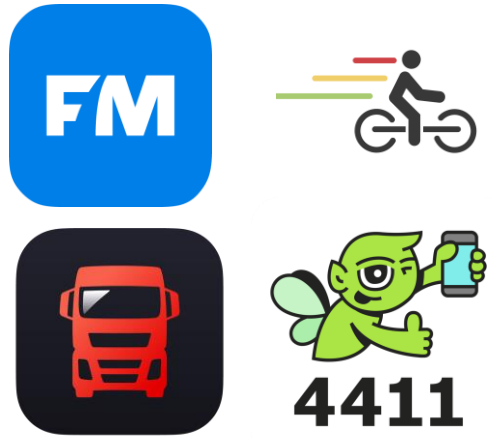
Be-Mobile

- Be-Mobile, based in Belgium (Melle), offers various mobility solutions for:

  Traffic Management, Traffic Information, Mobility Payments, Tolling Management, Logistics

- We support road operators, local governments, parking operators, transport and logistics managers and the automotive sector. Thanks to our leading mobile apps we can also provide services and share traffic information with individual multi-modal road-users.

- Within this project, the focus of Be-Mobile is on:
  - **4G mobile applications and cellular communication (long range)**
  - Our pilot sites: Antwerp, Helmond and TEN-T



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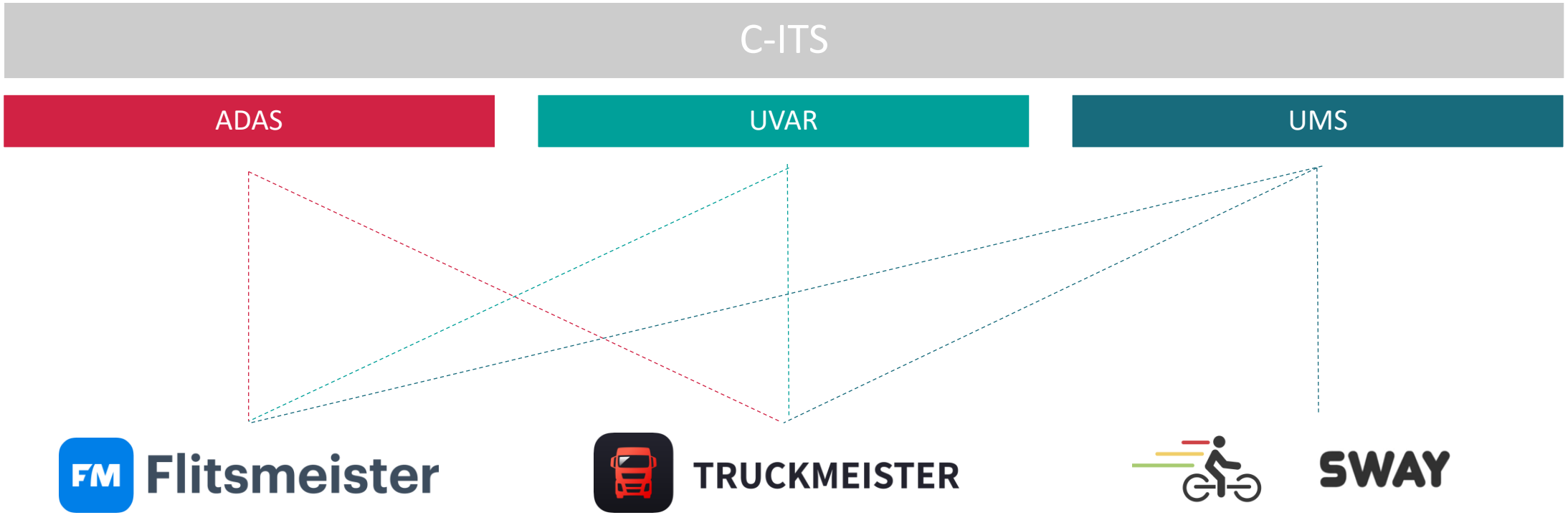
Be-Mobile applications



Our mobile applications

Use cases Flitsmeister

	Target	Recruited test-drivers
Private drivers	500	510
Professional drivers	250	285
Total	**750**	**795**

During our pilot with Flitsmeister we supported the following use cases:

ADAS	*Dynamic and Static Road Works Warning (RWW),* *Dynamic and Static In-Vehicle Signage (IVS),* *Other Hazardous Locations Notification (OHLN),* *Traffic Light Manoeuvres Road and Lane Topology,* *Traffic Jam Ahead on highways*	C-ROADS *DENM, IVI*
UVAR	*Temporary speed restrictions near school areas*	C-ROADS *IVI*
UMS	*P+R information for drivers on the highway (pre-trip advice Scale-Up)*	

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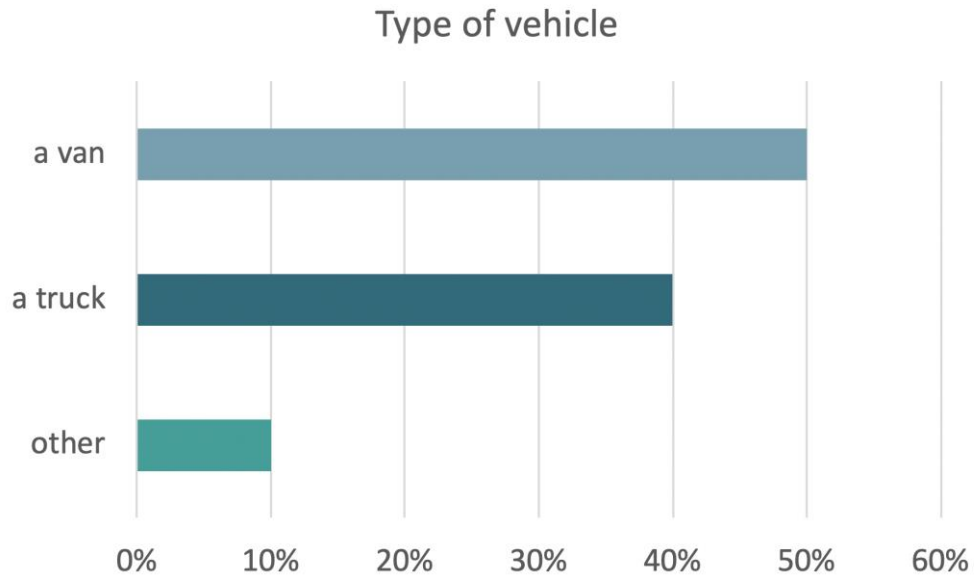
Recruited test drivers

	Target	Recruited test-drivers
Private drivers	500	510
Professional drivers	250	285
Total	**750**	**795**



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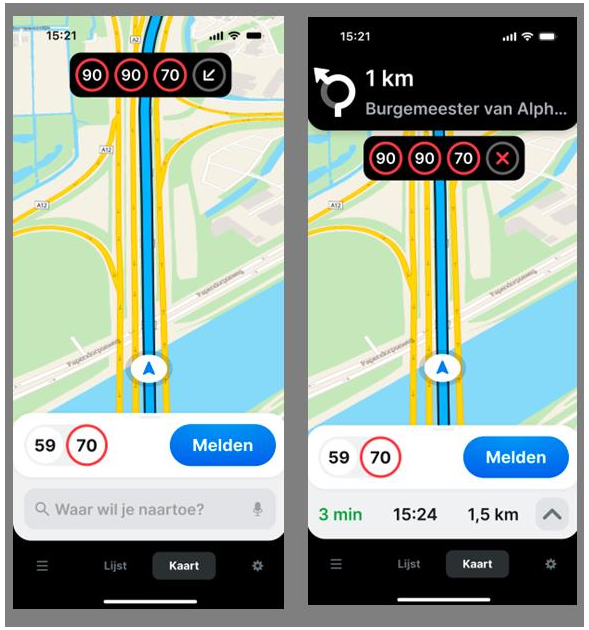
Use cases Flitsmeister

Also suited for truck drivers



IVS

Traffic Light Manoeuvres Road and Lane Topology

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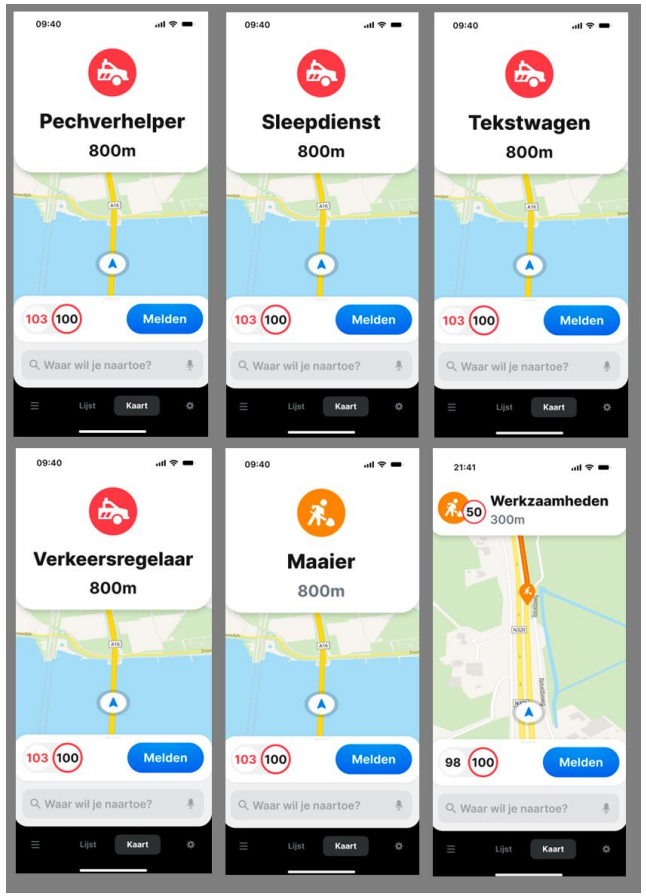
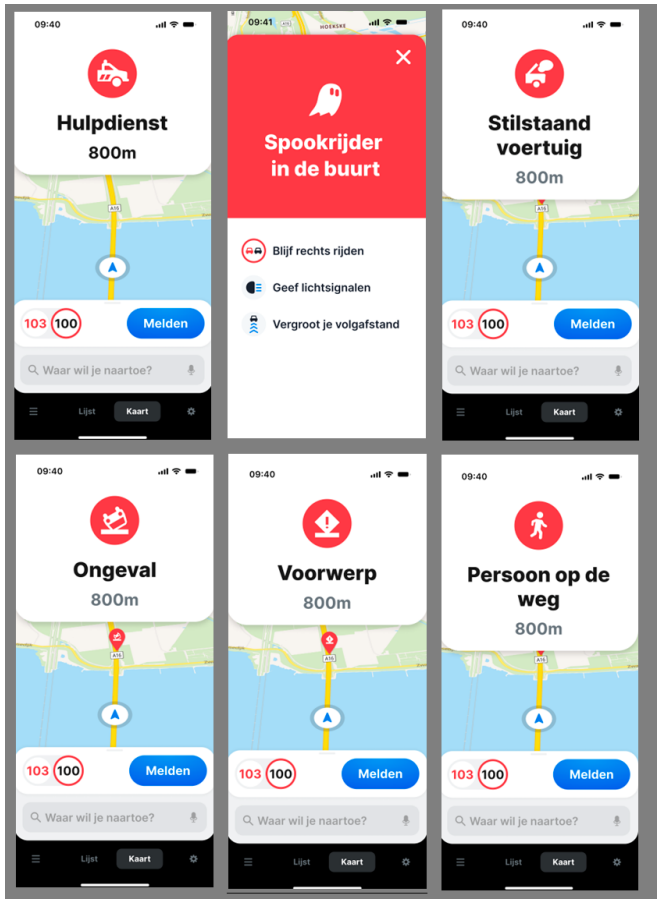
Use cases Flitsmeister



RWW



OHLN

We also collect road user feedback about current and possible new traffic events.
We translate new events in appropriate DENM messages following the C-roads standards.

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RTI User Acceptability-Acceptance Test

- Aim
  - Testing user acceptability and real-world acceptance
- Method
  - Primary tool: surveys conducted before and after two months of using the service
- Participants:
  - Separate groups private and professional drivers
    - acceptability (pre-test) survey: 298 drivers
    - acceptance (post-test) survey 214 drivers

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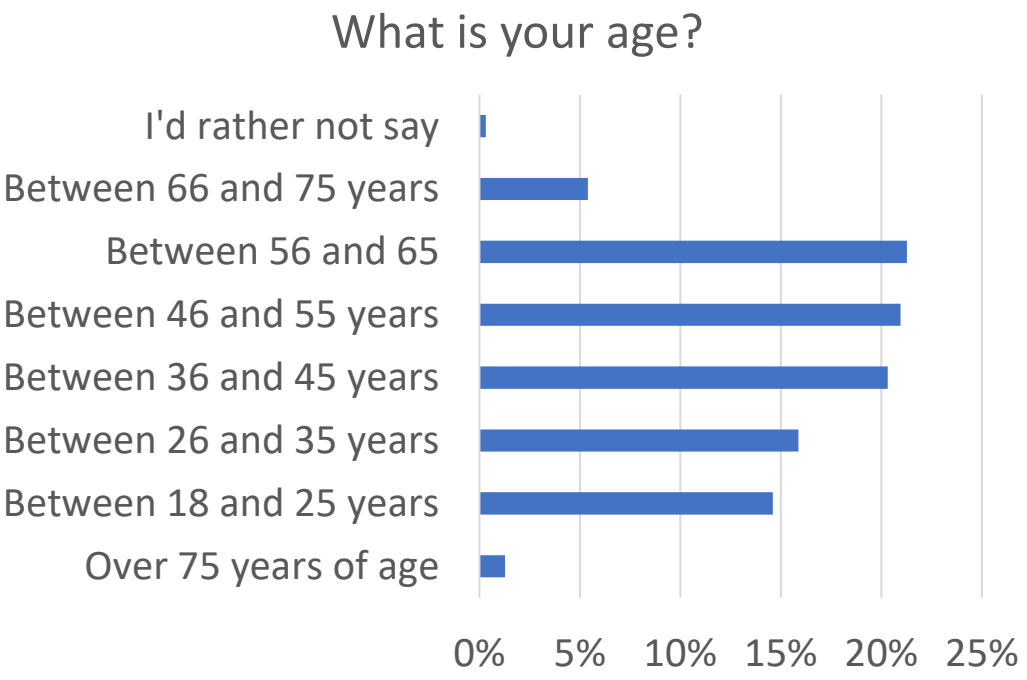
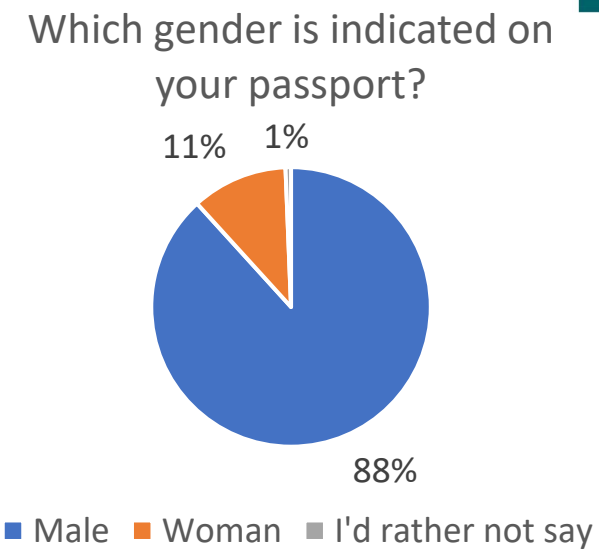
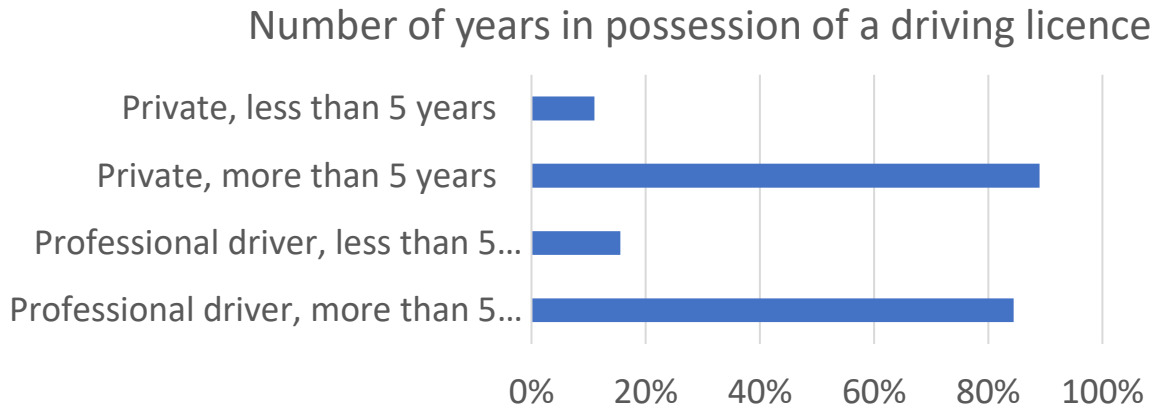
Participants

- Older people are represented, predominantly men
- Most participants are experienced drivers

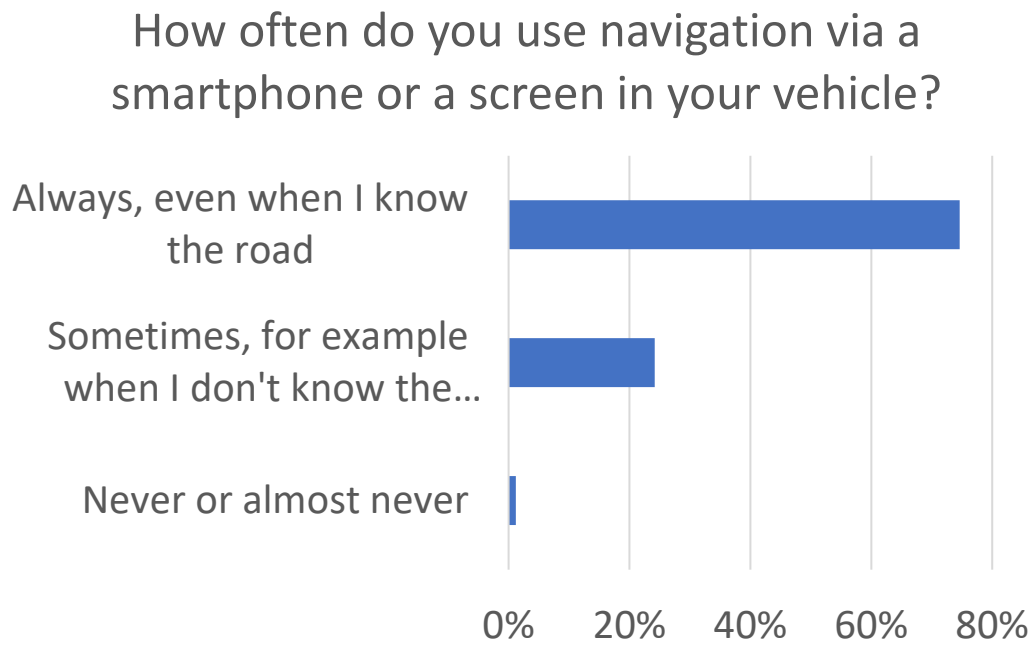


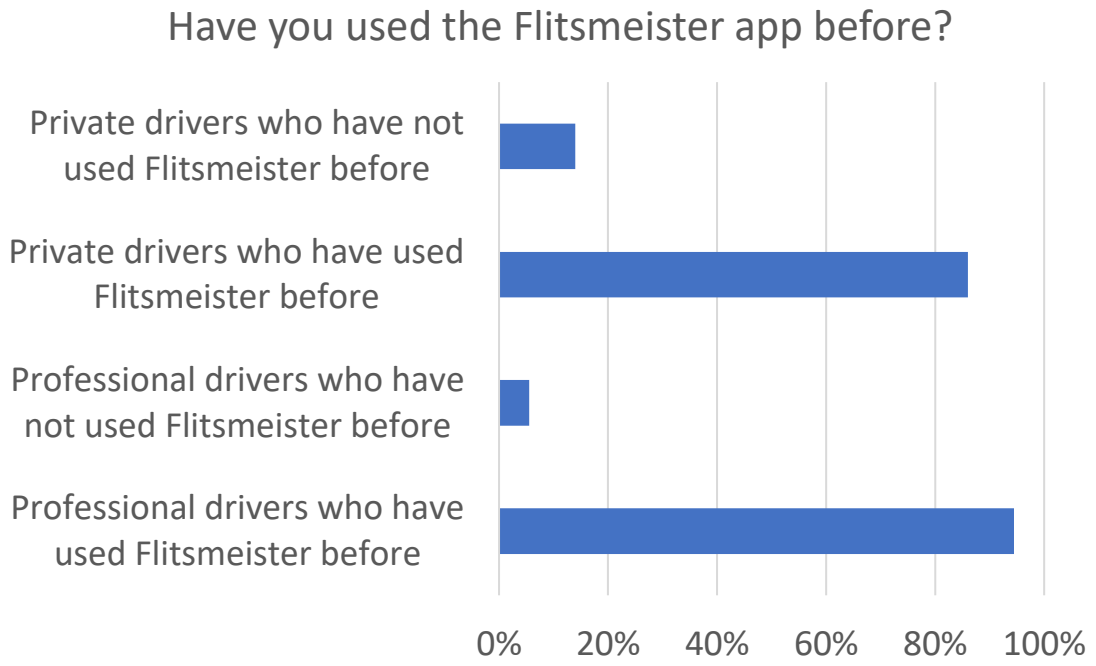




Context Acceptability testing

- Most participants use navigation apps in their cars, usually equipped with information about speed limits, traffic jams, and roadworks.
- Most participants have prior experience with the Flitsmeister app, so with similar Real-time traffic information (RTI) services to the one being tested.





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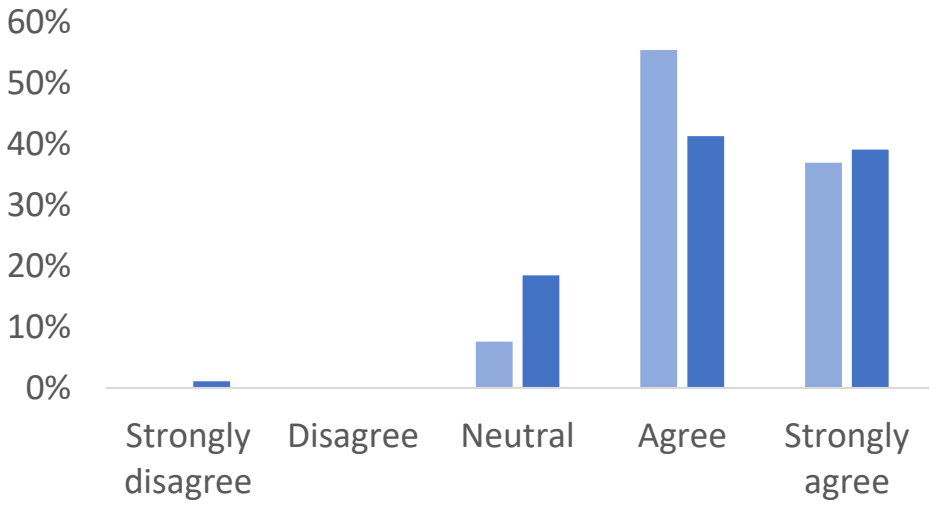
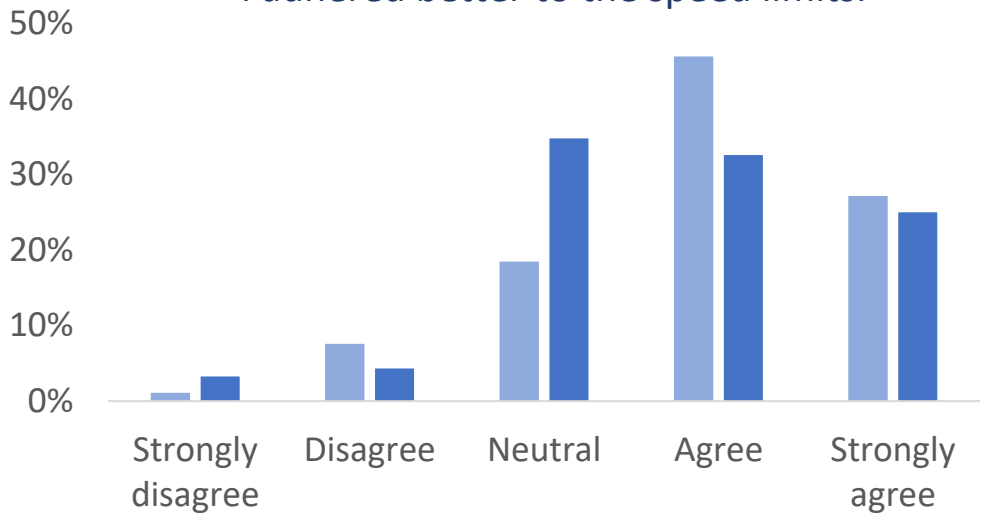
Road Safety Impact (1/2)

- Participants reported driving more safely with RTI
- They responded they follow speed limits better with RTI

With the received notifications messages in the past month, I drove more safely with the vehicle.



With the received notifications in the past month, I adhered better to the speed limits.



Legend

Pre (Statements administered at the beginning of the user experience)

Post (statements administered at the end of the user experience)

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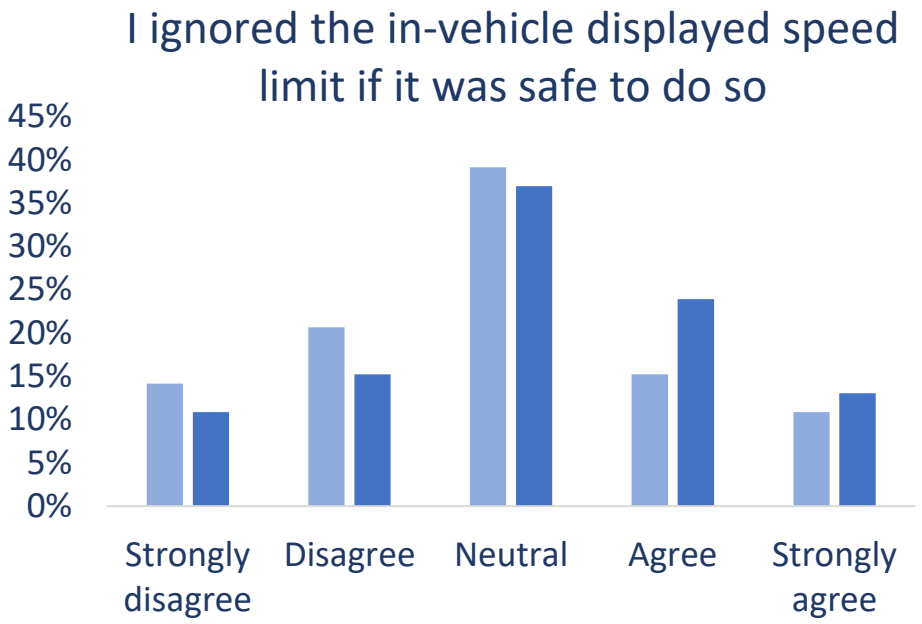
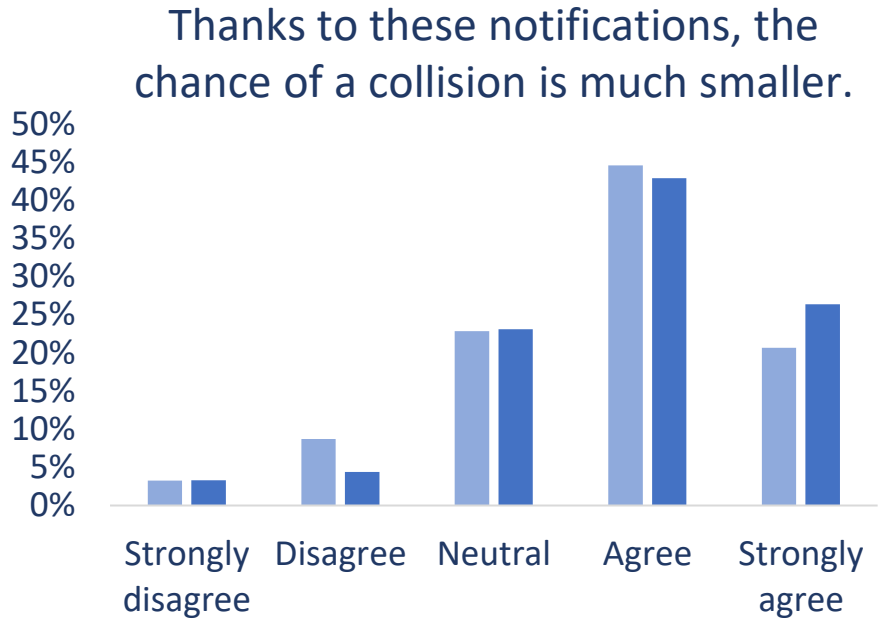
Road Safety Impact (2/2)

- About half planned to ignore advisory speed limits, but this number decreased after using the service
- Most participants believe the chance of a collision decreases with the services, and this belief remains stable after using the updated traffic information services.





Legend

Pre (Statements administered at the beginning of the user experience)

Post (statements administered at the end of the user experience)

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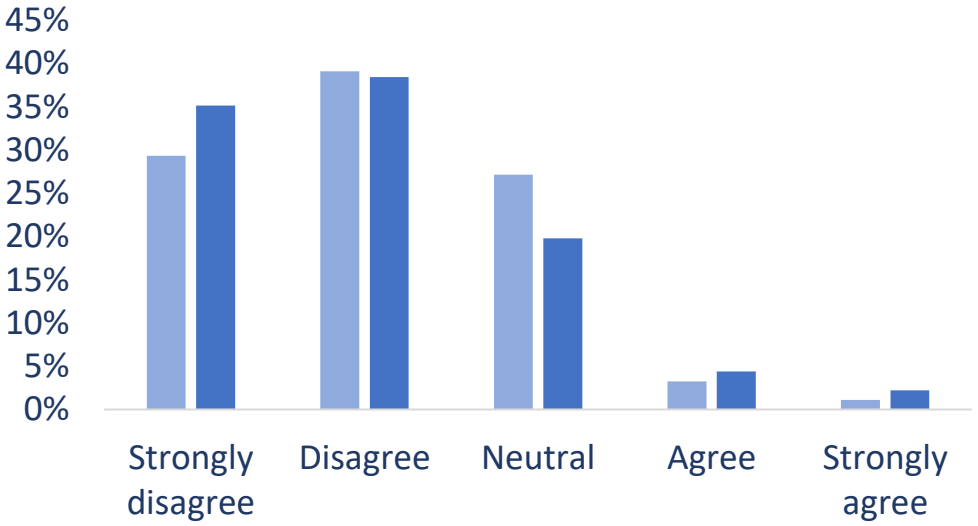
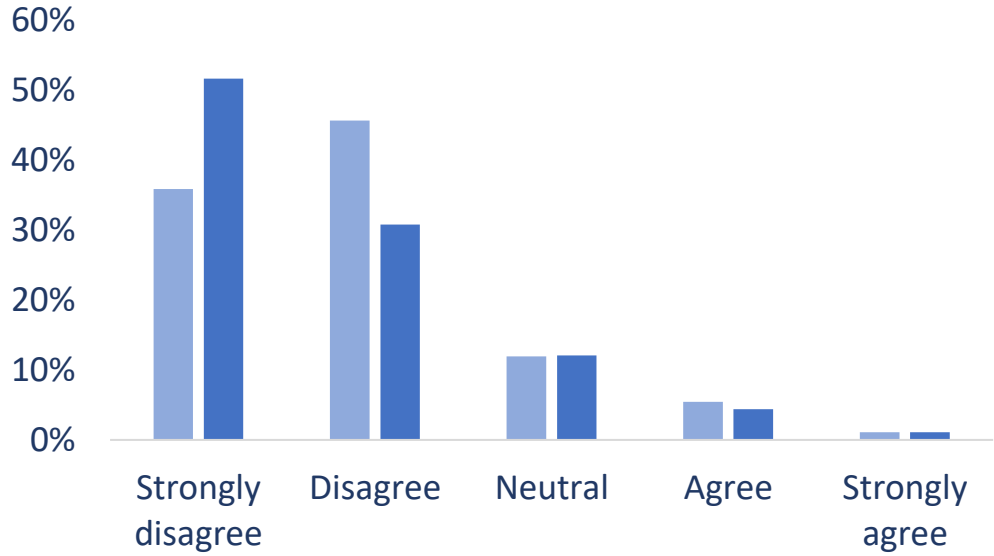
Focus and Distraction (1/2)

- Participants did not find speed warnings annoying.
- Overall, participants did not perceive the notifications as distracting

I found the way this app warns about excessive speed to be annoying.



The notifications were distracting while driving, so I turned off (most) of them.



Legend

Pre (Statements administered at the beginning of the user experience)

Post (statements administered at the end of the user experience)

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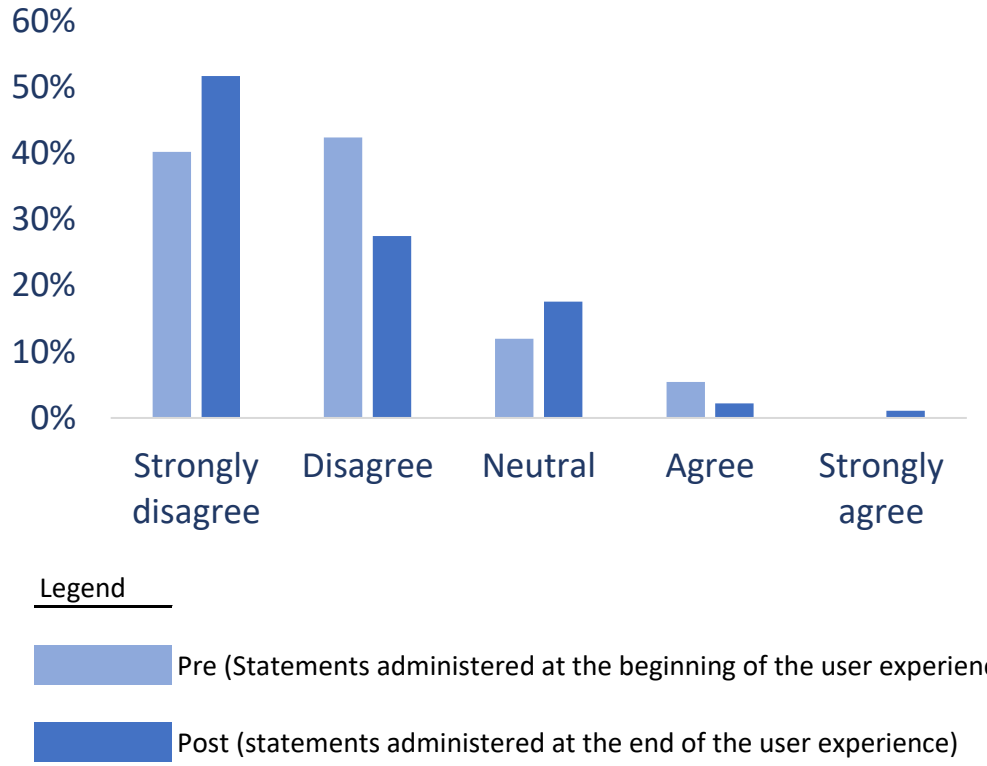
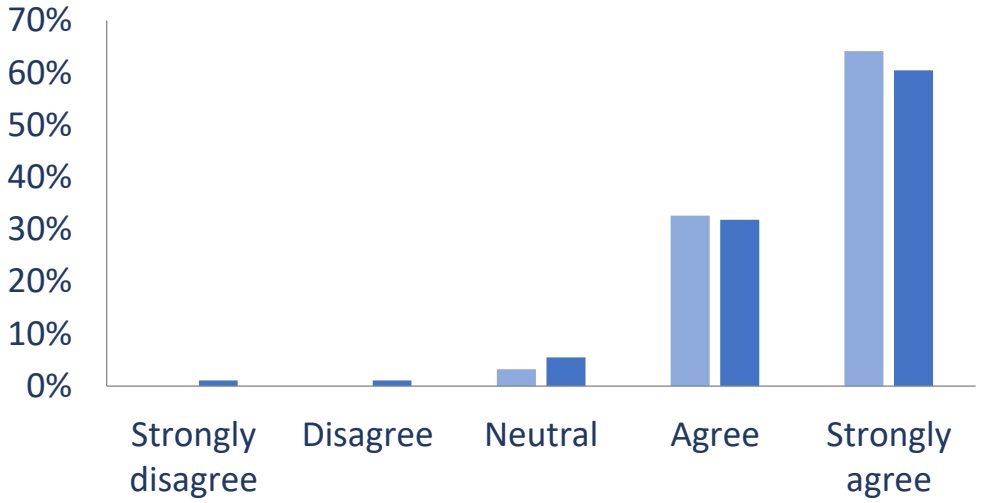
Focus and Distraction (2/2)

- Participants found the notifications non-distracting, posing no threat to road safety
- They agreed that the notifications are easily understandable

The notifications distracted my attention from the traffic, so they did not contribute to road safety.



The notification screens in the mobile app were easy to understand.



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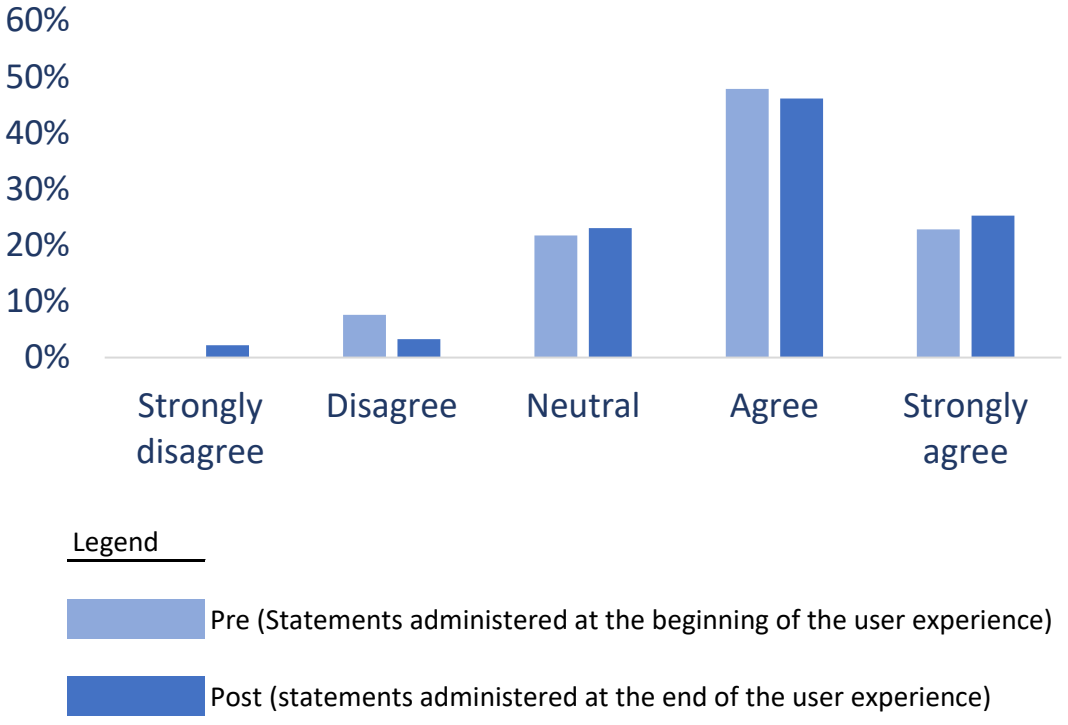
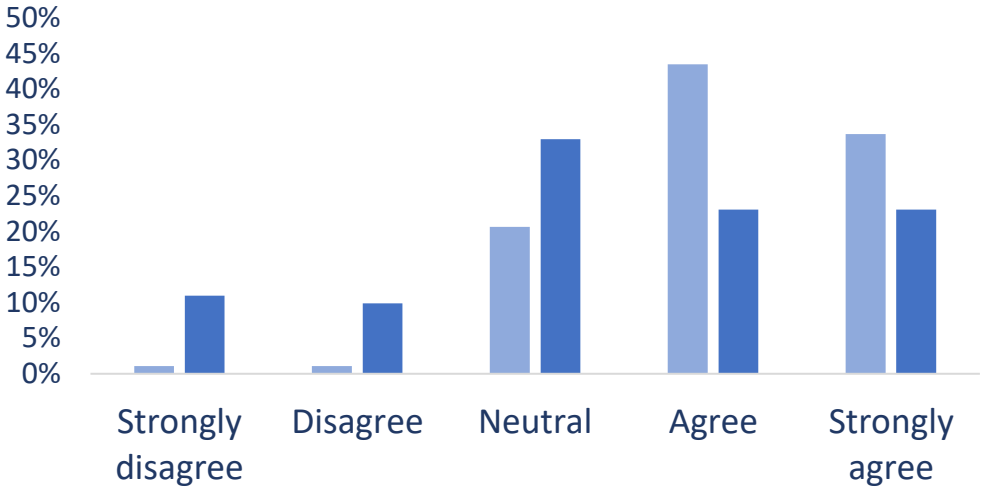
Traffic efficiency

- Most participants believe that the service can improve traffic efficiency
- Before using the updated service, participants believed the traffic light IVS would help them adjust their speed gradually, but fewer felt convinced after using it.

If everyone received these notifications, traffic would flow more smoothly, and traffic jams would be shorter.

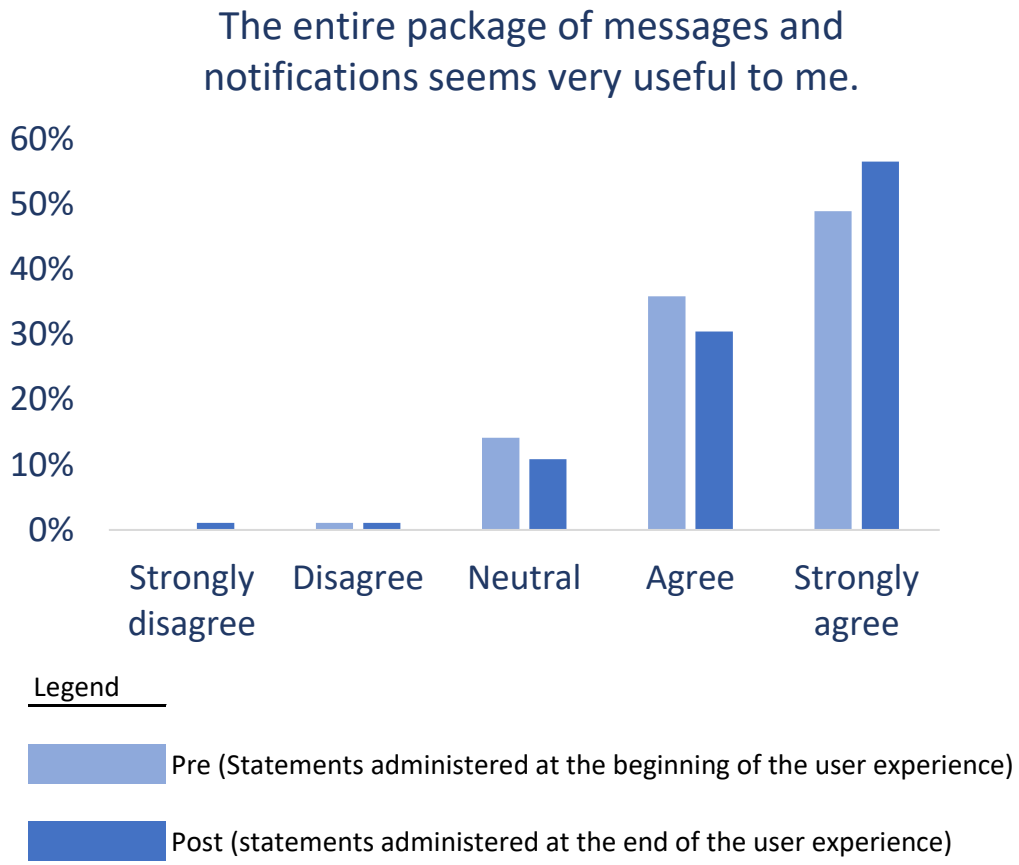


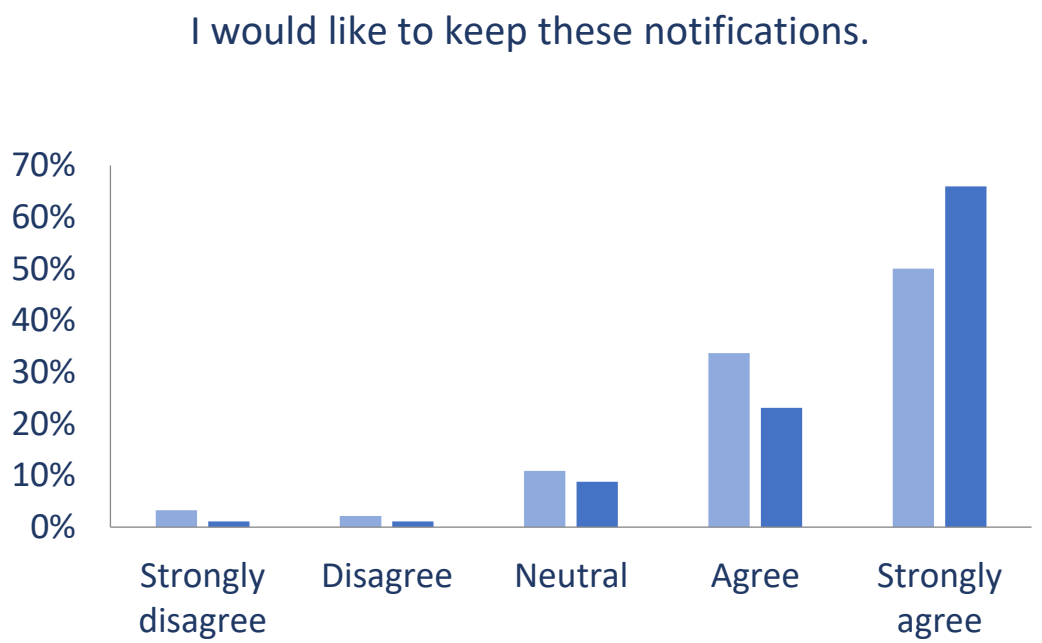
Knowing the light timing helped me slow down gradually instead of slamming on the brakes.



Usability and Adoption (1/2)

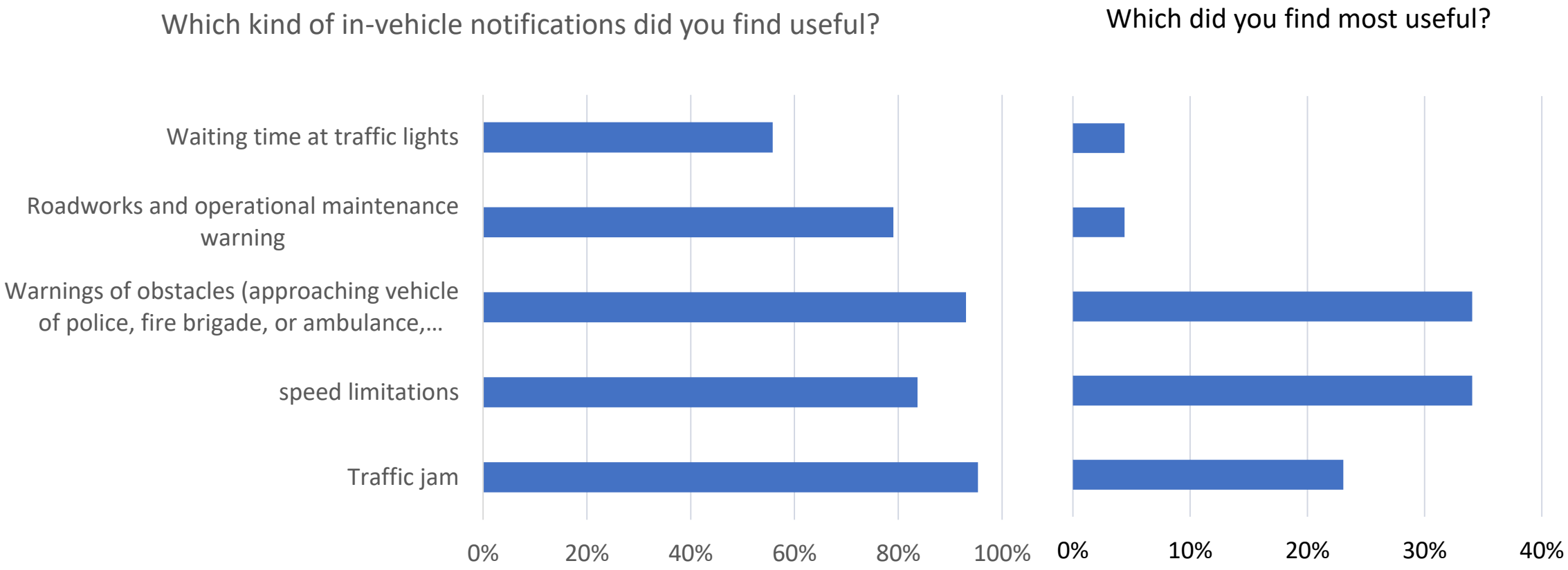
- Overall acceptance of usability and adoption





Usability and Adoption (2/2)

- All notifications were found useful, but warnings for obstacles speed limitations and traffic jam were found most useful.



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Comparison among participants groups

- Similar response tendencies were observed for professional drivers.
- Survey on attitudes and socio-demographic attributes were administered. Acceptance was compared among groups of participants
  - Attitude towards road safety, receptiveness to innovation, the need for being informed, and high versus low app usage.
  - We did not find any meaningful differences, possibly because the group of voluntary participants was too homogenous.

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Conclusion

- Overall high acceptability and acceptance of the services.
  - Believe in potential to enhance road safety
  - Believe in improving traffic efficiency
  - Consider that most participants were already users
- There were some reservations about how the traffic light IVS smooths out driving, especially after the use of the service.

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Antwerp-Helmond

Pilot 3: Slow-Speed Zones

Lucas van den Elshout (City of Antwerp)

October 2024

Co-funded by the European Union

First Regulations 2018

C-ROADS

STAD ANTWERPEN

First Issues

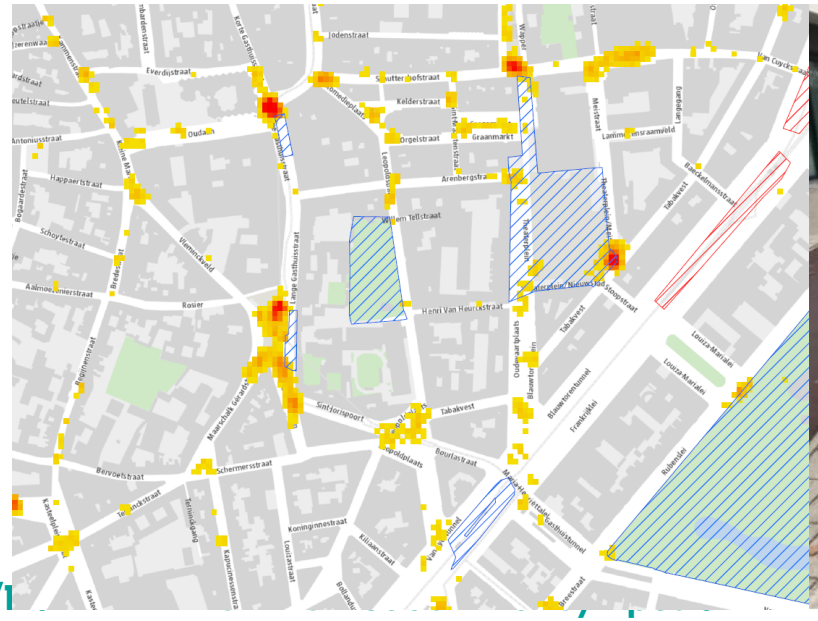
1. Uncontrolled growth
2. Chaotic parking
3. No way to interfere or control

1. A permit as means of control
2. Limit the number of permits
3. Limit the total amount of vehicles
4. Limit the number of vehicles within the city center
5. Hold companies responsible for parking issues




Revision 2021

1. Geofencing: No-go-zones, No-Park-Zones and Slow-Speed-Zones
2. Create dropzones based on parking data
3. Limit the number of vehicles within the city center
4. Monitoring the data provided by shared mobility companies



Evaluation of Slow Speed Zones

> “
> Does a slow-speed-zone (SSZ) for shared electric scooters have a positive impact on the safety and comfort of pedestrians in that area?

Functional test

Making trips in and out of the slow speed zone to learn about it from first hand experience.

Evaluation of historical trip data of electric scooters

Analyse trip data from before a SSZ and when it was introduced. Are drivers impacted by the SSZ changing their route?

Survey

What causes discomfort; and (possible) conflicts pedestrians and faster active road users?
What is the willingness of cyclists and scooter drivers to lower their speed in pedestrian zones?

Traffic counting and observation

Count the modal split in a slow speed zone to discover how many active road users will be impacted due to the SSZ

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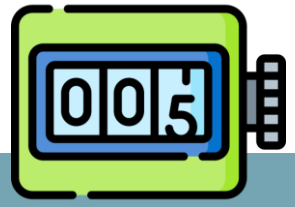
Traffic counting and observation



- In observations it became clear that the speed of 8 km/h works when e-scooters drive through pedestrian areas.
- Even though it only has impact on a very small group of user we think the Slow Speed Zones are a **good safety policy**.
- The question remains, how intelligent speed adaptation can be **implemented towards more modes.**

Numbers

13,4% of the micromobility modes was an e-scooter

3% of the micromobility modes was a shared e-scooter

80% of the e-scooters was private

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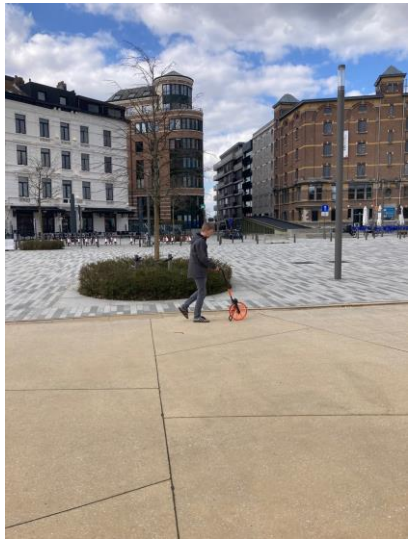
Functional test

Not all scooters reacted and breaked fast enough in the Slow Speed zone.

GPS frequency plays an even more important role than accuracy. Both need to be good enough.

Agreements about top speed and breaking need to be clear and upheld.



	A1	A2	B1	B2	C1	C1
Average SSZ activation distance in m.	64	68	16	41	69	25
Average SSZ deactivation distance in m.	35	18	6	20	-4	-6
Average deceleration distance in m.	23	-	12	-	-	65

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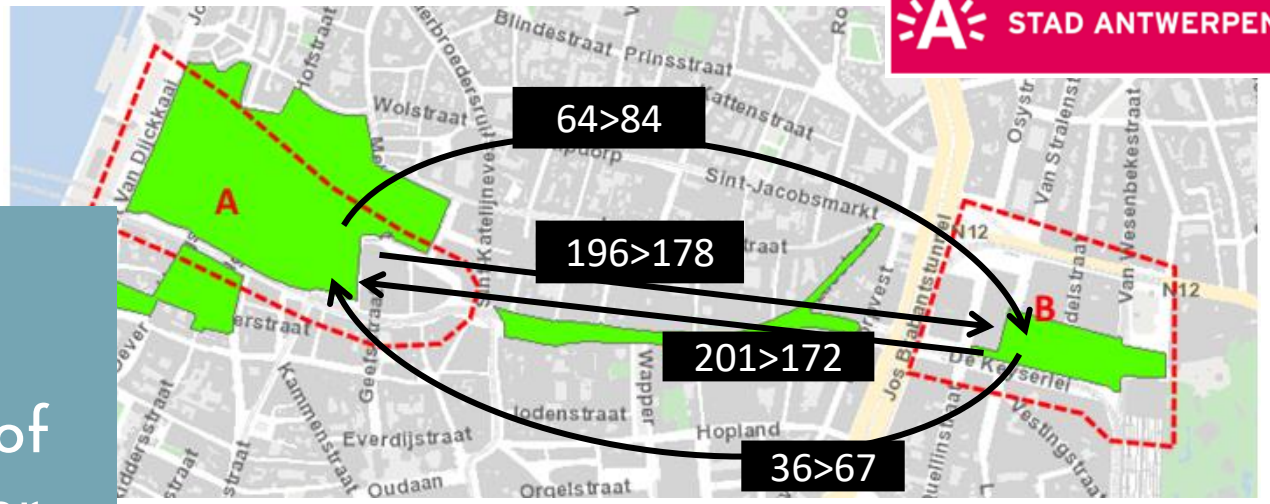
Historical trip data

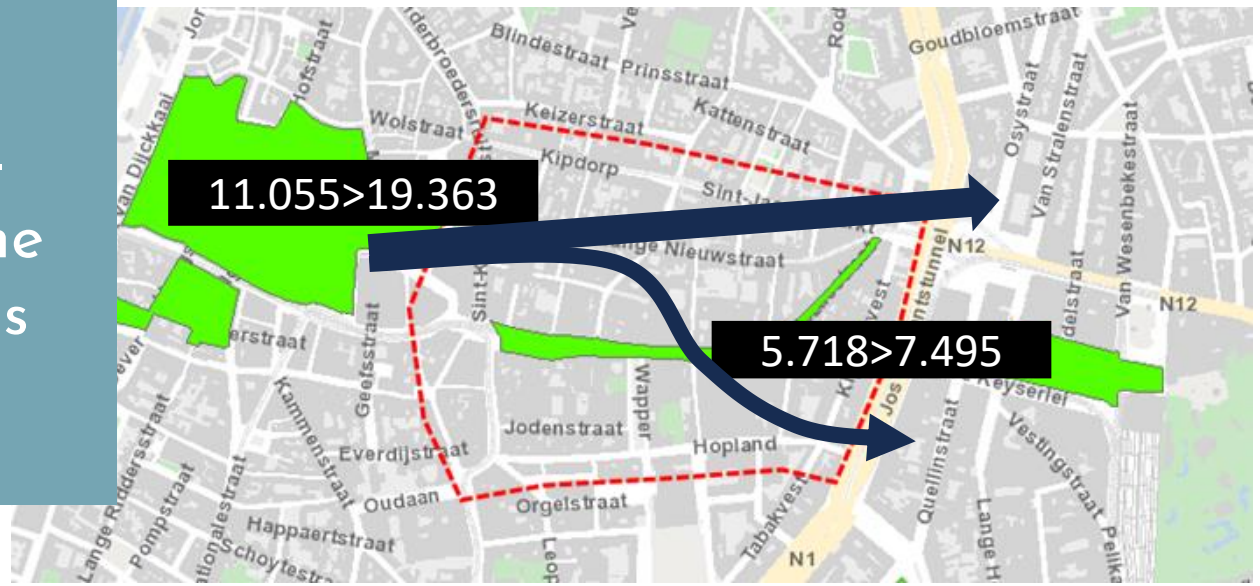
Method 1

A **7.5%** drop of trips through SSZ-C towards the Station and a **12,4%** drop of trips through SSZ-C towards the Center

Method 2

Before implementing the Slow-Speed-Zone **12.9%** of all trips went through the Meir and after the implementation this number became **9.7%.**





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Survey

Most drivers think 8km/u is too slow; and that slow speed zones make them consider using a private scooter and change their route.

Although drivers are not positive towards the policy, they do think it creates a safer environment in pedestrian zones.

Pedestrians on the shopping streets want this policy to be extended to other zones and modes of transport. Their frustration towards electric scooters is very high, yet so is their frustration towards cyclists and mopeds in these areas.

Many don't experience a difference between private scooters and shared scooters in a slow speed zone, making it hard to relate their answers directly to this policy.

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Conclusion

> “
> We think a slow-speed-zone (SSZ) for shared electric scooters has a small positive impact on the safety and comfort of pedestrians in that area. However, valuable enough.

Functionality

Improvements need to be made to let electric scooters react timely and consistently to geo-zones.

Impact on routing

After the implementation a small group of the drivers where avoiding the slow speed zone.

Opinions

Drivers of shared electric scooters are considering private scooters due to slow speed zones.
Pedestrians agree with this measurement and want to see it expanded towards other locations and modes as their frustration is high.

Impact

The impact of slow speed zones is relatively low as there are many private scooters and bikes on the streets that where not effected.

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C-ROADS

Antwerp-Helmond

Pilot 4: Traffic Light Priority

Johan Hellemans – Yunex Traffic

October 2024

Co-funded by the European Union

Pilot 4 Traffic Light Priority

C-ROADS

YUNEX TRAFFIC

C-ITS Cooperative Intelligent Transport Systems

- Be-Mobile Sway Application for Cyclists
- Tests with announcement & priority requests depending on the time of the day

SWAY

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Pilot 4 Traffic Light Priority

- No need to push the button & early announcement
- Smoother handling by Traffic Controller
- Actual status and Time to green information in APP

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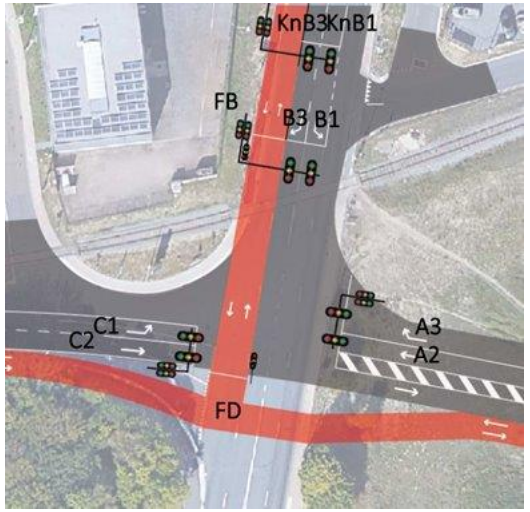
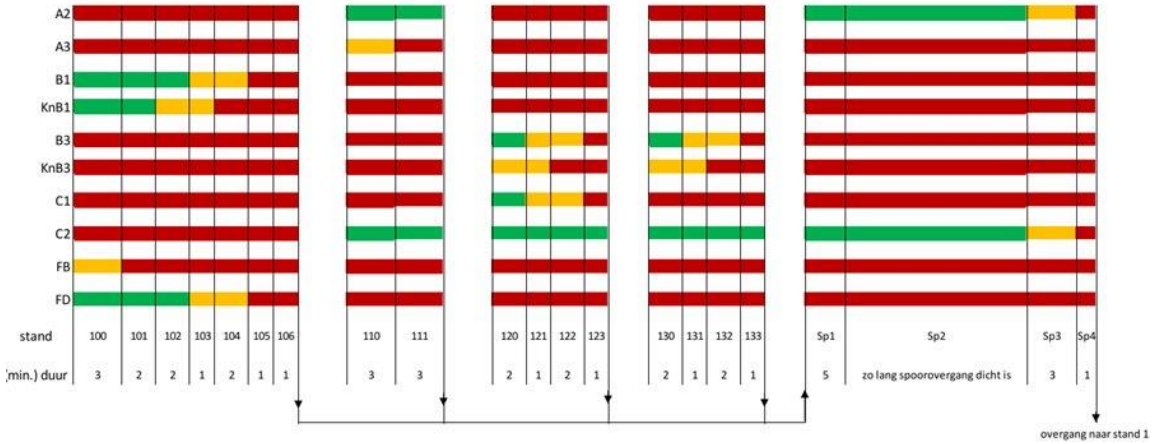
Pilot 4 Traffic Light Priority

CEF C-Roads Project:

- Upgrade intersections to enable C-ITS & optimizations for Cyclists
- Link traffic controllers with Mobilidata
- Enhanced and deployed Sway APP on Mobilidata





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Pilot 4 Traffic Light Priority

CEF C-Roads Project:

- Invited cyclists to use the Sway APP via email, flyering, webinars & local posters
- Collected user feedback

Pilot 4 Traffic Light Priority

CEF C-Roads Project:

- Truck Priority test in cooperation with Foodsavers
- Licensed Truckmeister APP
- Mild priority following time schedule aligned with City of Antwerp

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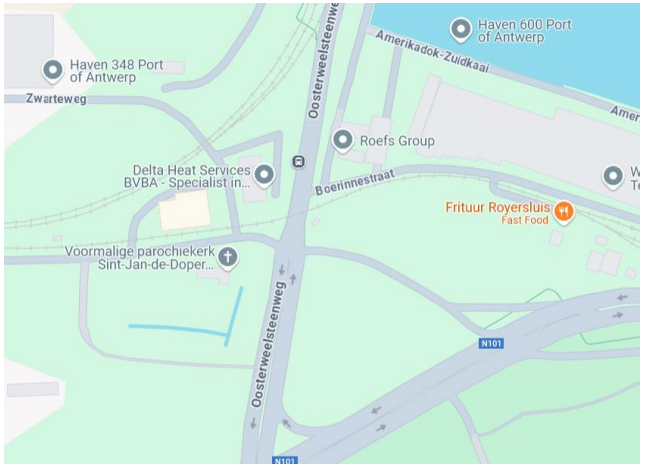
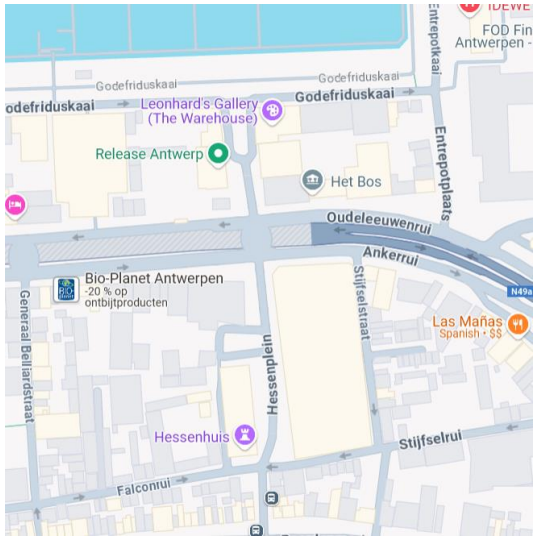
Traffic Light Priority User Acceptability-Acceptance Test

- Aim
  - Testing user acceptability and real-world acceptance
- Method
  - Primary tool: surveys conducted before and after three weeks of using the service
- Participants:
  - Voluntary cyclists passing 2 traffic lights
  - User acceptability pretesting: 24 participants
    User acceptance posttesting: 15 participants
- Location:
  - Two traffic lights in the city of Antwerp with priority equipped for active road users
  - Only prioritization outside peak hours





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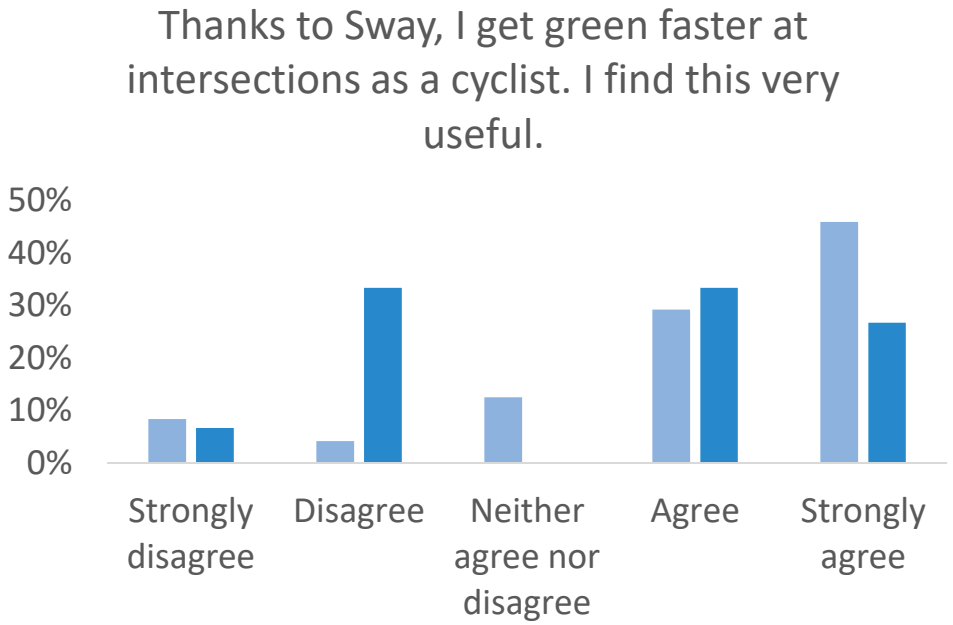
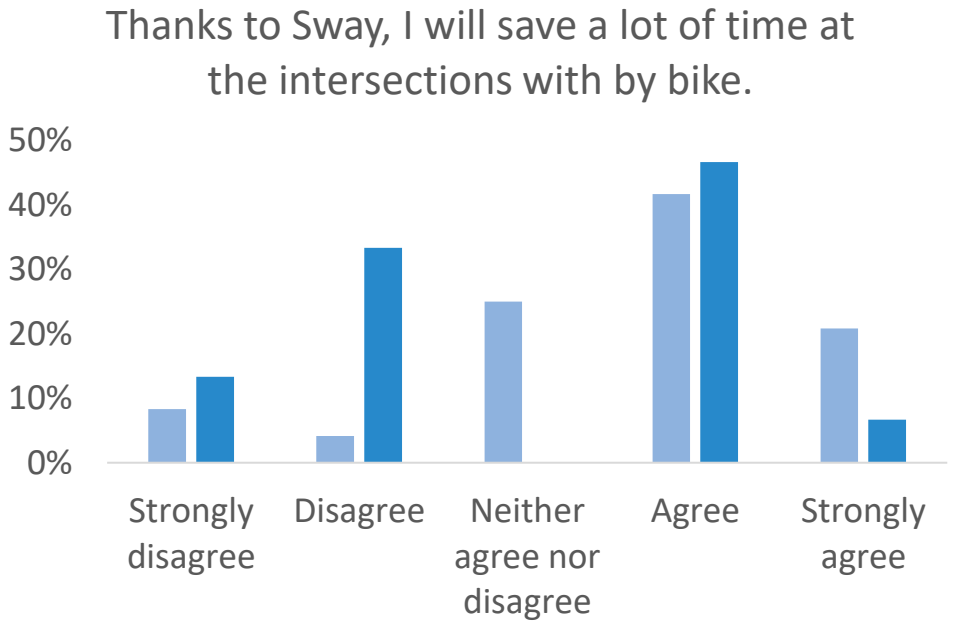
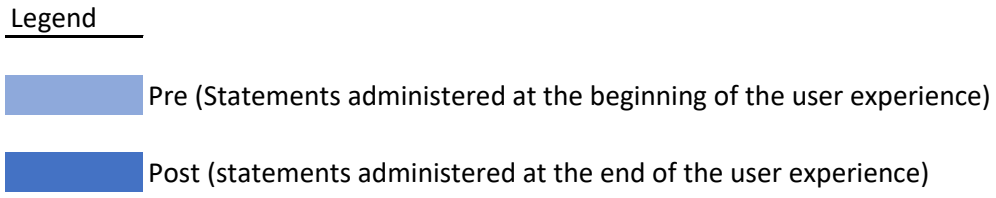
Concept and Time Efficiency (1/2)

- Most agreed with the useful benefit, but mixed responses after the user experience
- Some participants were not convinced that they have saved time (peak hours, Sway needs to learn the regular route)







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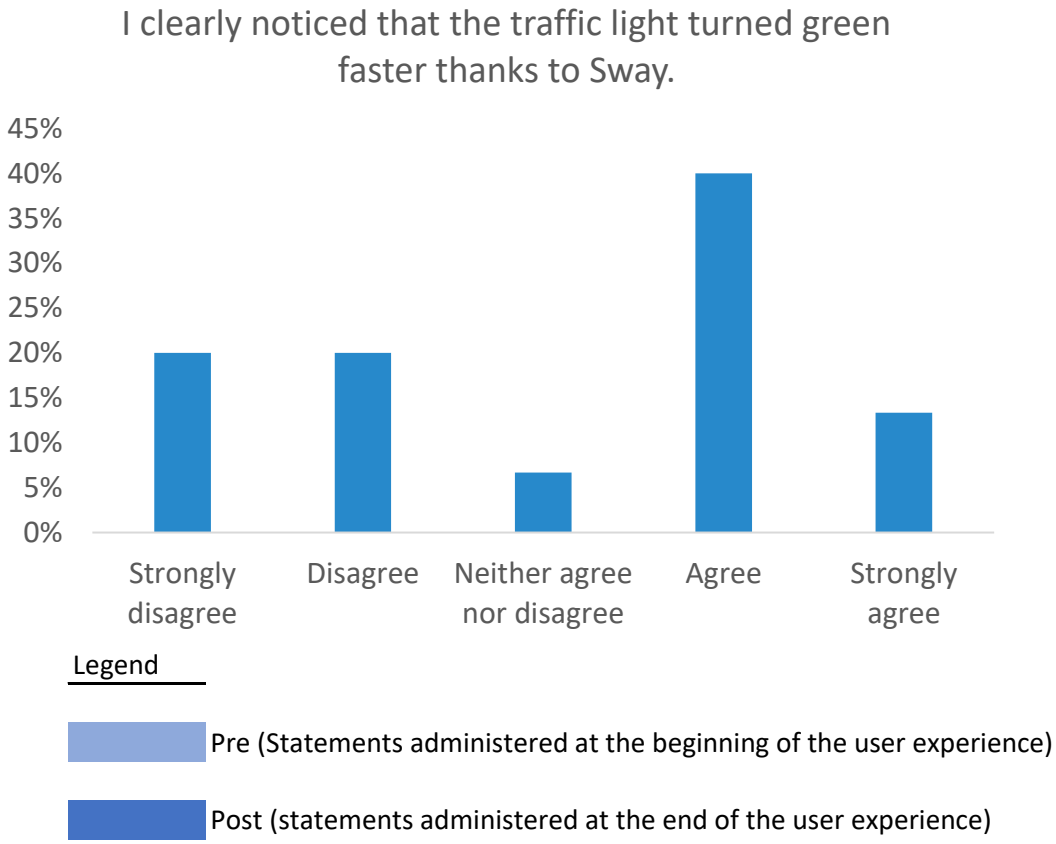
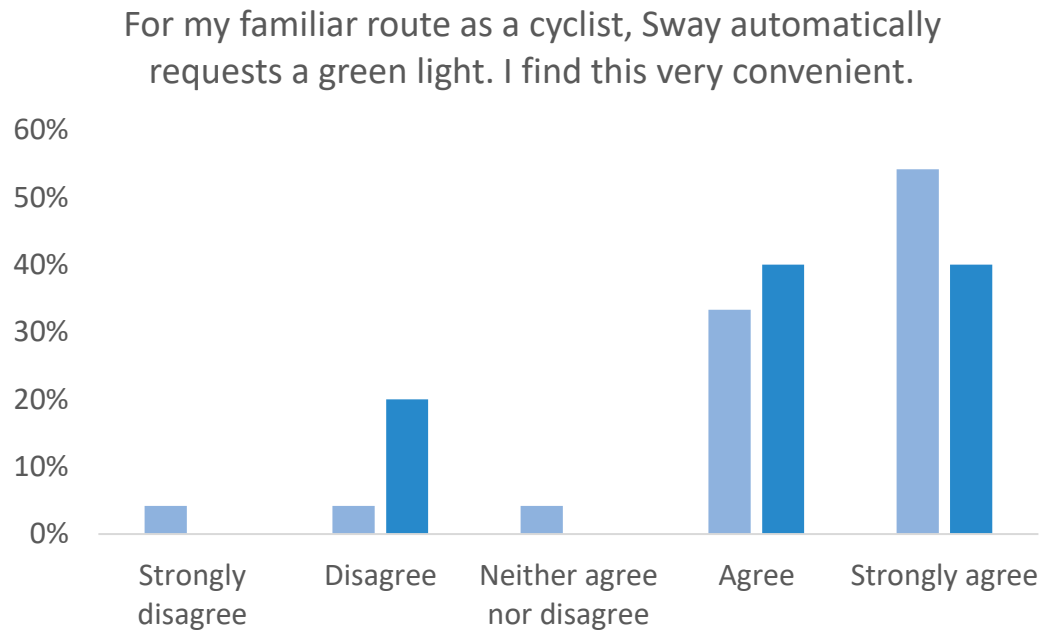
Concept and Time efficiency (2/2)

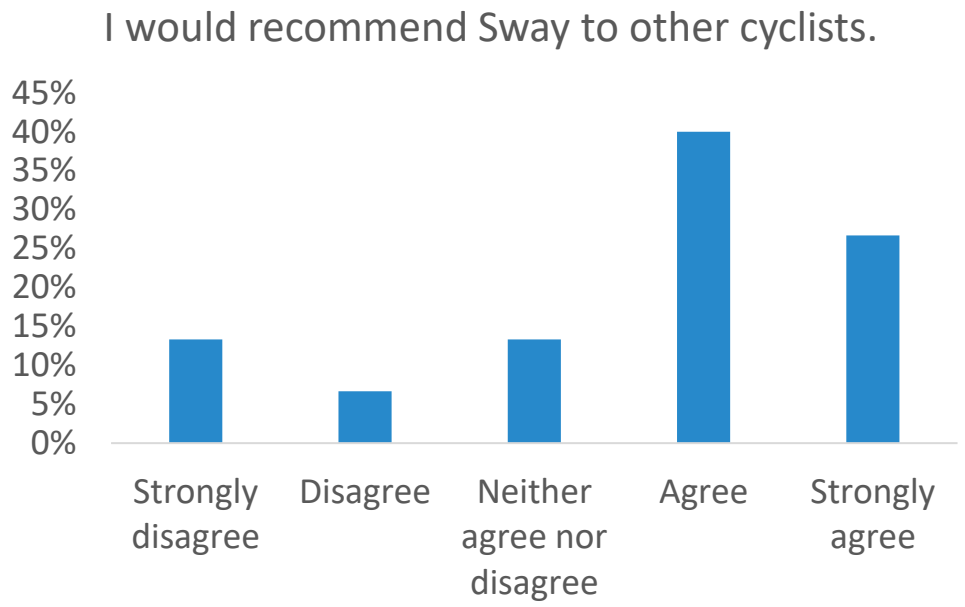
- 40% did not clearly noticed a time gain by using Sway, 10% was neutral, 50% clearly noticed a time gain.
- Most people find the concept convenient that Sway recognize the route and automatically request green light priority

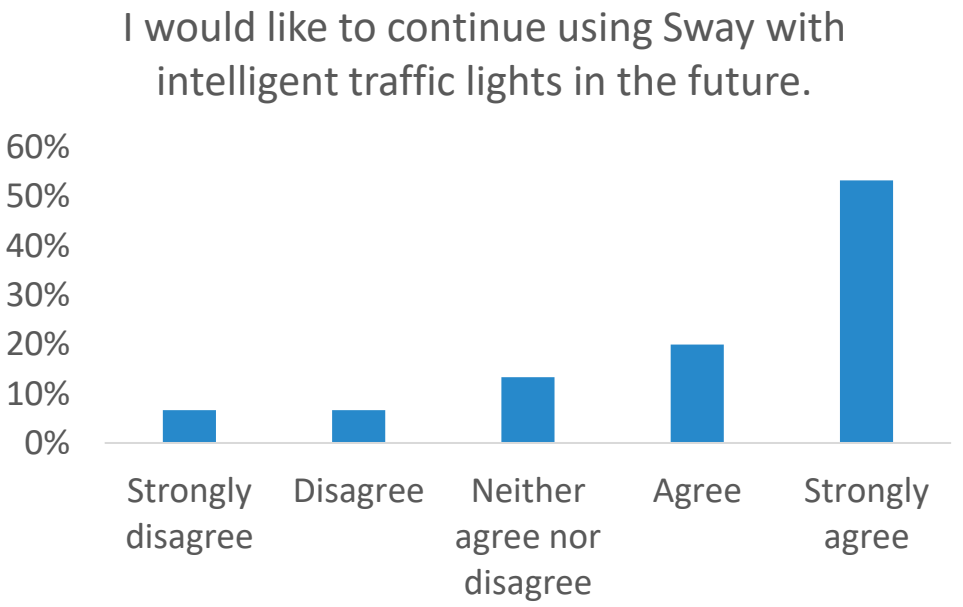




Adoption

- Partial adoption





Legend

Pre (Statements administered at the beginning of the user experience)

Post (statements administered at the end of the user experience)

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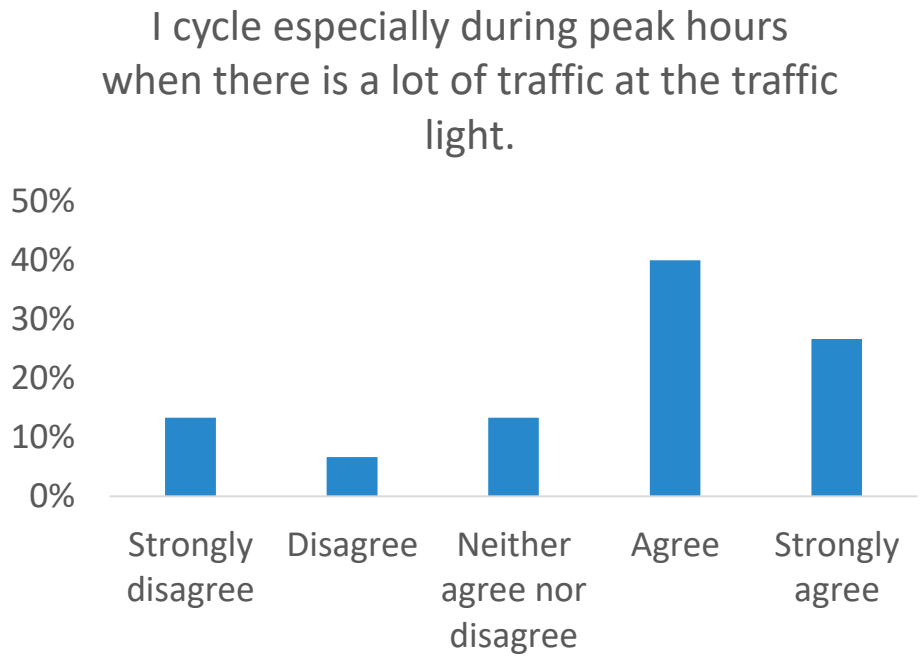
Conclusions (1/2)

- Acceptance of the concept:
  - Advancing green at traffic lights for active road users
  - Recognition of familiar routes and automated priority requests
- Reasons for low acceptance of the service:
  - Short pilot period (3 weeks).
  - Only two traffic lights were equipped in the pilot
  - No priority granted during peak hours (policy decision)



Conclusions (2/2)

- Partial adoption because of the testing context. Acceptance and adoption could improve if:
  - A longer trial period were available
  - Priority was granted both during and outside peak hours
  - More traffic lights were equipped with Traffic Light Priority, as increased time savings would be noticed more clearly and would enhance acceptance

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