VOLVO

Adapt:/Ve

Automated Driving Applications and Technologies for Intelligent Vehicles

Introduction to Human-Vehicle integration

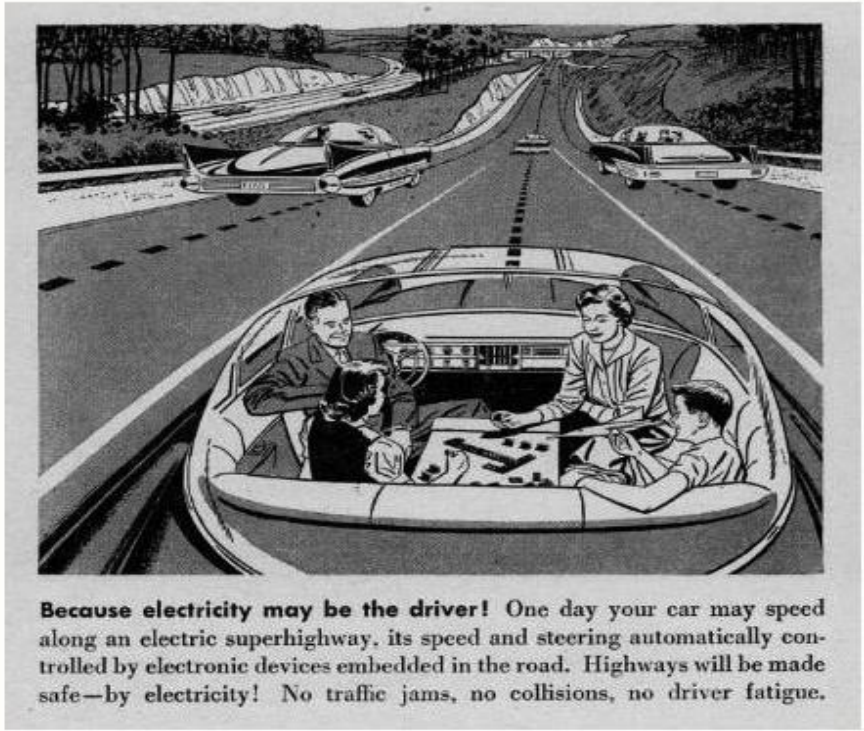
Mikael Söderman
Volvo Group

Final Event
Aachen, Germany
29 June 2017

//Why automated vehicles

Cars

- Safety
- Fuel
- Comfort
- Convenience
- Pleasure
- Better traffic flow, less congestion



Because electricity may be the driver! One day your car may speed along an electric superhighway, its speed and steering automatically controlled by electronic devices embedded in the road. Highways will be made safe—by electricity! No traffic jams, no collisions, no driver fatigue.

American magazine *Boys' Life*, June 1956.

// Why automated vehicles

Trucks

- Safety
- Fuel
- Higher productivity
- More uptime
- Better traffic flow, less congestion
- Competition
- Replace the driver (?)

// Why Human-Vehicle integration is important in automated vehicles

- The automation system has been put in because it can do the job better than the driver.
- Automated systems are not perfect or complete.
- The human driver is being asked to monitor that the automation system is working effectively and to take control if necessary.

// Why Human-Vehicle integration is important

The SAE levels 1-5 can be regarded as steps towards more advanced and ”better” automation functions. From a Human Factors perspective this may not always be applicable. Level 3: The system is in control of the dynamic driving tasks and also monitoring the driving environment.

Driver is taken Out-of-the-loop

”The human driver will respond appropriately to a request to intervene”.

The driver is the fallback of the dynamic driving tasks in situations the system cannot handle.

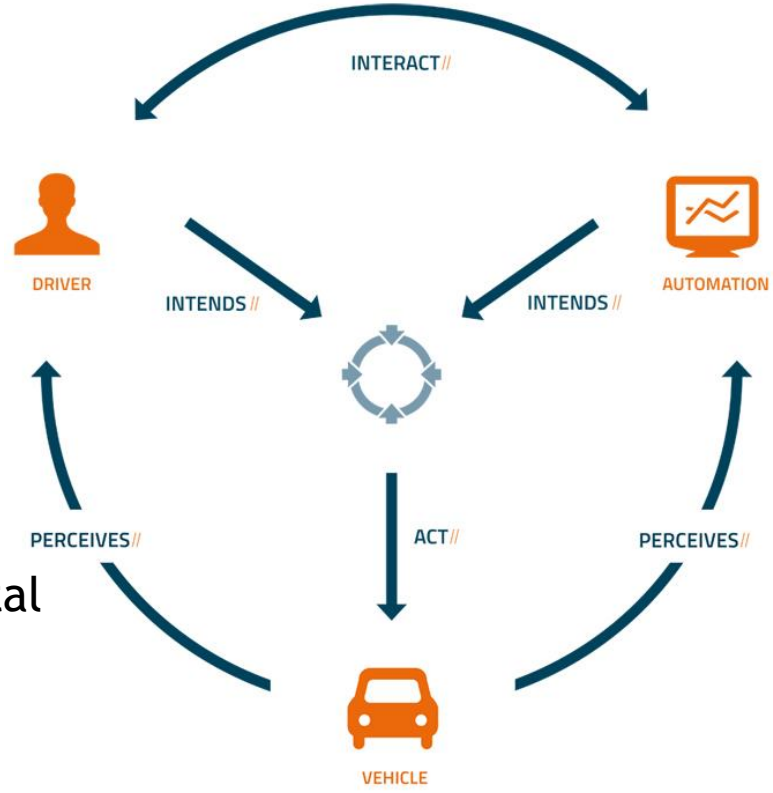
Driver needs to be brought back In-the-loop

Not monitoring the driving environment and still act appropriately and safely, on request could be difficult.

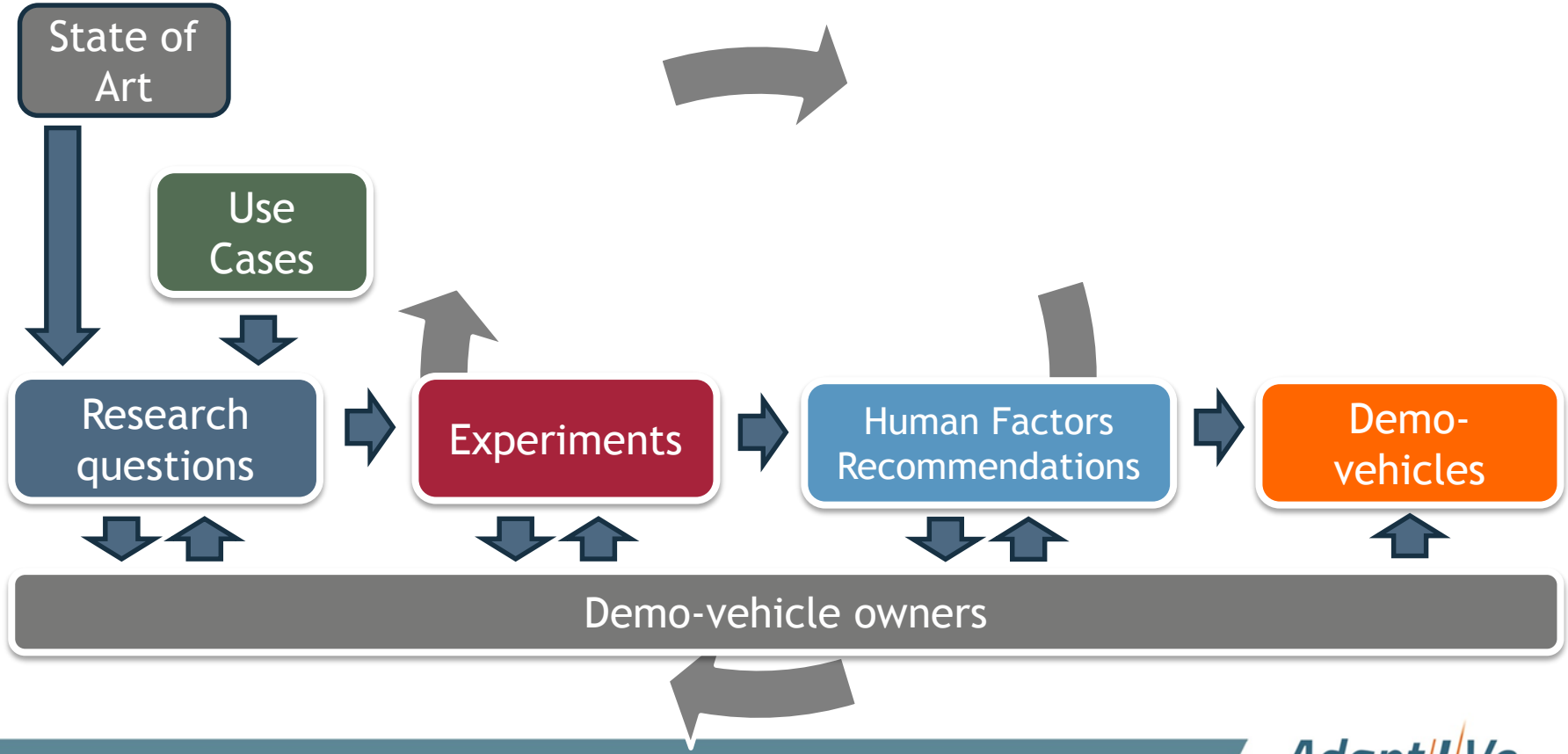
// Human-Vehicle-System integration

- Multi-agent system:
  - The human driver
  - The automation system
- The two agents interact with the intentions to achieve common goals.

As long as human drivers are part of the automated system Human Factors is fundamental for the vehicle's performance.



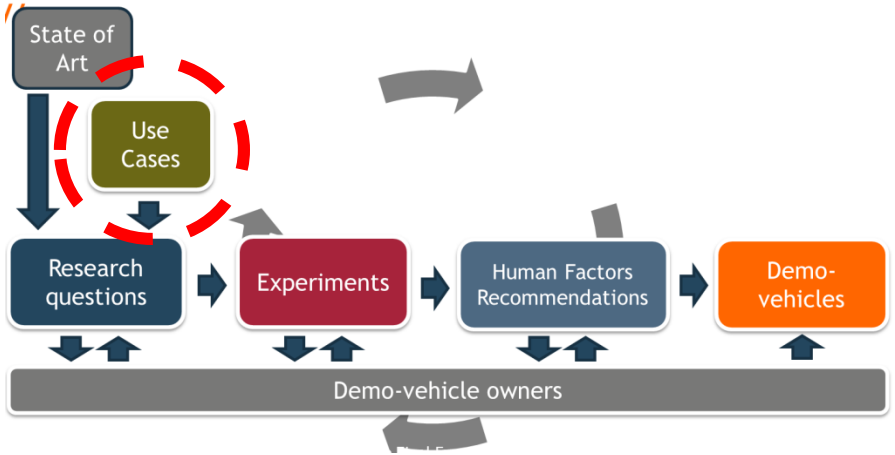
// Working process

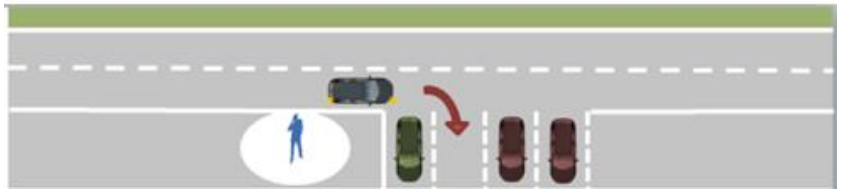


// Use Cases

A use case is a description of a sequence of interactions between the user and the technical system.

- Function as means for communication between team members and to achieve agreements.
- Provide a basis for defining requirements (Human Factors as well as technical).

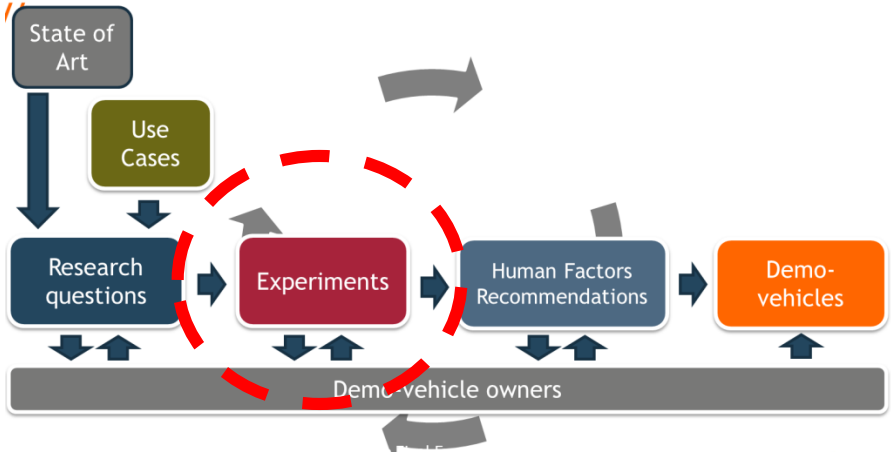




//Experiments

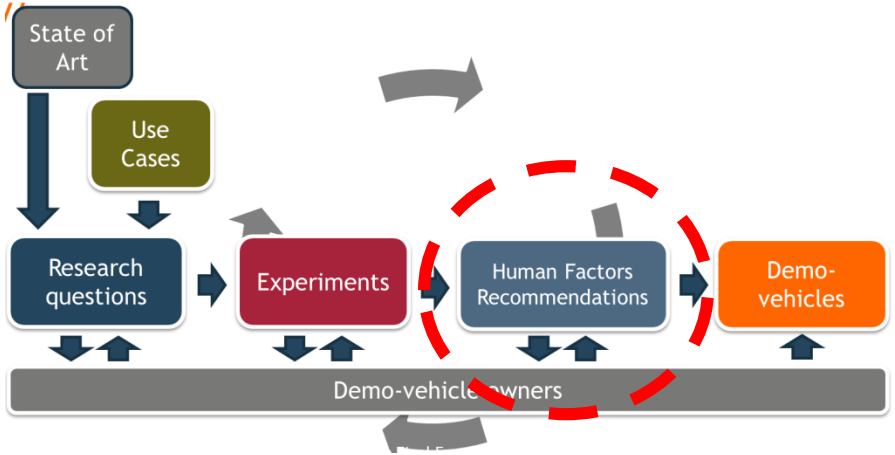
Research areas

- **Driver-in/out of-the-loop:** Situation- Mode- and Task awareness
- **Driver state:** inattention, distraction etc.
- **Non-driving related 2nd tasks:** the influence on drivers' reactions in critical situations
- **Transitions**: from automation to manual control and vice versa.
- **Arbitration**: Interaction & decision strategies between the driver and automation system.



//Human Factors Recommendations

High level design guidelines addressing Human Factors challenges regarding the interaction between the human driver and the automated systems.



// Human vehicle intergration presentations, June 29

Introduction
Mikael Söderman, Volvo Group

Use Cases
Stefan Wolter, Ford Europe

Experiments
Natasha Merat, Leeds University

Q & A

Coffee break

10.45-11.15, **Human Factors recommendations**
Johann Kelsch, DLR

Breakout session in the Exhibition hall

Co-funded by
the European Union

Adapt:/Ve

Automated Driving Applications and
Technologies for Intelligent Vehicles

Thank you.

Dr. Mikael Söderman, Volvo Group
mikael.soderman@volvo.com