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Stay attentive and active
– how to tailor autonomous driving to assist truck drivers

Automotive Roundtable

Shanghai, 17. April 2018
Yuwei Jin/Sarah Gelb-Wiegand

The challenges of truck driving – Status Quo

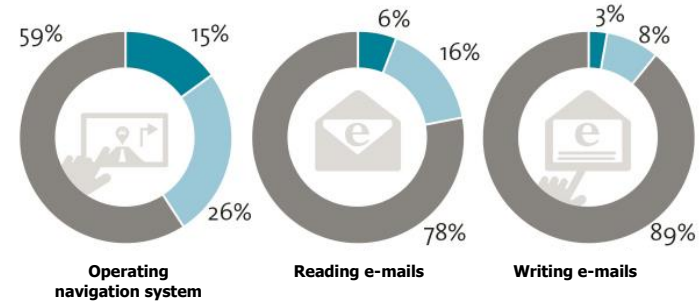
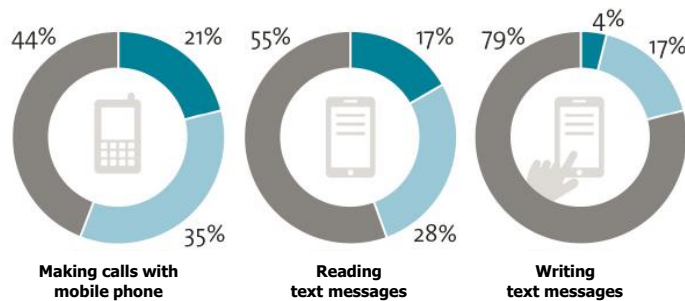


- Truck driving on **long-haul** routes can be a **burdensome** work task
- Permanent **attention** on driving task and traffic situation **tires** drivers
- **Concentration diminishes** and **reaction** speed reduces to a dangerously **low** level
- The **dullness** of hours of driving lead to dangerously **diminished attention** and heightened **tiredness**
- Those activities **jeopardize safety** of driving

The fight against monotony

- To maintain a certain level of wakefulness and fight boredom, drivers tend to **engage in activities** besides driving (watching TV, reading, making calls etc.), not only legal ones
- **Frequency of accidents rises** in the context of **mobile devices** which are used to distract/entertain oneself

Do you engage in the following activities while driving?



Survey on secondary tasks involving a mobile phone during driving (Bikom, 2013)

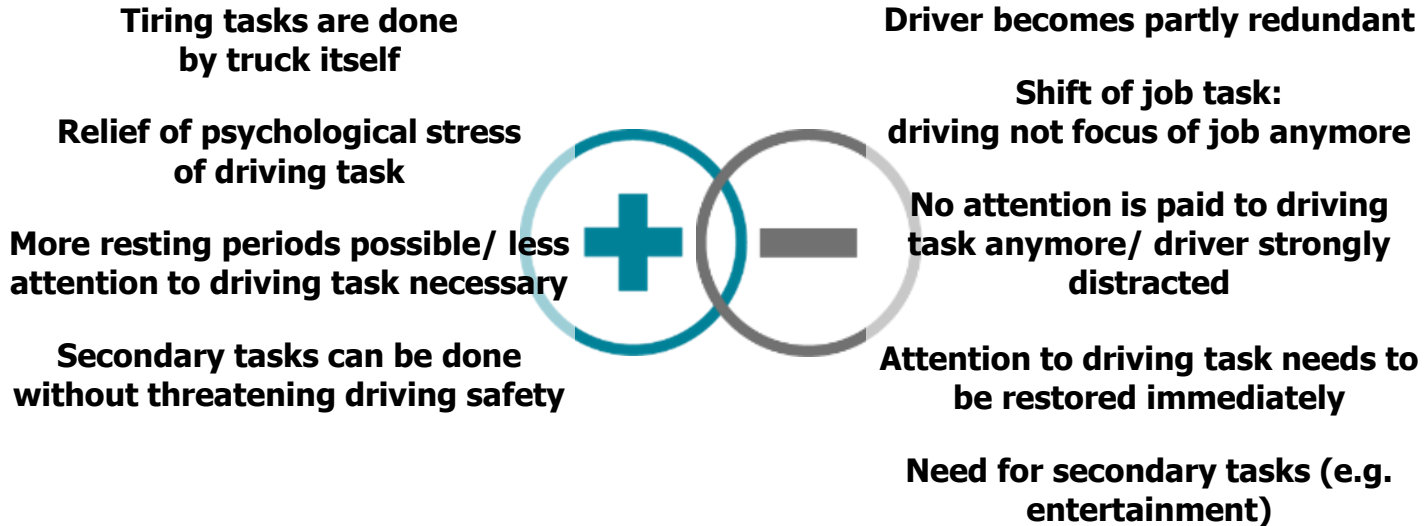
Benefits of autonomous driving

- With the concept of **automated driving**, many nowadays **issues** could be **solved**:
 - **Higher road safety**
(less involvement of the human factor)
 - **Higher traffic efficiency**
(driving of individual vehicles can be aligned to each other, congestions become less likely)
 - **Less stressful driving**
 - **Secondary tasks can be done safely**



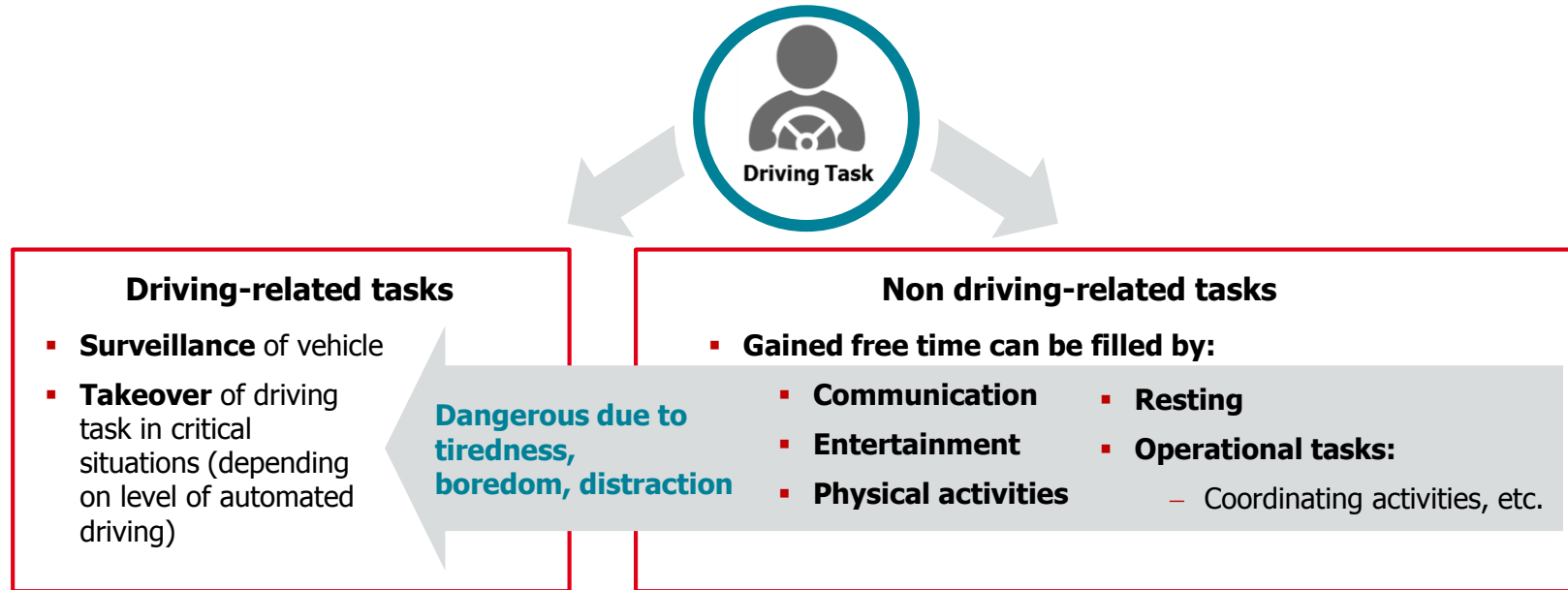
Ambivalence of autonomous driving

BUT: Autonomous driving does not only come with benefits ...



Automation: Same driver, different tasks

Current driving task will convert into two – partly contradictory – kinds of tasks:



What is TANGO?



- **Technologie für automatisiertes Fahren nutzergerecht optimiert**
= **Technology for user-optimized automated driving**
- Project sponsored by **German ministry of Economy and Energy**
- In **cooperation** with:

Project Lead

Project Partners



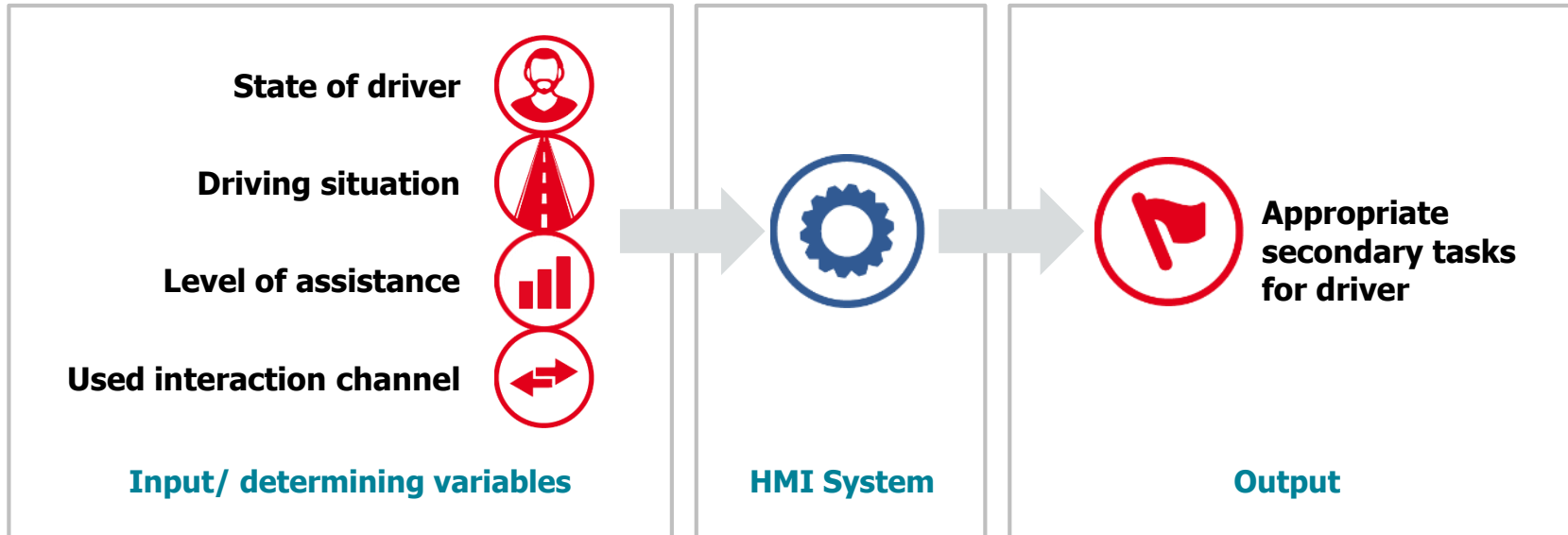
- **spiegelInstitut** and **CanControls** as **associated project partners**
Consumer Research & User Experience Consulting
The Art of Image Understanding

Goals of TANGO



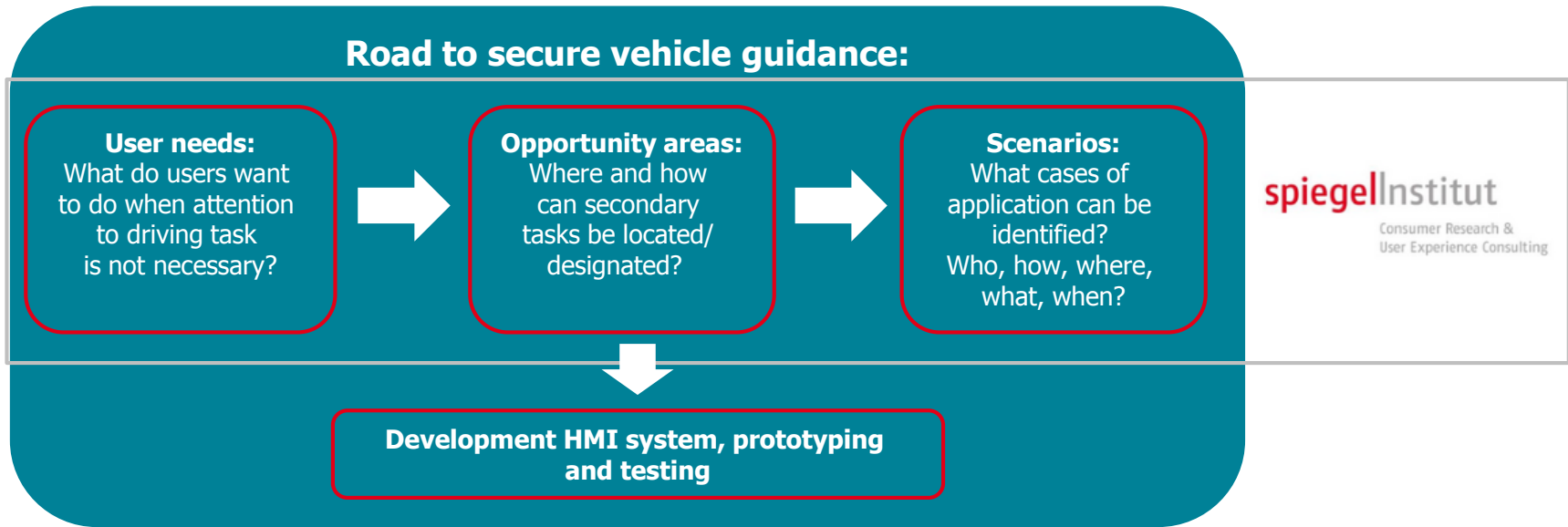
- **Focus:** Development of “**Attention and activity assistant**”, HMI system or “**virtual passenger**” to monitor and **manage activity** and **vigilance** of driver

➡ **Securing immediate and attentive take-over of driving task**



Goals of TANGO

To design a truck HMI system for **automated driving**, in which individual **user needs** have to be taken into account. Tango aims to:



What we did

Qualitative online study with truck drivers

Truck drivers who are...

- ...employed or freelancing drivers
- ...experienced with online forums, communities etc.
- ...motivated to participate (motivation rather low in this target group)



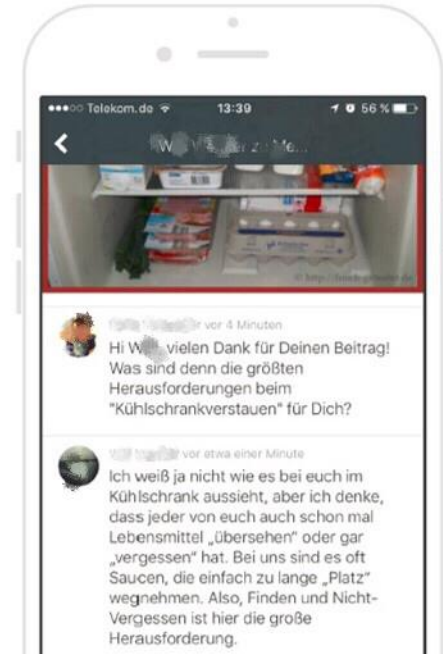
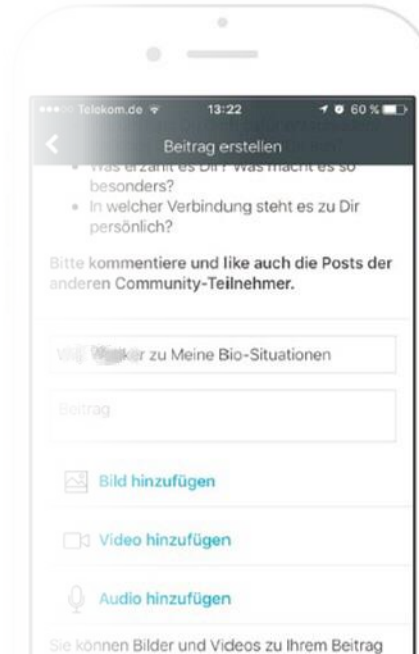
Preliminary telephone
interviews to ensure motivation
and appropriate capabilities



What we did

Online Diaries

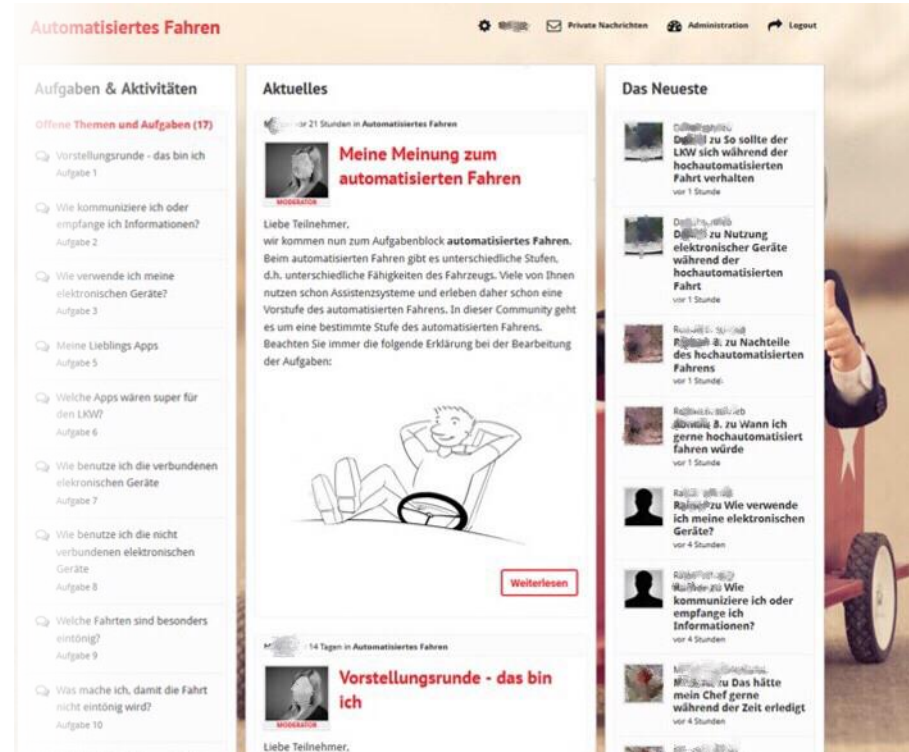
- 10 truck drivers
- Online diaries via mobile phone
 - Fits to truck drivers' work life being on the road constantly
- 3 weeks with daily entries about:
 - Daily work
 - Behavior and habits in the driver's cab
 - Drivers' workflow
 - Pain points and needs
- Possibility to upload pictures, videos, voice messages and voice-to-text entries



What we did

Online Forum

- 20 truck drivers
- Moderated online forum to discuss truck driving and automated driving
- Relevant aspects discussed:
 - Usage and added value of automated driving assistance systems (e.g. coping with difficult driving manoeuvres)
 - Dealing with time gains with automated driving (e.g. possible side activities)
- Suitable method to get into a discussion with truck drivers
→ hard to recruit for face-to-face discussion rounds



Output

Derivation of personas

- 3 different personas were characterized, based on the results of online diaries and forum

"Gerhard"

- Very experienced truck driver
- Higher age → skeptical about driver assistance systems, does not use them
- Assesses a lot of driving situations critically → very attentive, only few side activities while driving
- ...

"Andree"

- Experienced user of driver assistance systems
- Slick driver
- Knows his limits as well as assistance systems' limits
- Wish for more possible side activities
- ...

"Daniel"

- Very young professional driver
- Great fear for job future regarding autonomous driving
- Not very experienced, but a lot of side activities → private chats via smartphone
- Uses assistance systems without knowing their limits in detail
- ...



Personas were used to derive **individual driving scenarios** and develop a **suitable HMI-System** that **supports** truck drivers in their **individual needs and requirements**.

Dimensions of Personas

- **Personas** were **described** and illustrated on certain **dimensions** to form a basis for derivation of opportunity areas to implement features in HMI system concept:

Persona

- Demographics (age, gender)
- Working experience
- Role of work in own life
- Mindset/ attitude towards automated driving
- Job tasks and strategies for fulfillment of tasks
- Evaluation of critical driving situations
- Typical secondary tasks while driving
- Usage of digital Media
- Expectations/ wishes on future HMI systems
- Prediction of future developments of HMI/ truck systems
- Important aspects of truck design/layout
- ...

Further project steps

Development HMI system, prototyping and testing

Conception:

Development of concepts based on user requirements

Observation:

Monitoring of driver states on the actual driving task and during secondary tasks

Prototyping:

Implementation of operation and visualization concepts in test vehicle

Evaluation I:

Testing of early concept with users in laboratory setting

Evaluation II:

Testing concepts in real traffic situations



Analysis and Recommendations:
Derivation of principles to design and test HMI systems in the context of automated driving



Spiegel Institut

How can we support you?

Which project are you currently working on?

Please contact us.

We discuss the research question with you and recommend an individual study setup tailored to your needs and budget.

Founding institute of market psychology in Germany

The institute



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- **Research focus**
Supporting our clients' product development
- **Customer integrated product development**
Support in every phase of the product development process with specially developed tools
- **Interdisciplinary team**
140 experts of different fields of study

We create user experience – together with you

Competences



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Consumer Insights
Concept
Product
Image and Brand



UX Consulting

Ideation
Innovation
Development
Human Centered
Design
UX-Evaluation



Usability Engineering

Context Analysis
User Requirements
Conception/
Interaction Design
Operation Specifications
Usability-Test
Technical
Documentation



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UX-Process Consulting
Implementation of
UX-Design
UX-Strategy
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We conduct international projects from Germany, China and USA

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Thank you very much for your attention!

