TechTalk: Psychology of Mobility
March 30, 2023
Driving with Psychology
Dr. Christoph Bernhard
Vita

Dr. Christoph Bernhard

- PhD in Psychology
- Deputy Head of Operations / Senior User Experience Researcher at Custom Interactions GmbH
- 6 years experience in applied psychology in automotive industry
- Focus on human-machine interaction, assistance systems & applied human perception

Custom Interactions

red dot: winner 2021
interface design
red dot: winner 2020
interface design
red dot: award 2019
winner interface design
UX DESIGN AWARDS
honored 2020
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Certified
100
Your winner
Company

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Public

Psychology of Mobility
How users trick systems that do give them a positive experience

https://www.youtube.com/watch?v=ovc2axLmzIw&feature=emb_imp_woyt

„Users will find ways to improve their experience”
How industry works towards reduction of accidents and increases safety

“Innovations will not succeed to increase road safety if they do not have a positive user experience”

Example 1: Partially Automated Driving

Requirements:

- **Focus attention and monitor**
- **Hold the wheel and be ready to react**

„Human drivers are bad in monotonous tasks – they will focus on other tasks, even if this leads to risks.“

Sources:
- Youtube (https://www.youtube.com/watch?v=-6kxvz52aL0&feature=emb_imp_wot)
- Freepik
- Hand icons created by Freepik – Flaticon (https://www.flaticon.com/free-icons/hand)
- Eye icons created by Freepik – Flaticon (https://www.flaticon.com)
Example 2: Lane keep assistant

Requirements:

- Focus attention and monitor
- Indicate your lane change with a turn indicator

Sources:
Freepik
Hand icons created by Freepik – Flaticon (https://www.flaticon.com/free-icons/hand)
Eye icons created by Freepik – Flaticon (https://www.flaticon.com)

"If a system delivers a negative experience, drivers will not use it."

Lane maintenance systems still a turnoff for many drivers
June 22, 2017
Why are drivers not using systems that increase safety? Because the systems do not provide a good experience.

Describes how easy or efficient a system supports the user in what he wants to do („do-goals“)

Describes to what degree system use evokes positive experiences, such as joy or pleasure in use („be-goals“)

„Being safe and easy to use is not enough. A system needs to evoke a positive mobility experience.“
Psychology & Mobility – What promotes positive experience?

“Systems can evoke a positive mobility experience by addressing the needs of human drivers.”
Psychology provides knowledge, methods and tools to analyse and understands needs, wishes and demands of drivers.

Sources:
Freepik
Think icons created by Smashicons – Flaticon (https://www.flaticon.com/free-icons/think" title="think icons)
Psychology & Mobility – What is the role of Psychology?

System use

Motivation

Processing Perception

Needs

Emotion

Safety

Market Impact

Brand Perception

Sources:
Eye icons created by Freepik – Flaticon (https://www.flaticon.com/)
Touch screen icons created by Freepik – Flaticon (https://www.flaticon.com/free-icons/touch-screen)
Car icons created by Freepik – Flaticon (https://www.flaticon.com/free-icons/car)
Graphic icons created by Kiranshastry – Flaticon (https://www.flaticon.com/free-icons/graphic)
Psychology & Mobility Experience – Why is it important?

https://www.youtube.com/watch?v=BIAHOM_SACM&feature=emb_logo

„Driving will be a positive experience if the system fulfils needs of users”
Psychology & positive experience is important – but how do we get there?

„User Centered Design is a way to bring knowledge about the user into the development of new systems.“
Conclusion: Importance of Psychology & Mobility Experience

• New innovations will not succeed to increase road safety if they do not have a positive user experience.
• Being safe and easy to use is not enough to create a positive user experience.
• A positive mobility experience can be created by fulfilling user needs for Novelty, Attractiveness and Stimulation.
• Psychology provides knowledge, methods and tools to analyse and understand needs, wishes and demands of users
• User Centered Design is a way to bring this knowledge into the development of new systems.
Thank you!

Your contact

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Our Services in Detail

Observation & Data Collection
- Field Observation
- Interviews
- Contextual Inquiries
- Comic Strips

Understand the Data
- User Needs
- User Requirements
- Use Cases
- Personas

Data-driven Design
- User Interface Concepts
- Wireframes
- Clickdummies
- Visual Design

Test to Update your Data
- Concept Tests
- Handling Tests
- Usability-/UX-Tests
- Eyetracking

Document Results
- Style Guides
- Development
- Ready Assets
Transformation in mobility experiences
Guido Meier-Arendt
Experiences
Link to preferences and context
Transformation in mobility experiences
The change in time

Means of transportation

Human Machine Interface (HMI)

User needs
Augmented Reality Head-up Display - Vision 2025
A natural enhancement of the Human Machine Interface
Transformation in mobility experiences
The user is human

It’s not the **BRAIN** which drives a car, it’s the **HUMAN BEING** ...
User experience (UX) refers to a person’s total experience using a particular product, system or service.

User experience (UX) refers to a person’s total experience using a particular product, system or service.

Pragmatic Dimensions
- Efficiency
- Dependability
- Perspicuity

Hedonic Dimensions
- Novelty
- Attractiveness
- Stimulation

- Perceptions
- Preferences
- Beliefs
- Preferences
- Emotions
- Behavior
Understanding the user and his context
Basic dimensions of mobility experiences
Understanding the user and his context
Basic dimensions of mobility experiences
Understanding the user and his context
Basic dimensions of mobility experiences

User experience

User intention & Goal

Whishes

Needs

User condition

Traits

States

Safety

Usability

Joy of Use

Context

Weather Condition

Traffic Member

User condition

Traits

States

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Understanding the user and his context
Basic dimensions of mobility experiences
Understanding the user and his context
Basic dimensions of mobility experiences

Psychology
- Perception
- Cognition
- Social Psychology
- Differential Psychology
- Emotion & Motivation

Context
- Weather Condition
- Traffic Member

User experience
- Safety
- Usability
- Joy of Use

User intention & Goal
- Whishes
- Needs

Human Machine Interface & User tasks
- Interaction
- Observation
- Communication

User condition
- Traits
- States
Understanding the user and his context
Basic dimensions of mobility experiences

Psychology

Perception

Thresholds
Channel capacity
→ Reading time
→ Visual distraction

HUD / AR HUD to lower perception times

Peripheral information to guide information perception
Understanding the user and his context
Basic dimensions of mobility experiences

Psychology

Cognition
- Cognitive overload
- Situation awareness
- Mode awareness
- Vigilance

Perception  Cognition
Social Psychology  Differential Psychology
Emotion & Motivation

Cabin Sensing
Intersection Assistant
Psychology
Basis for user´s goals and technology solutions

Strong emotions are affecting traffic safety 1)

1) Source: [https://vtnews.vt.edu/articles/2016/02/022316-vtti-researchdistraction.html](https://vtnews.vt.edu/articles/2016/02/022316-vtti-researchdistraction.html) last access March 29th, 2023
Psychology
Basis for user’s goals and technology solutions

 Perception Cognition
 Social Psychology Differential Psychology
 Emotion & Motivation

› Fear of missing out
› Texting while driving 1)

› Highly Automated driving
› Efficient HMI solutions

Understanding the user and his context
Basic dimensions of mobility experiences

User experience:
- Whishes
- Needs
- User intention & Goal

Context:
- Weather
- Traffic
- Member

User condition:
- Traits
- States

Psychology:
- Perception
- Cognition
- Social Psychology
- Differential Psychology
- Emotion & Motivation

Human Machine Interface & User tasks:
- Interaction
- Observation
- Communication

User experience:
- Safety
- Usability
- Joy of Use
Transformation in mobility experiences
User centered design

Key Principles
Transformation in mobility experiences
User centered design

Key Principles

1. Early focus of end user
2. Iterative approach
3. Testing
Transformation in mobility experiences
User centered design

User Centered Design

Technology & Services

HMI | Holistic approach

Positive UX

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Human Machine Interface development
Holistic approach is essential

Environment
› Traffic situation
› Infrastructure
› Traffic member

User
› Needs
› Preferences
› States & Traits
› Abilities

Tasks & Goals

Vehicle
› Maneuver
› Position
› Speed
› Type and state

Context based interaction
Human Machine Interface development
Holistic approach is essential

User understanding is key

Context based interaction
Transformation in mobility experiences
User understanding

“"If I had asked people what they wanted, they would have said faster horses.”

Henry Ford

Understanding the user is about …

› … asking the “right” questions
› … selecting a suitable method
› … figuring out his needs
› … analyzing his context
# Attitudes towards Automated Driving

## Challenge: Trust

<table>
<thead>
<tr>
<th>Statement</th>
<th>Germany 2013 (%)</th>
<th>Germany 2018 (%)</th>
<th>USA 2013 (%)</th>
<th>USA 2018 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automated driving is a sensible advancement.</td>
<td>53</td>
<td>53</td>
<td>41</td>
<td>50</td>
</tr>
<tr>
<td>Automated driving will be a part of everyday life in 5 to 10 years.</td>
<td>50</td>
<td>40</td>
<td>40</td>
<td>52</td>
</tr>
<tr>
<td>Automated driving scares me somewhat.</td>
<td>52</td>
<td>62</td>
<td>66</td>
<td>77</td>
</tr>
<tr>
<td>I have waited a long time for something like this.</td>
<td>19</td>
<td>17</td>
<td>23</td>
<td>27</td>
</tr>
<tr>
<td>I don't believe that it will function reliably.</td>
<td>48</td>
<td>57</td>
<td>56</td>
<td>77</td>
</tr>
</tbody>
</table>

Continental mobility study 2013 Participants: 1000 per country; 200 online interviews per country; Continental mobility study 2018 Participants: 1015 per country; 1050 online interviews per country
Increase trust level…
…through enhanced system transparency

› Show what the vehicle in automated mode recognizes
› Clear assignment of system and user tasks
› Multimodal information management
› Providing route related information
Increase trust level…
…through enhanced system transparency
Inspiring mobility experiences
Conclusion

› Transformation in mobility experiences took place
› None driving related tasks will become most important
› HMI creation according end users’ needs is the enabler for positive mobility experiences
› Understanding the end user in regards of psychology dimensions is important
› Considering the context is key
› Result: Human machine interface innovations which perfectly fits to user´s expectations
Inspiring mobility experiences

Conclusion

User Centered Design with it´s focus on a deep user understanding is THE enabler for HMI technologies which leads to inspiring mobility experiences

We are the advocate of the end user
Blind Trust? Calibrating Trust in Technology

Sebastian Weiss
“TRUST is the attitude that an agent will help achieve an individual’s goals in a situation characterized by uncertainty and vulnerability.”

Lee & See (2004)
“TRUST is the attitude that an agent will help achieve an individual’s goals in a situation characterized by uncertainty and vulnerability.”

Lee & See (2004)
“TRUST is the attitude that an agent will help achieve an individual’s goals in a situation characterized by uncertainty and vulnerability.”

Lee & See (2004)
Should you trust blindly?
Trust

Distrust

Trustworthiness

Lee & See (2004)
Lee & See (2004)
“I can cross the road no matter what the automated vehicle is communicating because it will always detect me.”

“I am afraid the vehicle will hit me so I will avoid it completely and just wait until it is gone.”

“I know the vehicle has detected me and is yielding – nevertheless I will still stay cautious.”
Lee & See (2004)
Why is it challenging to calibrate trust?
Appearance
Level of Control
Ease of Use
Communication
Transparency

Other people
Environment
Time

Personality
Age
Technical Affinity
Cultural Background
Prior Knowledge

Other people
Environment
Time

Personality
Age
Technical Affinity
Cultural Background
Prior Knowledge

Appearance
Level of Control
Ease of Use
Communication
Transparency
TRUST

Safety
Acceptance
Usage

Hoff & Bashir (2015)
How do we develop to meet the challenges?
1 Early focus of end user

2 Iterative approach

3 Testing

Realize

Evaluate

Create

Iterate

Understand

Demonstrate

Ideation

Product Concept
Present delivery robot: Corriere LM

New product design, Human Machine Interface and behavior for the delivery robot

Set-up of VR environment for the user study

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Robots with different HMI features

Stable Virtual Reality environment

>30 Participants
in Singapore & Germany
Different age groups
Various prior experience with robots
More humanoid communication

Which robot do you trust more?
Perceived Safety

-2 -1 0 1 2

very unsafe

very safe

1.47

-0.07

User Experience

Attractiveness

Efficiency

Novelty

Stimulation

Perspicuity

Dependability

Scales range from -3 (poor) to +3 (good)

No humanoid communication

Humanoid communication

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This is what we at Continental thrive for:

› To provide the right information at the right time and place.
› To help to achieve the user’s individual goals in a situation characterized by uncertainty and vulnerability.
› To build calibrated trust – so you do not have to trust blindly.
UX and Link to Innovations & Products…?

Jochen Möller
That was then
That was then
That was then
This is now
Haptic Relief Print on Surface
Luxury Minimalism Concept

Future
UX Cockpit Concept 2026
Luxury Minimalism
The Future?
Many Cockpits Thinkable
Q&A

Speakers:
› Christoph Bernhard
› Guido Meier-Arendt
› Sebastian Weiß
› Jochen Möller