

# **Report on the we.Conect Car HMI Europe 2018**

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## 2 Introduction

This paper reports the keynotes and presentations held at the we.Conect Car HMI Europe. The meeting was conducted with about 300 participants at the Titanic Hotel Berlin. Beside the presentations in the main forum, a row of workshops in the “Challenge Your Peers” and the “Word Café” format where held. The World Café on HMIs in autonomous driving is reported in a separate paper. The meeting was accompanied by an exhibition of HMI related companies, an Ice Breaker before the meeting and a conference dinner on day one.

The meeting was organized highly professional. Networking opportunities were perfect, delivered content on a high level. Most of the speakers and the topics discussed have a high relevance in the Automotive HMI community. All statements listed below where made by the speakers. They do not necessarily reflect my personal or professional opinion. Where appropriate I make my own remarks.

## 3 Background, Markets and Trends

- User experience (UX) steers user perception (joy of use, desirable, attractiveness, trust). Usability steers user performance (effective, efficient, usable). Both build user satisfaction
- “UX encompasses all aspects of the end-user interaction, with the company, it’s services and products...” Donald Norman
- A product or service with great UX is usable, feasible, and valuable
- User interaction is all about shaping the relationship between humans and their environment
- UX is the crucial identity of the automotive future
- Megatrends influencing the automotive industry are: digital lifestyle, electrification, autonomy, sharing economy (remark: is see others as well: urbanization, aging societies, health, safety, ...)
- Future HMI trends are augmented reality, social and demographic changes, autonomous driving, humanized HMI solutions, digital assistants. Humanizing means holistic, multimodal, AI based

- HMI solutions allow the dialogue between humans and technology. Future HMIs will cover more than just the interaction in the car, but also interactions before and after the trip
- UX is core for a functional brand strategy, this is not only for the vehicle themselves, but for the entire ecosystem
- The automotive industry is changing its paradigms, from “exterior first” to “interior first”, from “driving experience” to “experience during driving and beyond”
- The automotive industry in the middle of a digital change. Driver for this change are: global markets, urbanization, competition, standards, aging society, faster update cycles. Relevant technologies are: cloud & big data, connectivity and car-2-x, security & privacy. Applications are: driver and data analytics, autonomous driving, mobile and digital services
- The reality for European OEMs changes rapidly. From the US new players like Lyft, Uber, Google, Microsoft, or Apple show up, from Asia companies like Baidu, Samsung or Alibaba
- The paradigm of the automotive industry will change from asset owned and human driven to shared and autonomous. Future vehicles will be lounges on wheels
- Flexible ownerships of the future will have impacts on HMIs, ownership will turn into usage of cars. Even conservative users are changing towards flexibility, short time usage
- Different markets and cultures have different ideas on UX
- Consumer electronics are a heavy driver of automotive HMIs, typical functions are digital assistance, voice recognition, artificial intelligence
- Autonomous driving will change the entire automotive UX landscape, it will move cars from product centric to service centric
- Autonomous driving will change the driving experience from car to rolling living room. Activities beyond driving will change from listening to music, talking to friends and family, messaging to reading a book, watching a movie, sleeping, using social media, working, exercising etc.
- 22% of Generation Z will not trust autonomous cars, 17% of Generation Y, 34% of Generation X, 44% of Baby Boomers, and 49% of pre-boomers. The older users are, the lower the trust in autonomous vehicles is
- Trust is the foundation of driver-vehicle collaboration, in both ways
- Users want to have a smart life on-board, entertainment, work, relaxing, communication, consuming
- Vehicle interior will be even more relevant for the UX compared to today. They will shift from components to holistic experiences, from ME to WE, from driver to passenger
- Future interior may not have dedicated HMI components anymore, but HMIs everywhere. Smart surfaces will integrate HMI sensor seamlessly, they will be available depending on the context of use

## 4 Processes and Tools

- A successful HMI/UX development requires a holistic view on the customers' lives: habits on mobility, eating, digital lifestyles, living in megacities
- A complete UX innovation practice involves: research on in vehicle UX and UX strategies to support product planning, consumer sentiment analytics, and product evaluation
- A UX development strategy contains four components:
  - Discover, integrate all parties related to topics and products, set up a team, share workspace (remark: they may be physical, but I learn constantly that virtual workspaces have real opportunities), create brand-bible, analyze the existing HMIs and concept cars, create personas, benchmark
  - Define
  - Develop
  - Deploy
- Align with what you want to do and what not, apply the IS/IS NOT tool, create a mission to be different, an aspiration to make a promise, identify concrete benefits, and result in an innovative product, be unique, advantageous, and essential, create myths, rites, and signs for your vision
- A modern automotive HMI process is human centric and applies user journey, storyboard, identification of requirements, concept, visual design, prototyping, testing, feedback into development
- Modern HMI development avoid waterfall processes, agile approaches with incremental deliveries are the trend
- The quality of an HMI needs to be measured. Criteria for a valid measurement procedure are: clear, specific, normalized, comparable, has an impact. The metric will be as unique as businesses are
- A complete measurement procedure includes expert analysis and user analysis
- UX teams may be distributed in the company or collected into one group, tendency is to build larger groups (remark: the set up of large, centralized HMI groups have clear advantages, the teams are more powerful, the exchange between team members is more elaborated, de-centralized UX teams have the advantage that they are closer to technology, have more impact in daily development activities, are more respected by technological developers, so at the end a mixed model will be the optimum)
- Augmented reality is a prominent tool for HMI development and testing. This includes the development of scenarios, of virtual dashboards, and of usability testing of new HMIs
- Today's biggest drivers of the HMI business are service oriented architecture, augmented reality, autonomous driving, consumer electronics, display, glass, smart lighting, new business models

- Virtual digital assistants, and artificial intelligence are main driver of developments. They allow interaction, contextualization, knowledge and personalization
- The car industry is not the best UI industry (remark: I see this totally different: other industries face different challenges and produce different results, in vehicle driving is still the main task, and many of the solutions the car industry presents fit perfectly this use, others may be fancier, more colorful or shiny, but the car industry is safer)
- Core for a useful application of head up displays is a measurement procedure, that is highly accurate, fast, easy to use, and measures what human really see. SAE J1757-2 is the related standard
- Comfort and well-being consists of peace of mind, physical well-being, proxemics, usability, pleasure, social interaction, aesthetics, association

## 5 Products and Technologies

- The new Ford Focus has a new HMI solution. It is based on a human centric, low clutter design and sold worldwide. Cluster and HUD focus on driving related information, the content can be adapted to personal use cases. The steering wheel gives control to the driver by a reduced number of input devices and a driver-oriented grouping. The infotainment system allows effortless connectivity, it uses an old HMI paradigm by having two rotary knobs. The driver assistance systems are easy to use, the 360° function integrated various driver assistance systems. The global requirements are: covering the broadest spectrum of mid-size car users, simplified design, intuitive driving experience
- The MBUX contains cutting edge design thinking, multimodality and has no limits to realize a unique UX. The HMI is easy to use, multimodal, intuitive, and personal. It contains benchmark connectivity, best possible graphics and artificial intelligence. It is part of the Internet of Things and contains natural speech interaction for most languages
- To gain UX emotion needs to be added to usability. Possible technologies are: haptic surfaces, holography, virtual reality, user stare and health measurements, caring technology, embodiment, empathic convenience, artificial and emotional intelligence in the HMI
- An understanding between car and driver is required, co-learning, co-driving, communicating
- 70% of users turn ADAS systems off due to a poor initial experience
- There is a potential mis-match between the capabilities of an autonomous car and the user needs. Users shall be able to change the driving style of the autonomous car to their own preferences
- User profiles shall be taken from one car to the other. They include seat positions, media preferences and content, traffic, concierge services. This will allow the switch between different vehicles, by keeping the car personalized. Users will enjoy the ride from the beginning
- The integration of cockpit controllers and automated driving will face the HMI challenges induced by autonomous driving. Secure, flexible, multimodal and context sensitive interaction will be possible

- The success of handovers from vehicle to driver depend on modality, amount and format of information. Evaluation criteria are: trust, pleasantness, usefulness, and reaction time
- Users have a core need to know what's going on, even in autonomous cars. Mode awareness may be created by changing the color of lights in the steering wheel or illumination of the roof. User want to know what's going on, seeing and doing creates trust
- External HMIs communicating between vehicle and instances outside the car, will add new meanings to vehicles. Particularly pedestrians shall be informed about the intention of a (autonomous) vehicle. This maximize user acceptance, safety, and traffic flow
- An unsolved problem in autonomous driving is motion sickness. This is caused by absence of vehicle control, engagement in non-driving tasks, alternative seating arrangements. Research needs to be performed on motion cueing (timing, information specificity, sensory modality) and user acceptance
- Augmented reality head up displays shall highlight vehicles around the own one, vehicles infringing the own path dangerously, vehicles merging into the own lane, slow vehicle ahead, that intent to make a lane change
- Users of electric vehicles prefer range in miles/km to percentage of battery left or vice versa. Both needs to be shown. Additional battery information is not required. Core information on charging stations is availability, cost, quality, proximity to intended route. Companion apps have limited value. Dedicated infotainment head units are required for electric vehicles, since today's systems have limited value only
- Gazing directions can be used to identify if a driver is in the loop or out
- People expect a voice communication that is like interaction with other humans, this includes grammar and wording. A certain social distance and professionalism is preferred. Voice shall be supportive while drive and support the driver with the vehicle
- Speech leads to anthromorphism: humans do not overcome their usual ways of speaking. They will apply the heuristics they use when talking to other humans