Drivers of Autonomous Vehicle Adaption – a Qualitative Assessment of Consumers’ Motives

ASSA Conference Presentation
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Agenda

I. What drives us?

II. Background

III. Paper Overview

IV. Methodology – the Means-End Chain

V. Hierarchical Value Map

VI. The Main Findings

VII. Conclusion
What drives us?

1. Technological Progress: enabling new modes of transport

2. Innovation Issue: scepticism towards changes in technology

3. Market Issue: Electric vehicles – failure to read consumers‘ minds

4. Management Issue: Consumers‘ perception of autonomous driving

(Mohr, Sengupta, & Slater, 2009)

(Egbue, Ona, & Long, 2012)
### Industry’s Perspective on Autonomous Driving

<table>
<thead>
<tr>
<th>Terms</th>
<th>Definitions</th>
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<tbody>
<tr>
<td>Level 0</td>
<td>Driver Only&lt;br&gt;Continuously exercising long. and lat. control</td>
</tr>
<tr>
<td>Level 1</td>
<td>Assisted&lt;br&gt;Continuously exercising long. OR lat. control</td>
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<tr>
<td>Level 2</td>
<td>Partial Automation&lt;br&gt;Monitor the system at all times</td>
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<tr>
<td>Level 3</td>
<td>Conditional Automation&lt;br&gt;No need to monitor all times; always be ready to resume control</td>
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<td>Level 4</td>
<td>High Automation&lt;br&gt;Not required during defined use cases</td>
</tr>
<tr>
<td>Level 5</td>
<td>Full Automation&lt;br&gt;Not required</td>
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- **Driver**<br>Level 0: *Driver Only*<br>Level 1: *Assisted*<br>Level 2: *Partial Automation*<br>Level 3: *Conditional Automation*<br>Level 4: *High Automation*<br>Level 5: *Full Automation*

- **Vehicle**<br>Level 0: *None*<br>Level 1: *Long. or lat. control*<br>Level 2: *Long. and lat. control in a specific use case*<br>Level 3: *Long. and lat. control in a specific use case; System recognizes performance limits and alerts driver*<br>Level 4: *Cope with all situations automatically in a defined use case*<br>Level 5: *Cope with all situations automatically*
Consumers‘ Perspective on Autonomous Driving

From nightmares…

“I would never hand over control to a computer.“

“Using the park assistant is more demanding than parking myself.“

… to good drive’s sleep.

“I’d love to drive autonomously. It would give me the opportunity to utilize the driving time for working or sleeping. Consequently, I would have more time for the fun things in life.“

When the industry does not precisely explain customers what AD is all about, the consumer will define the answer himself.
Benefits of Autonomous Driving

Traffic safety: increases, less congestions, impacting roadwork capacity

Urban improvement: reduced emissions, reduction of car park, repurposurement of parking spaces, optimization of road structure.

New opportunities for public transport: emergence of shared autonomous vehicles (autonomous carsharing), autonomous bus systems, robocabs

Mobility enabling: individuals currently unable to drive (e.g. children, elderly, disabled, ill) get the chance to be “equal” citizens

Fagnant & Kockelman, 2015; Wu, Zhao, & Ou, 2011; Ge & Orosz, 2014

Levinson, 2015; Fagnant & Kockelman, 2015; Litman, 2014

Alessandrini, Campagna, Delle Site, Filippi, & Persia, 2015; Greenblatt & Shaheen, 2015

Bradshaw-Martin & Easton, 2014; Smith, 2012
## Areas of Current Research

<table>
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<tr>
<th>Political</th>
<th>Implementation and general benefits for the society (Isaac, 2016; Lari, Douma, &amp; Onyiah, 2015; Marletto, 2014; Smith, 2016)</th>
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<tr>
<td>Economical</td>
<td>Affordability, societal perspectives (Acharya, 2014), reduction or increases in externalities (Greenblatt &amp; Shaheen, 2015; Gucwa, 2014; Peterson, 2014), and general impacts on the economy (Burns, 2013; McEvoy, 2014).</td>
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<td>Ethical</td>
<td>Artificial intelligence settings (Goodall, 2014a, 2014b), dilemma scenarios (Deng, 2015), societal benefits (Gucwa, 2014), overall responsibilities (Gless, Silverman, &amp; Weigend, 2016; Hevelke &amp; Nida-Rümelin, 2014), AI’s limitations in this context (J.-F. Bonnefon, Shariff, &amp; Rahwan, 2015; Brassington-Edwards; Lin, 2013, 2016), public perception of these liabilities (Li, Zhao, Cho, Ju, &amp; Malle, 2016)</td>
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<tr>
<td>Technological</td>
<td>Programming issues (Kumar et al., 2012; Markelic, 2010), mapping challenges (Jie, 2014), integration of different road observation systems (Beliveau, Fithian, &amp; Deisenroth, 1996), risk reduction (Brini, Crubillé, Lussier, &amp; Schon, 2016), overall potential/feasibility aspects (Behere &amp; Törngren, 2016)</td>
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<td>Legal</td>
<td>Liability issues (Cohen, 2015; Crane, Logue, &amp; Pilz, 2016; Douma &amp; Palodichuk, 2012; Goodrich, 2013; Gurney, 2013; Pinto, 2012), the novel role of the driver (Beiker, 2012; Duffy &amp; Hopkins, 2013), insurance challenges (Gurney, 2013).</td>
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By conducting a MEC analysis, the overall motivations to use AD have been analyzed. Motive structures will be identified to deduce customer segments and resulting recommendations for elements to be communicated within a market launch.

Managerial Issue

How should AD be communicated in order to successfully bring it to market?

Research Problem

Studies on AD predominantly focus on technological contexts. However, no study has considered consumers’ motivational drivers to adopt AD.

To analyze adaption motives, we conducted a series of laddering interviews and employed the MEC technique because it allows for a detailed analysis of a consumer's usage motives and cognitive motive structures by linking relevant attributes, the resulting utility components, and underlying individual values, which can serve as a basis for market segmentation.

- Sample Size: 18
- Frequent drivers (more than 20,000 km per year)
- Rationale: Expositions, Benefits, Involvement

(1) extending academia’s focus on AD to a customer perspective
(2) uncovering frequent drivers motives and barriers to adopt AD
(3) connecting AD-related attributes to the identified motives
Methodology – the Means-End Chain

<table>
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<th>MEC Terms</th>
<th>Explanation</th>
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<tr>
<td>Means-End Chain</td>
<td>A MEC is a knowledge structure, linking the attributes of a product or service (i.e., means) to resulting consequences, achieved through consumption of the product or service, and ultimately values (i.e., ends) the consumer’s wish to fulfill with the product or service.</td>
</tr>
<tr>
<td>Attributes</td>
<td>In the present study, the attributes describe the AD-relevant characteristics of frequent drivers (e.g., driving time, car traffic).</td>
</tr>
<tr>
<td>Functional Consequences</td>
<td>The next level in the MEC, the consequences, are best understood in terms of utility and represent outcomes of the lower-order attributes. Functional consequences specify direct outcomes of the use of a product or service (e.g., improvement in traffic).</td>
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<tr>
<td>Psychosocial Consequences</td>
<td>Psychosocial consequences describe social and psychological outcomes, including everything that is outside the core function of a commodity (e.g., feel save using it) (Herrmann &amp; Huber, 2000).</td>
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<tr>
<td>Values</td>
<td>Values, the highest-order elements in a MEC, represent individual standards or goals (Pieters et al., 1995). “Values constitute an explicit or implicit conception of ideals, characteristic of the individual concerned, which controls the choice of a particular mode, instrument (means) and goal (end) of conduct” (Herrmann &amp; Huber, 2000, p. 98).</td>
</tr>
</tbody>
</table>
(1) Car drives autonomously
(2) Driving time
(3) Autonomous Driving Technology
(4) Interior design
(5) In-Car-Connectivity Technology
(6) Security enhancing features
(7) Car traffic
(8) Car2Car Communication
(9) New driving experience
(10) Communicate with others
(11) Be entertained
(12) Features to work on the road
(13) Improved traffic flow
(14) Additional time
(15) Improvement in traffic
(16) Be more productive in my job
(17) Certified technology
(18) Be entertained
(19) Communicate with others
(20) Novel mobility service
(21) Lean back
(22) Peace for mind & body
(23) Time for my own
(24) New Quality Time
(25) New mobility portfolio
(26) Time for my own
(27) Be more productive in my job
(28) Peace for mind & body
(29) Lean back
(30) Enhanced traffic safety
(31) Can trust technology
(32) Enhanced traffic flow
(33) Feel save using it
(34) Enhanced mobility portfolio
(35) Enhanced mobility portfolio
(36) Security
(37) Productivity
(38) new Quality Time
(39) New Quality Time
(40) Comfort
(41) Trust
(42) Societal benefits
(43) Job Status
(44) Hierarchical Value Map
### Main Findings

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<th>Backseaters</th>
<th>Backseaters value the comfort that AD offers. Novel interior design concepts, AD capabilities and the sheer driving offer them new driving experiences, where they can lean back. Having peace for mind &amp; body is a central consequence, associated with being able to communicate via new channels with others and indulging in entertainment features. This result supports findings of the qualitative study undertaken by Gardner and Abraham (2007) who investigated commuters reasons for car usage finding the relevance of a personal space allowing for relaxation.</th>
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<tr>
<td>Time Collectors</td>
<td>Time collectors mainly associate a new quality time with AD. To them, AD offers not only an enhanced traffic flow, but it allows them to have time for their own – in a privacy, that they otherwise might not have and that they are free to use for whatever purpose they prefer. This supports Lyons and Urry (2005) as well as Mokhtarian and Salomon (2001) who investigated the dimensions and important factors of travel time.</td>
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<td>Busy Bees</td>
<td>Busy Bees believe that AD will provide them with the opportunities of being more productive and successful in their job, due to features that allow them to work in their ‘office on wheels’. Likewise, they consider ’peace for mind &amp; body’ while being driven as important, as this allows them to be rejuvenated for the next meeting. Fujii and Gärling (2005) and Brown et al. (2003) found that car drivers forced to reduce car use and switch to public transport came to realize that journey time is not „dead time“ and used the disposable time productively.</td>
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<td>Security Seekers</td>
<td>For Security Seekers, trust and safety are central in their knowledge-structure on AD. They are concerned about feeling save when using AD features and an enhanced traffic safety. Certification of AD technology is of importance to them. Their type is supported by Byun (2001) who found that “safety” to be the most important factor in a car purchase decision.</td>
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## Conclusion

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<th>Why is AD relevant for the economic development?</th>
<th>Increases traffic safety, improves urban infrastructure, new opportunities for public transport, enables mobility.</th>
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<tbody>
<tr>
<td>What are potential customer groups?</td>
<td>The Backseaters (comfort and relaxation), the Time Collectors (gain of quality time), the Busy Bees (increased productivity), and the Safety Seekers (certified and mature technology).</td>
</tr>
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<td>How should one communicate AD?</td>
<td>Focus on general benefits associated with additional time available during driving (working, socializing, relaxing) and a better driving experience (safety, comfort, privacy).</td>
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<tr>
<td>Which topics are delicate?</td>
<td>Data safety, loss of control, loss of driving pleasure, insurance/liability issues, immature technology.</td>
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Thank you very much for your time!