A study of users’ preference after a brief exposure in a Shared Autonomous Vehicle (SAV).

Daniela Paddeu, Ian Shergold, Graham Parkhurst, Ioannis Tsourus, Amalia Polydoropoulou

*University of the West of England, Bristol, Frenchay Campus, Coldharbour Lane BS16 1QY - United Kingdom
b University of the Aegean, 3HP9+2H Mytilene, Lesvos Greece

Abstract

Shared Autonomous Vehicles (SAVs) represent an emerging alternative for driverless and on-demand transport (Fagnant and Kockelman, 2018), offering a compromise between private ownership and public transport (Haboucha et al., 2017). Ridesharing, fleet optimisation and downsizing, less congestion, and lower energy consumption are potential benefits of SAV over individual ownership of AV (Lu et al., 2018; Shaheen and Cohen, 2013; Fagnant and Kockelman, 2015; Meyer and Shaheen, 2017; Cai et al., 2019). SAVs also have potential in last/first-mile solutions for areas of low accessibility, and for integration with other modes such as public transport (Krueger et al., 2016). They may in fact be seen to be a more convenient alternative due to high flexibility (e.g. door-to-door service), and become a competitor to public transport. They may be seen as more convenient than private transport by allowing activities to be undertaken during the journey. Moreover, they would likely be cheaper than an exclusively used automated taxi. However, it is worth noting that the SAV user experience is likely to involve lower privacy, lower space availability, and a less seamless travel experience as the vehicle might divert from the shortest-path route to service other passengers. Travel cost, travel time and waiting time are key attributes for the acceptance of SAV (Krueger et al. 2016), especially within a dynamic ride sharing DRS environment (i.e. people share with strangers). However, a successful implementation of SAVs would also depend on people’s willingness to use the autonomous technology and to share the vehicle with unfamiliar others.

The literature offers many studies of AV acceptance and adoption, whereas studies of SAVs are limited. Most such studies are based on task choice exercises (e.g. stated preference) within online surveys that explore people’s preferences towards AVs and SAVs in hypothetical scenarios rather than actual experiences with AVs or SAVs in real environments. SAV user characteristics are also poorly understood although it is suggested that people with limited car access may be attracted to SAVs (Anderson et al. 2014; Fagnant and Kockelman, 2015). However, in general there is no empirical evidence to allow an a priori segmentation of SAV users.

The paper presents the results of a stated preference (SP) experiment designed to investigate preferences towards SAVs before and after experiencing a ride in a shared fully-automated vehicle in a real (but constrained) environment. The ride was provided in a four-seat electrically-powered fully-automated vehicle, at a large out-of-town shopping mall located to the north of the city of Bristol (UK) during January 2020.

The vehicle was always fully occupied, with either three or four participants to additionally explore the impact of safety stewards being present in the shuttle vehicle or not. The two surveys took on average 10-15 minutes to complete, and were administered on touchscreen tablets in a meeting room in the management offices of the mall, away from public areas. Participants were escorted to the trial site in a closed car park a short walk from the management offices before and after their ride. The route of each run was an approximate loop with some navigation round planted ‘islands’ and lasted 4-5 minutes, during which a series of interactions were staged. These included actors walking in front of

* Corresponding author. Tel.: +44 (0) 117 32 87549.
E-mail address: Daniela.paddeu@uwe.ac.uk

Peer-review under responsibility of the scientific committee of the 23rd EURO Working Group on Transportation Meeting.
the shuttle, or passing on an e-scooter to demonstrate the shuttle stopping, slowing down, or continuing at the same speed if no collision was predicted.

The sample (N=131) was balanced in terms of gender (50% males, 50% females) and all age groups were represented, even though there was a slightly higher number of people aged 50-69. Most participants were car drivers. Each was asked to carry out a choice task that included a reference mode and three AV alternatives: (1) AV-taxi shared with family or friends; (2) AV-taxi shared with strangers; (3) AV mini-bus that allowed for 10-15 people.

A survey instrument covering trust and comfort was also administered before and after the experience in order to allow a comparison between expectations and final perceptions. Other data relating to personality traits, interpersonal trust and trust in automation were also collected to investigate whether personal-experiential factors predicted response to the automated shuttle.

Initial results show that trust and comfort rates increased after the experience, confirming the findings from Paddeu et al. (2020). Additionally, for motorised mode users we observed an increase in the choice of both self-driving taxis and self-driving shared taxis after the experiment along with a drop in the choice of self-driving bus. For active mode users, we observed an increase in preferences for self-driving shared taxi and self-driving bus.

To further explore user preferences, an ICLV model (Integrated Choice Latent Variable) is under development. The model framework is presented in Figure 1. The model explores the effect of latent traits, comfort in an AV and trust in AVs, on the preference for different AV service models (exclusive taxi, shared taxi and bus). Initial analysis indicates interesting findings in terms of user preferences, some change after the experiment and a rise in value of time for self-driving taxis and shared taxis and drop in the value of time for self-driving buses. This finding may indicate a decreased user tolerance for time spent in autonomous taxis and an increased tolerance for time spent in autonomous buses after the experiment. It could also indicate that car users may re-evaluate time spent in the AVs, as they are no longer required to focus their attention on driving. Segmenting the users using latent constructs will reveal

![Figure 1 Model framework](image)

more information and explain the heterogeneity between user preferences. The original methodology and the real world-experience make this paper a novel contribution to the literature. To our knowledge, this is one of the first research papers in the literature to explore user preferences using SP experiments before and after real-life exposure to an autonomous vehicle.

References


Peer-review under responsibility of the scientific committee of the 23rd EURO Working Group on Transportation Meeting. Keywords: Shared Autonomous Vehicles (SAVs); Stated Preference; Real world experiment; Trust;