Vehicle Design May Be Critical to Encourage Ride-pooling in Shared Automated Vehicles

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In his book entitled *Three Revolutions: Steering Shared, Automated and Electric Vehicles to a Better Future*, UC Davis Professor Dan Sperling describes two scenarios that could result from new automated vehicles (AVs). In the "nightmare scenario," consumers privately own AVs and vehicle miles travelled (VMT) per capita increase (along with traffic and emissions) due to greater ease and accessibility of car travel. In the "dream scenario," consumers relinquish private car ownership in favor of pooling rides in shared autonomous vehicle (SAV) fleets, resulting in a reduction of VMT per capita, traffic, and emissions. Achieving the dream scenario depends on consumers' willingness to share rides with others.

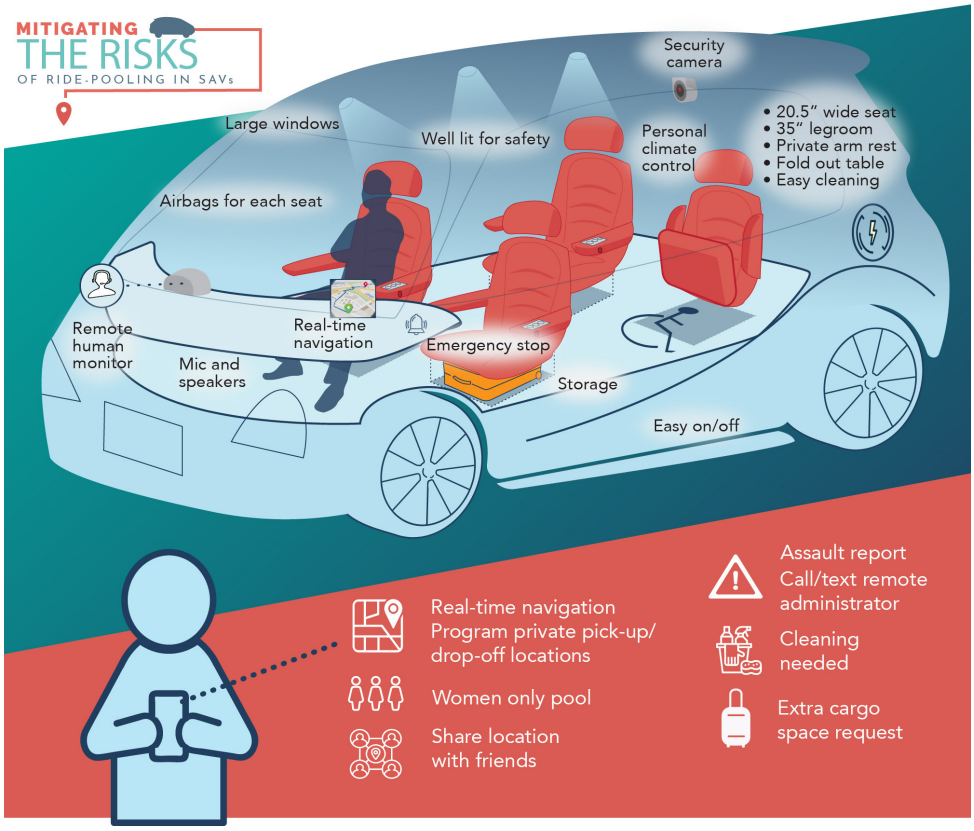

Figure 1. Vehicle design features that may mitigate the risks of ride-pooling in shared autonomous vehicles.

Public policy that incentivizes manufacturers to produce "pooling-supportive" vehicle design may be critical to encouraging a market shift towards shared mobility. However, little is known regarding the conditions under which riders will tolerate (or even benefit) from ride-pooling. To address this gap in knowledge, UC Davis conducted a study exploring the potential risks and benefits of sharing a ride with a stranger in an SAV, and articulating potential solutions based on vehicle and ride-hailing service design.

Key Research Findings

A review of relevant literature indicated that the following characteristics of the SAV ride-pooling experience could have an impact on risks to users: personal space, security (physical safety and data privacy), control, and convenience. Figure 1 depicts design features that could address these factors to mitigate risks, including:

- Large windows to offer a high degree of visibility in and out of the vehicle
- Spacious seating and legroom (relative to larger shared vehicles like buses and planes)
- Seats that orient forward with individual armrests
- A real-time map-based navigation display
- Remote administrators who can observe inside the vehicle at all times
- Good lighting so all passengers can observe each other
- Access to an emergency button or switch for all passengers
- A user app that allows riders to select pick-up and drop-off sites at public locations near actual private origins and destinations
- Opportunities for "ownership" of a particular vehicle by groups or associations (e.g., a female-only SAV)

Potential benefits of pooled SAVs that may be enhanced by design include providing restorative environments and/or enhancing social capital (networks of beneficial social relationships). Restorative environments provide a sense of being away from one's daily routines and having positive distractions or opportunities for creative activities, leisure, and fun. SAVs could be designed as restorative environments to help riders relax and elevate their mood by incorporating features such as themed interiors, quizzes and games, ambient entertainment, augmented reality windshields, and natural elements. Features that enable and encourage social interaction, highlight what riders have in common, and celebrate local diversity can help generate social capital. These features include allowing riders to face each other, accommodating food and drink, ensuring broad access (e.g., ADA), and making SAVs a canvas for local art. Figure 2 depicts these features aimed at creating benefits for ride-pooling.

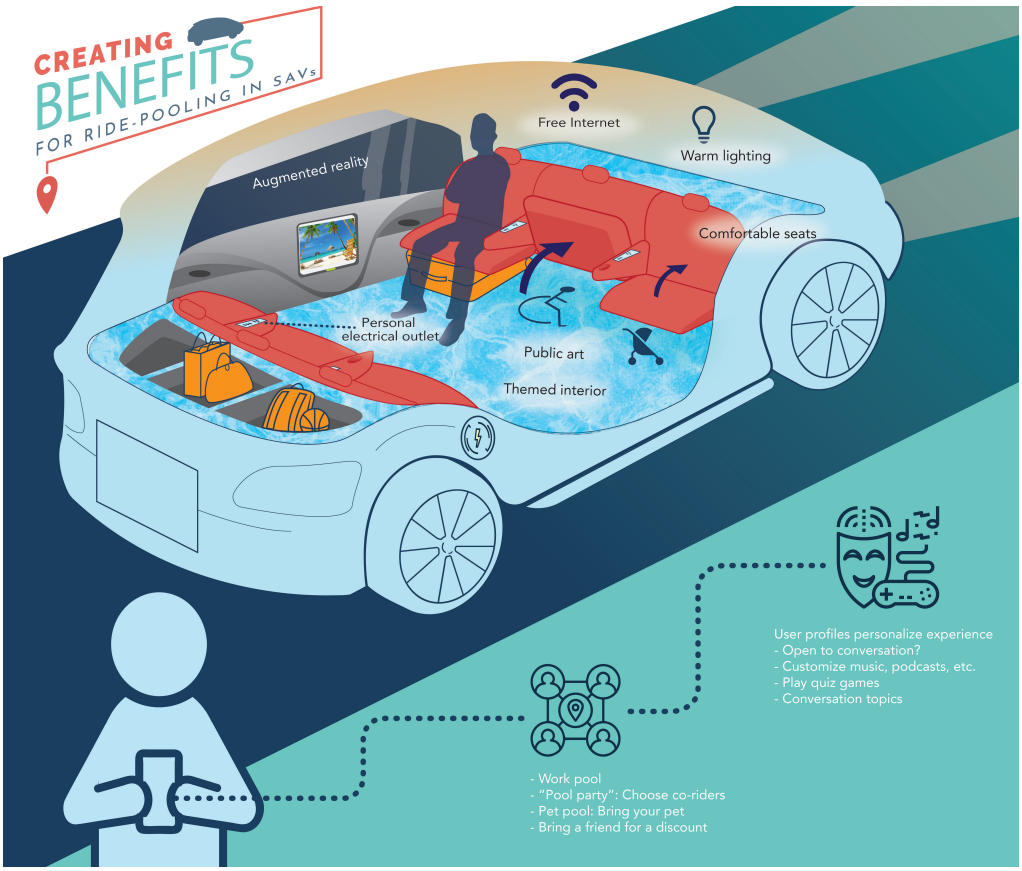

Figure 2. Vehicle design features that may increase the benefits of ride-pooling.

Although design solutions are displayed in two separate graphics here, features that mitigate risks and those that create benefits are not necessarily mutually exclusive. Designs can be flexible, allowing users to configure some features on-demand, such as swivel seats and in-ride entertainment. Future research can help determine whether a single flexible vehicle design could accommodate most prospective users' wishes (which may change over time after experience with the mode) or if different designs are required to accomplish certain goals for users (e.g., maximize physical safety versus enable social interaction).

Further Reading

This policy brief is drawn from the research report "Is it OK to Get in a Car with a Stranger? Risks and Benefits of Ride-pooling in Shared Automated Vehicles," prepared by Angela Sanguinetti and Ken Kurani with the Institute of Transportation Studies at the University of California, Davis, and Beth Ferguson with the UC Davis Department of Design. The report can be found here: https://escholarship.org/uc/item/1cb6n6r9. Also referenced in this brief is the book *Three Revolutions: Steering Shared, Automated and Electric Vehicles to a Better Future*, by Dan Sperling (Island Press).

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