Mobility automation: A double-edged sword

The transition to automated mobility will bring about big changes, not all of them positive. How can we mitigate negative impacts for groups at risk of being left behind?

Automated road transport has the capacity to bring about a number of social benefits, including social inclusion, safety improvements and more efficient traffic, in both urban and interurban contexts. But these same benefits could lead to **social conflicts** as one mobility paradigm gives way to another, upsetting the current equilibrium. This creative destruction process and the resistance of groups who stand to lose out could hinder the diffusion of these new technologies in our environments. Policy makers need to better understand their concerns in order to find ways to address them.

Key insights

- Automated mobility will **increase access** for those who are mobility impaired.
- Job losses due to automation are inevitable. Policy decisions are needed to **transition workers to new jobs.**
- Operational costs will be reduced. The **price settings** of traditional transport operators will need to be adjusted.
- **Social trade-offs** between transport operators, trade unions, shops, etc. will need to be resolved, especially for city logistics.
- Decision makers and institutions could use **cognitive mapping** to gain a fuller comprehension of attitudes and fears regarding automated mobility and to find a new equilibrium.

The detailed explanation

The introduction of AVs will bring about a number of potential benefits for society (Greenblatt and Shaheen 2015; Childress et al. 2015; Wadud et al. 2016; Morrow et al. 2014). We could see energy savings of up to ~80% from platooning, more efficient traffic flow (leading to less sporadic acceleration and braking), decreased parking requirements, and automated ridesharing. Additional energy savings are possible if increased safety reduces the need for safety equipment and a minimum mass for occupant protection (thus allowing for lighter vehicles). If AVs also enable greater use of battery electric vehicles (BEVs) or hydrogen fuel cell vehicles-(HFCVs), we could see decreases in polluting emissions. Removing human error and encouraging sharing could also lead to more efficient road use and decreased congestion, thanks to a combination of shorter headways and a decrease in accidents. AVs could also bring about social inclusion, through the provision of mobility services to people currently unable to drive.

There are also some positive indirect effects of AVs. For example, the technical infrastructure required to operate and manage AVs will make it easier to track usage per kilometre, and so will facilitate transport demand management tools such as distance-based taxes and pay-as-you-drive insurance policies. Also, roadway infrastructure could be managed dynamically. Directions could be modified on individual road lanes depending on aggregate AV flows. This would mean that lanes used for driving into town in the morning could be switched in the evening for driving out of town. In a fully automated system, travel times will become perfectly predictable (or estimates will be instantaneously adjusted in case of incidents), reducing the wait time at intermodal interchanges, and thus promoting intermodal transport.

One of the biggest benefit of AVs is their safety. In fact, if AVs could eliminate all human causes of crashes, it is thought that accident rates could fall by 80 to 90%. Because AVs would give the highest priority to pedestrians in terms of safety, they would reduce the need for strictly pedestrian areas, thereby increasing door-to-door mobility for mobility impaired people.

On the other hand, a potential downside of full automation is that it could lead to a dramatic increase in distance travelled, for example as the result of (Greenblatt and Shaheen 2015; Childress et al. 2015; Morrow et al. 2014) increased use by those currently unable to drive such as young people without driving licenses, the physically impaired, and elderly people. This could also mean a shift away from public transit and additional VMT/VKT (vehicle miles/kilometres of travel) due to self-parking and self-fuelling.

Also, many of these changes will lead to job losses and will necessitate modifications to current pricing structures. Initially there could be some resistance and even social conflict in this area, particularly if there are clear "winners" and "losers". Policy makers may want to look at who disproportionately bears the costs of these transitions, both in terms of job losses and pricing changes, and provide incentives to encourage uptake.

However, it may not simply be a matter of factual losses, there is also the perception of losses that decision makers need to consider. One tool that can shed some light on how different social groups perceive the changes that AVs threaten to bring to their sectors is cognitive mapping. Cognitive maps, which show cause and effect networks, could be used with developers, engineers and policy makers to identify mental models and provide a basis for reflecting upon and questioning those mental models.

References

Childress et al. (2015) Using an activity-based model to explore possible impacts of automated vehicles, Submitted for presentation at the Transportation Research Board 2015

Greenblatt, J. B., S. Shaheen (2015) On-Demand Mobility, Autonomous Vehicles, and Environmental Impacts," Current Sustainable/Renewable Energy Reports, volume and issue forthcoming. DOI 10.1007/s40518-015-0038-5.

McBride, N., The ethics of driverless cars, ACM SIGCAS Computers and Society 45(3):179-184, January 2016

McBride, N., ACTIVE ethics: an information systems ethics for the Internet age, Journal of Information, Communication and Ethics in Society, vol. 12, no. 1, 2014, pp. 21-43.

Morrow et al. (2014) Key Factors Influencing Autonomous Vehicles' Energy and Environmental Outcome, Road Vehicle Automation, Springer, 2014, pp 127-135

The Economist, Special report - Artificial Intelligence, June 2016

Skinner, R., Making Better Places: Autonomous vehicles and future opportunities, WSP - Parsons Brinckerhoff in association with Farrells, 2016

Wadud, Z., D. MacKenzie and P. Leiby (2016) Help or hindrance? The travel, energy and carbon impacts of highly automated vehicles, Transportation Research Part A: Policy and Practice, 86, 1–18.