UNIVERSITÄT DUISBURG ESSEN

Chair of General Business Administration & International Automotive Management
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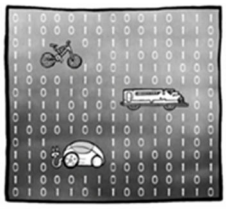
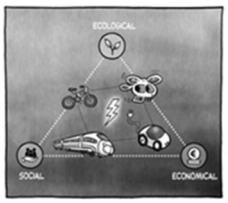
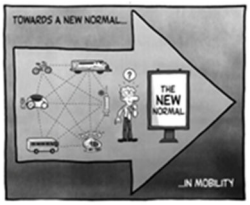
FUTURE OF THE AUTOMOTIVE INDUSTRY



Theses on the future of (auto)mobility in rural areas

The transformation of mobility will continue, even though electric mobility is currently being called into question in Germany, autonomous driving in mixed traffic will hardly be possible across the board in this decade, and shared driving, e.g., car and ride sharing or pooling, as well as Mobility as a Service (MaaS) as a seamless offering of various mobility services (Hietanen, 2014) is not (yet) profitable (Hensher et al., 2020). This is because the four global megatrends driving this transformation (digitalization, demographic change, urbanization, and decarbonization) are becoming stronger, as are competitors (technology companies, ride-sharing providers, and new automotive companies from China and the US)[1].

The transformation of mobility in rural areas differs from the transformation of mobility in urban areas:

- The transition to electric mobility is easier in rural areas because there is more space and better charging options, including on people's doorsteps, but journeys are longer, and charging is required more frequently.
- The transition to shared driving, on the other hand, is more difficult. In rural areas, journeys are slightly longer (43 km per day on average) than in cities (37 km on average), but the majority (56 percent) are made in private cars (in cities, the figure is only 27 percent, BMDV, 2024). This is due to lower population density and inadequate public transport. The utilization of shared mobility services is also low, and their profitability is even much lower than in urban areas.
- Autonomous driving would be helpful in rural areas because it does not require expensive drivers (who account for about two-thirds of the variable costs of on-demand solutions) and can be used continuously (with charging breaks). However, autonomous vehicles are unlikely to be driven in mixed traffic with other vehicles in Germany this decade (beyond pilot applications on test tracks and limited routes such as in Hamburg).

Five theses can be put forward for dealing with these challenges in rural areas[2].

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1 See the theses on the development of CASE transformation in the automotive industry by the Chair of Business Administration & International Automotive Management at the University of Duisburg-Essen.

2 The theses are based on discussions held by the Chair of Business Administration and International Automotive Management at the University of Duisburg-Essen, including at the symposium “The Future of Mobility in Rural Areas” at the University of Paderborn on November 6, 2024.

Thesis 1: Changing mobility in rural areas requires providers who work together in partner networks (ecosystems).

In order to accelerate the transformation to shared mobility with new MaaS offerings in rural areas, it is not enough to understand the often habitualized mobility behavior of consumers (e.g., Weyer et al., 2025) and initiate changes. It must also be worthwhile for providers.

In view of the major changes resulting from global megatrends in mobility and the many, often unclear framework conditions of the mobility transformation, it is helpful for automotive and mobility providers to work together in fixed partner networks in order to achieve the transformation together. Compared to loose collaborations, this means a joint alignment of more than two fixed partners via a common platform towards an overarching value proposition (Adner, 2017), with the aim of generating added value for all parties involved (Brandenburger & Stuart, 2007). This is even more true in rural areas than in cities, given the particular profitability problems there. Offering shared mobility and MaaS requires fewer joint innovations (in an innovation ecosystem) than, for example, the development of software-defined vehicles. It is about the use of “shared resources” in a transaction ecosystem.

One problem with building ecosystems is that traditional automotive companies, at least, are not particularly willing to cooperate, as evidenced by many failed collaborations (Reeves et al., 2019) and problems with ecosystems. They try to optimize hardware and dominate partnerships, but struggle with the agile working methods of software and technology providers. In contrast, the still young automotive companies on the US West Coast and in China are successfully cooperating with software companies.

Thesis 2: Changing mobility in rural areas requires public-private partnerships.

The transformation of mobility cannot be driven by the state alone because there is not enough money to do so. However, the state should be involved in order to ensure that all groups in rural areas have access to transportation that enables them to reach workplaces, educational institutions, healthcare facilities, and leisure activities, and that reduces environmental pollution. In addition to expanding public transportation, on-demand transportation, car sharing, and other innovative solutions are needed. Given the tight public finances, private capital is also necessary, which requires the possibility of profits and profitable business models.

Many innovative solutions from public-private partnerships are still in the research or pilot project stage. For example, in the automotive city of Detroit, an autonomous on-demand shuttle is being tested in a pilot project (Accessibili-D[3]), because the expansion of local public transport has been neglected, making mobility difficult for those who cannot afford a vehicle, especially older people and people with

[3] http://City previews "Accessibili-D," a free autonomous vehicle shuttle for residents age 62+ and/or with disabilities, ahead of June 20 launch | City of Detroit.

disabilities. The Michigan Mobility Collaborative (MMC), founded by the city of Detroit, has received a $7.5 million grant from the US Department of Transportation (USDOT) to set up autonomous vehicle services to provide free transportation for seniors (over 62) and people with disabilities during the pilot period. May Mobility was selected as the autonomous vehicle system. The consulting firm Deloitte is leading the project management office and has developed a “Car to Cloud Data Platform” that collects data from the vehicles' sensors and helps researchers optimize safety and comfort.

To address the more difficult transformation of mobility in rural areas, the Neue Mobilität Paderborn initiative, for example, aims to create a sustainable mobility ecosystem involving public and private partners. With support from the BMWK, the NeMo.bil project (https://nemo-bil.de) is developing and prototyping a “needs-based passenger and freight transport” system. “To this end, an innovative approach with two types of automated vehicles is being pursued: swarms of small vehicles serve the first and last miles and combine on longer distances to form a convoy pulled by a larger vehicle.” By combining small, very light vehicles with low speeds and a “towing vehicle to form a convoy with reduced air resistance” at higher speeds, resources and energy requirements per kilometer driven are significantly reduced.

It is important to scale these public-private mobility ecosystems in such a way that they generate profits for private providers and minimize losses for local authorities.

Thesis 3: Providers in public-private mobility ecosystems must moderate conflicts of interest and need secure data rooms, even in rural areas.

In addition to the lack of cooperation among traditional automotive companies (Thesis 1), conflicts of interest must be reduced—especially in cities with limited space, but also in small and medium-sized centers in rural areas, i.e. Conflicts between contradictory and sometimes irreconcilable interests (e.g., Proff, 2019), such as

- Conflicts between fairness and distribution (between residents with private vehicles, businesses and companies, and visitors, employees, and customers with cars)
- Conflicts between quality of life and new technological solutions (between vehicle owners and people without cars)
- Conflicts over cost allocation (between providers of charging infrastructure and owners or tenants of apartments or housing companies) and
- Governance conflicts (between private and public providers).

Mediation solutions must be sought for unsolvable conflicts (see also Proff, 2019). For example, the conflict over cost allocation can be resolved by incorporating bidirectional charging[4]. This generates additional revenue and can provide relief in terms of cost allocation[5].

The state can not only engage in public-private partnerships, it can also initiate mediation solutions and steer economic development. Unlike in China, where the state intervenes very openly and massively, and in the US, where industry is very strongly protected and supported, German economic policy tends to set framework conditions and support data transfer and exchange, for example. Because data

[4] With bidirectional charging, electric vehicles are not only charged but also discharged. The stored energy can be used to optimize self-consumption, balance peak loads, or trade on the electricity exchange (Meyer et al., 2025).

[5] Conflicting goals on the path to sustainable mobility will also be a topic at the next Science Forum Mobility, which the IAM Chair is organizing for the Faculty of Engineering in Duisburg on May 15, 2025, and which is once again expected to attract some 400 high-profile participants from science, politics, and business..

must flow between public and private providers of new mobility concepts as a prerequisite or enabler of joint value creation in ecosystems, secure data rooms and data protection regulations are important. This is also shown by a study of global MaaS offerings (Jeppe et al., 2025). Although financial flows between partners in ecosystems are improving, data is often not exchanged.

Gaia-X is developing a data infrastructure in Europe (https://gaia-x.eu). One initiative is Ca-tena-X (https://catena-x.net/de), “the first end-to-end, collaborative, and open” data ecosystem for the automotive industry, “connecting all players along the value chain” and facilitating “standardized, interoperable, and data-sovereign collaboration” to “promote innovation, increase efficiency, and enable compliance.” Other initiatives include the establishment of a Mobility Data Space (MDS, https://mobility-dataspace.eu/de), where vehicle and mobility providers can quickly and efficiently obtain data from a wide variety of sources with a high degree of transparency regarding the data offered and standardized connectors.

The study of global MaaS ecosystems also shows that, in addition to external data rooms, it is also important to protect data when it is exchanged within ecosystems. In addition to structural regulation (platform technology) and access regulation (barriers to entry for new players), transfer regulation within the platform (e.g., redistribution of profits, control regulation), competition rules, and IP regulation (e.g., rights of complementary parties to their own IP) also help to improve relationships between partners, e.g., through trust (see, for example, Dyer et al., 2018).

Thesis 4: Joint value creation in public-private mobility ecosystems requires user participation, active orchestrators, and additional business models.

Joint value creation can only succeed in ecosystems if the platform is used more intensively, i.e., if more traffic is generated. This requires both more private and commercial users. In the case of private customers, the aim is to attract affluent older people who are more willing to pay for better and longer-term participation in mobility (see, for example, the studies in Proff et al., 2020), but also wealthy families with children.

A study of global MaaS offerings (Jeppe et al., 2025) shows that users must be involved in the development of MaaS offerings in order to create value together (value co-creation according to the service-dominant logic of Vargo & Lusch, 2004). The more we succeed in “making them dream,” the more willing they are to pay for innovative solutions. Here, it is important to enable innovative solutions for rural areas as well, and not just for cities.

It is also important that the coordinator or orchestrator of a MaaS ecosystem does not just offer a platform or app, i.e., is not purely a broker (Jeppe et al., 2025). Instead, they should also be involved in the means of transport in order to understand and better address the cooperation, coordination, and data transfer issues involved in joint value creation via the transaction platform.

The services offered by such a mobility ecosystem should also go beyond transportation from A to B. In order to attract additional traffic to the platform, additional services are needed, e.g., personalized services for aging populations such as individualized meal services, but also combined event and mobility tickets. In addition, data can be sold, e.g., important information about road conditions and available parking spaces to road and urban planners, but also to private advertisers. Providers should also try to attract business customers whose CO2 reporting is increasingly being questioned and who want

to appeal to new and, above all, younger talent with more modern mobility offerings. Examples include mobility budgets, i.e., financial budgets that employers make available to their employees as an additional benefit for their individual commutes and work trips. In rural areas, car and ride-sharing offers should also be included in the usual public transport mobility offers. A real-world laboratory for such a mobility budget (cf. in Weyer, 2025) has shown, for example, that employees are willing to use mobility budgets and try out new modes of transport. However, there can be no “one-size-fits-all” approach, but rather different packages for customer groups with different needs.

Thesis 5: Only autonomous driving will bring about a radical change in mobility in rural areas; intermediate steps should be taken first.

Autonomous driving will not leave pilot applications and routes in Germany until the next decade. Only then will the breakthrough in the transformation to sustainable and socially equitable mobility in rural areas be achieved. However, steps should already be taken today to move in this direction by improving the driver assistance systems currently on offer and gradually introducing new mobility services. To make them more profitable, additional services (e.g., transport of food, medicine, or data sales) are necessary.

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