Equity Gap: Advancing Accessibility of Emerging Mobility Services

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1. MOTIVATION

Due to the novelty of emerging mobility services, such as ride pooling, e-scooter sharing or robotaxis, empirical studies that focus on the accessibility of these systems for vulnerable-to-exclusion citizens are still lacking. Some early studies point to benefits of emerging mobility systems for advancing accessibility of transport, like promoting independent travelling for visually impaired persons with autonomous vehicles (Bennett, Vijaygopal, & Kottasz, 2020) or via the integration of new mobility services in the public transport system (Palm, Farber, Shalaby, 2021 & Young). On the other hand, emerging mobility systems, such as bike sharing or e-scooter sharing are expected to decrease accessibility due to cost-related or skill-related exclusion (Milakis, Gebhardt, Ehebrecht & Lenz, 2020). This paper is based on the research aim to understand which measures do people with disabilities suggest to ensure the accessibility of emerging shared mobility services. understand the divergent needs and attitudes of people with access needs towards future mobility as a means for designing inclusive mobility solutions. The paper addresses this pertinent research question in more detail: It aims to understand the divergent needs and attitudes of people with access needs towards future mobility as a means of designing inclusive mobility solutions.

2. METHODS

The paper is based on an empirical study that was conducted within the European research project TRIPS (T*Ransport Innovation for vulnerable-to-exclusion People needs Satisfaction,* https://trips-project.eu) that aims to empower people with different types of disabilities to play a central role in the design of inclusive future mobility solutions. A survey developed on the findings of a preceding qualitative study (König, Seiler, Alčiauskaitė, & Hatzakis, 2021), addressed the respondents' views on topics such as local inclusion policies, emerging assistive technologies and COVID-19 related changes of mobility. The survey was translated to 15 languages and disseminated via networks of disability organizations, newsletters and social media. After data cleansing, data from 553 respondents from 21 European countries were analysed. The mean age of respondents was 46.4 years (*SD* = 15.7 years). The sample consisted of people with different impairments: physical (53.7%), visual (15.4%), hearing (8.1%), mental (2.9%), intellectual (3.1%), multiple (15.4%) and other impairments (1.1%).

Whereas the project adopts a broader view on mobility, this paper focusses on six emerging shared mobility services: ride pooling, bike sharing, e-scooter-sharing, motorbike taxi, microtransit and robotaxis. In particular, we present the findings of a single open-ended question: "*What would you need to make this system work for you?*". Data was analysed using the inductive category development

approach of qualitative content analysis using the software MAXQDA. Overall, more than 660 suggestions were identified and used for the analysis. The results were clustered to seven different areas of measures: 1) service design aspects, 2) vehicle design concepts, 3) measures to increasing social awareness and training of staff, 4) policy measures and regulations, 5) infrastructure measures, 6) safety, 7) human-machine-interaction and 7) affordability.

3. RESULTS AND DISCUSSION

Data was analysed using the inductive category development approach of qualitative content analysis using the software MAXQDA. Overall, more than 660 suggestions were identified and used for the analysis. The results were clustered to seven different areas of measures: 1) service design aspects, 2) vehicle design concepts, 3) measures to increasing social awareness and training of staff, 4) policy measures and regulations, 5) infrastructure measures, 6) safety, 7) human-machine-interaction and 7) affordability. The code matrix browser provides an overview over the code system and compares the frequency of codes for the six mobility services (Figure 1).

For robotaxis, suggestions often fell within the category *human-machine-interaction* by indicating the need for accessible interaction systems with the driverless vehicle, such as a sign language transcription system, easy-read information and voice commands. The respondents requested design concepts to identify the pick-up stop and the vehicle. Suggestions from physically-impaired people underlined the need for automatic ramps for self-boarding.

With regard to bike sharing, suggestions mostly pointed to adapted vehicles concepts that support keeping one’s balance, such as four-wheelers, tandems or tricycles. Respondents also expressed the need for the service to be compatible with wheelchairs or strollers, e.g., handbikes and support while riding by electric support or even self-driving bikes.

For e-scooter sharing, suggestions were comparable to the bike sharing results. Beyond, the availability of a seat would be desirable to respondents with physical impairments. Regardless of the form of disability, respondents made a wish for the possibility of being accompanied by a companion.

Suggestions with regard to the concept of microtransit highlighted the need for a door-to-door-service, an on-demand service that does not require long pre-booking times and wheelchair-accessible vehicles. Some comments also emphasized the wish for non-shared vehicles or separate compartments.

Suggestions for ride pooling were in most parts comparable to microtransit. Furthermore, respondents required a location detection of the vehicle and an alternative to app-based booking.

With regard to motorbike taxis, suggestions pointed to the need for training drivers in interacting with persons with disabilities. As for other two-wheelers, design concepts were requested for increasing stability and for carrying a companion. Furthermore, an alternative to wearing a helmet was required by some persons, e.g., due to wearing a cochlear implant.

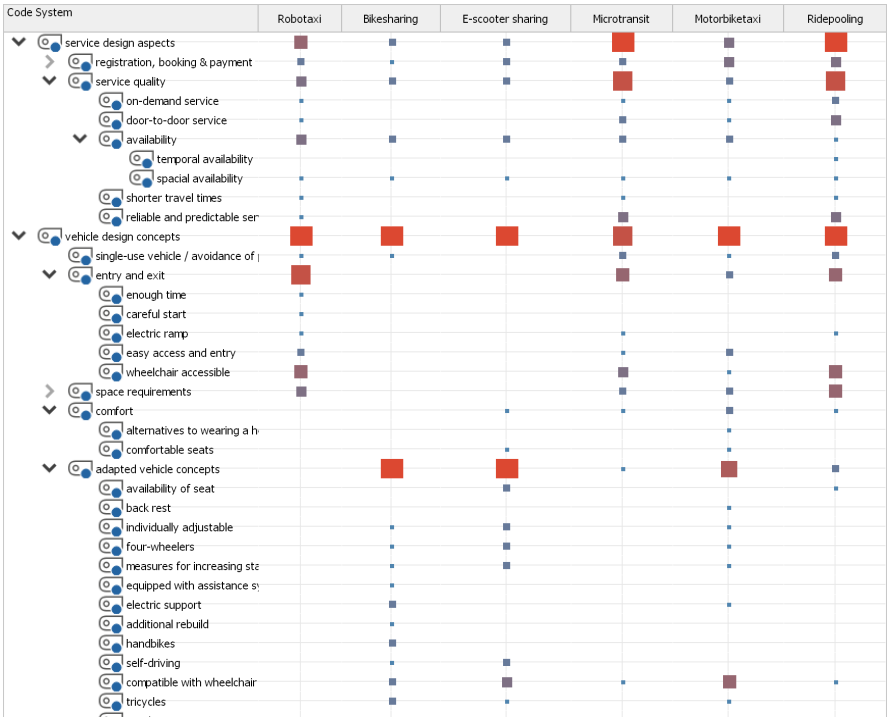

Figure 1 – Excerpt from the code matrix browser of the code system

To conclude, several suggestions from respondents address measures for increasing accessibility across the six mobility services. To highlight two suggestions, booking systems that do not require mobile internet access and ensuring a certain soundstage of the vehicles for their identification are examples for advancing accessibility of these emerging mobility systems. It should also be noted that most of the suggestions for improvements, such as separate infrastructure or reliable and predictable information, would also benefit people without disabilities.

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