What Makes People Change Their Preferences in Public Transportation – Opinions in Different User Groups

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Abstract. Mobility is a critical requirement for cities, but broadly accepted mobility concepts are difficult to realize. Environmental hazards, high costs, complex planning processes, affordability, accessibility and safety are crucial factors. Also, the demographic change in line with increasing individual transportation needs and mobility profiles aggravate a sustainable and topical planning of urban mobility. As the understanding of human needs is vital for the acceptance of novel mobility concepts, we explored pro- and contra-using motives for public transportation as well as aspects of conditional acceptance. Using an empirical approach, 580 persons answered a questionnaire in this regard. The results allow insights into opinions of age and gender related mobility needs in the public transport sector.

Keywords: Public transport · Mobility pattern · Acceptance · Pro-using arguments · Contra-using arguments · User diversity

1 Motivation and Related Work

Traffic situations in many cities worldwide have reached critical proportions. Not only do bumper-to-bumper traffic jams congest cities each day, especially at peak times. But environmental hazards such as the climate change and increasing CO_2-emissions urge communities and urban planners to sensibly develop novel public mobility concepts which might adapt to the critical mobility needs of modern cities. In addition, the demographic change has a considerable impact on mobility concepts: An increasing portion of older adults travelling around as well as the changed biographical roles and duties (children's ride to and from school or kindergarten, short distance city trips, tourist excursions or profession car poolers) require highly flexible transport systems at multiple scales (e.g., day-by-day or seasonally). Such transport systems should meet community needs such as accessibility, comfort, safety, sustainability, affordability, but also climate-related needs. In order to be context-adaptive, mobility options must be intermodal, flexible, and designed as "door-to-door" mobility chains [1]. Yet, in most of the European municipalities and communes, there is a predominantly technology-centered planning of infrastructural public mobility concepts. Even if technical and economic factors are key criteria for feasible and affordable mobility services, mobility

includes also a strong behavioral component [2] in relation to different mobility needs. Persons at different points in their life might have varying preferences with regard to specific means of transportation, be it as a matter of customization [3], family habits [4], or specific mobility needs, and one type of transportation might be perceived as more appropriate than others [5, 6]. Personal traits (standard of comfort, environmental morality), age and generation [7], but also gender do play a considerable role in transportation habits [8, 9]. As there is an urgent need in understanding people's attitudes towards the use of public transportation, this exploratory study aims at revealing user opinions regarding the use of means of public transportation, including all types (buses, trains, subways, etc.). Beyond pro-using arguments, on the one hand, and con-using arguments, on the other, possible circumstances are explored under which users would be willing to adopt public transport in the near future.

2   Method

To reach a large number of participants, the questionnaire method was chosen. Participants were asked via email to take part in the study. Completing the questionnaire took about 30 min. Items were taken from argumentation patterns of focus group studies [10, 11] which were carried out prior to this study. In total, 580 persons (17–86 years (M = 31.3 years; SD = 11.6); 47.6 % women took part. In age group 1, the mean age was 22.5 (SD = 2, N = 200); in age group 2, the mean age was 30.1 (SD = 3.5; N = 292), and in age group 3, the mean age 54.1 years (SD = 9.9; N = 88). As independent variables, gender and age were examined. Three age groups were formed: (1) <25 years of age, (2) 26–40 years (beginnings of the professional career), and (3) 41 + years (high professionals). Dependent variables were the levels of (dis) agreement to the *pro public transport* arguments and to the *contra public transport* arguments. Pro- and con-arguments were categorized within four dimensions (comfort, ecology, economy, and efficiency).

(1) PROs for using public transport

- *comfort-related arguments:* convenience, restfulness, possibility to take other persons/animals, sightseeing, time for other things (e.g., read, work, sleep)
- *ecology-related ('green') arguments:* eco-friendliness, to be outdoorsy
- *economy-related arguments:* low costs, affordability, price-performance balance
- *efficiency-related arguments:* punctuality, start points nearby, good availability, efficient destination reachability, flexibility, continuous mobility.

(2) CONs against using public transport

- *comfort-related arguments:* inflexibility, stressful, discomfort, disturbing travel passengers, too close contact with other passengers, overcrowded
- *ecology-related ('green') arguments:* ecological damage, weather dependency
- *economy-related arguments:* high costs, long waiting times
- *efficiency-related arguments:* lacking availability, slow locomotion, unpunctuality, lacking possibility to do other things (e.g., working), unreliability.

(3) Reasons for changes in mobility patterns: if changes occur in…

financial situation, health, movability, family situation, living situation, mobility needs, quality of public infrastructure.

3   Results

Data was analyzed by using M(ANOVA) procedures with repeated measurements. The significance level was set at 5 %.

3.1   Evaluation of PRO Arguments

The MANOVA yielded a significant omnibus effect of age ($F(2,586) = 14.3$; $p < 0.000$). The age effect was most prominent in ecology ($F(2,586) = 20.2$; $p < 0.000$) and economy related arguments ($F(2,586) = 39.8$; $p < 0.000$), both being less important with increasing age (Fig. 1).
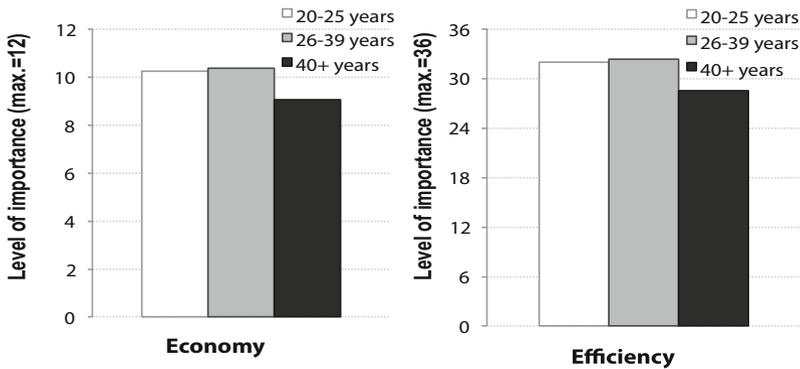

Fig. 1. Age effects on pro-using arguments.

Beyond the main effect of age, significant interacting effects of gender and age were revealed (Fig. 2) regarding ecological ($F(2,586) = 14.4$; $p < 0.000$), economic ($F(2,586) = 8.2$; $p < 0.000$), and efficiency related arguments ($F(2,586) = 9.7$; $p < 0.000$).

3.2   Evaluation of CON Arguments

The next analysis is directed at the perceived barriers (Fig. 3). Again, a significant omnibus effect of age was found ($F(2,586) = 5.6$; $p < 0.000$) that reached significance for ecological ($F(2,586) = 3.8$; $p < 0.02$), economic ($F(2,586) = 7.1$; $p < 0.001$), and efficiency related arguments ($F(2,586) = 8.9$; $p < 0.000$). With increasing age, eco-friendliness is more while costs and efficiency are less important as decision criteria for
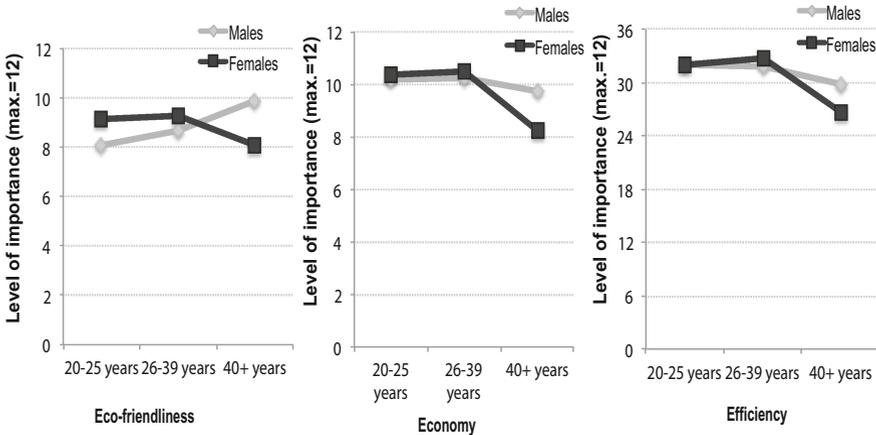
Fig. 2. Interacting effect of age and gender on arguments pro public transport

the use of public transportation. Also, the significant interaction of age and gender ($F(1,586) = 7.4$; $p < 0.000$) revealed that environmental arguments are less important for young males in contrast to all other (age and gender) groups (not pictured here).
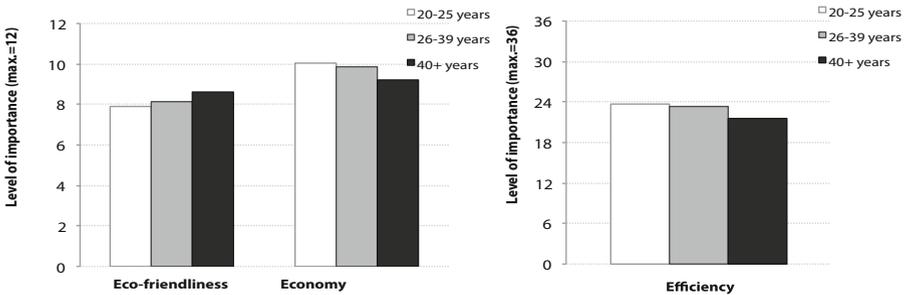

Fig. 3. Age effects on con-using arguments.

3.3   Conditional Acceptance Criteria

Finally, conditional circumstances were collected which could increase the acceptance to use public means of transportation (Fig. 4).

Considerable age effects were present regarding the evaluation of conditional acceptance towards using public means of transportation ($F(2,586) = 11.8$; $p < 0.000$). The oldest group seems to have quite different priorities in most of the lines of argumentation compared to the youngest group. The middle-aged group was partly in line with the oldest group (e.g., out of restricted mobility), partly with the youngest group (e.g., when the living situation, the family situation or the place of residence changes). Also, women reported to have a significantly higher conditional acceptance in contrast
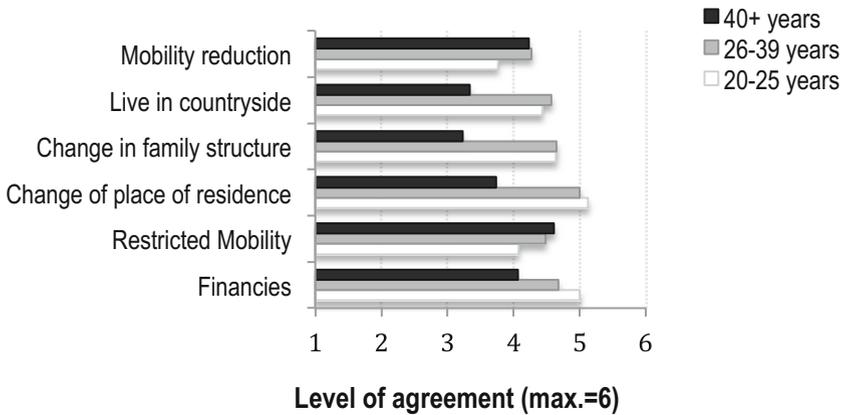
Fig. 4. Agreement to conditional acceptance criteria (1 = not at all, 6 = completely agree)

to men ($F(1,178) = 2.4$; $p < 0.004$) and they were more willing to change their mobility patterns depending on external reasons (e.g., change in family situations, living in country side) than men.

4   Discussion and Conclusion

Technological, infrastructural, or economic criteria are almost always the exclusive foci during the urban planning of mobility concepts and do not include the public. However, current developments show that ignorance towards human needs within the technical planning process of urban mobility might raise public protests and decision delays. The latter could be avoided if human mobility needs would be integrated early in the development process and if adequate and individually tailored public information and communication concepts would be launched. In order to understand human opinions with respect to using motives and barriers when using means of public transportation, an online survey was carried out and completed by 580 persons in Germany. Prior to the questionnaire, focus groups were run to find out which argumentation patterns and mental models about mobility needs prevail.

Overall, there was a higher positive motivation to use public means of transport than a negative motivation towards the usage of public transport (taken from the higher scores on confirmation of pro-using compared to contra-using arguments). Main pro-using motives were economy- and ecology-related reasons. Contra-using arguments were mostly the low comfort and the comparably low efficiency (unreliability, unpunctuality) of public transportation means.

User diversity is a critical factor for the usage of public means of transport. With increasing age, economy arguments were less and ecological arguments more important. Apparently, age corresponds to a higher awareness of responsibility for future generations as well as sustainability on a larger scale in terms of environmental morality. Environmentally friendly mobility concepts are also crucial for women, possibly due to their more family related perspective.

Insightfully, there are no static pro- or contra argumentations for or against a specific means of transportation. Mobility behaviors are not a question of faith or affinity to specific means of transportation. Rather, acceptance follows a highly context-related and situational dependent view. Persons are to a much lesser extent committed to a specific vehicle type or form or modality; they rather do respond to individual preferences and situational needs, be it ecological or economical or efficiency or comfort-related. Participants reported to wish for many different mobility options and travel alternatives that should be available all the time, have easy booking and registration interfaces, a high interconnectivity and intermodal mobility services (car, bus, tram, bicycle, or car sharing), as well as offer an easy and integrated accounting procedure across transportation means [12]. Having the full choice, dwellers then could adapt their mobility habits to individual and situational needs depending on family roles, private or professional needs, as well as life-long mobility patterns. Thus, mobility and urban planners might have to re-think. Mobility services should not only be designed according to technical and infrastructural or economic factors, but they should be designed along human-centered mobility and travel chains, with intermodal mobility services including different types of transportation means. These results may also have an impact on information and communication aspects for novel urban mobility concepts. The usage of public transport should not be praised as a patronizing top-down reasoning. Dwellers require mobility concepts that integrate their natural mobility needs and user diversity in the individual travel profiles, and also offer a timely and transparent public information and communication procedure.

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