BEHAVE 2020
6th European Conference on Behaviour and Energy Efficiency
Copenhagen, 21-23 October 2020

SHARING VEHICLES OR SHARING RIDES - WHAT INFLUENCES THE ACCEPTANCE OF SHARED MOBILITY SERVICES IN GERMANY?

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Keywords: Shared mobility, adoption, social acceptance, diffusion of innovation

1. Introduction

In the light of climate change and declining fossil resources, increasing energy efficiency in the transport sector is in the focus of many governments. Today, individual transport is dominated by cars - specifically the usage of private vehicles with combustion engines. Shared mobility presents one solution to break this dominating paradigm and to make transport more efficient and sustainable. Since wide adoption is crucial for shared mobility to play out its advantages, this paper focuses on psychological factors influencing its acceptance based on a survey study from Germany.

2. Background, theory and methodology

Shared mobility refers to transportation modes shared on an as-needed basis [1], e.g. carsharing, ridesharing or e-kickscootersharing. In this study, we focus on the two services of carsharing and ridesharing in order to analyse and compare psychological factors influencing the acceptance of a more established and a recently introduced sharing system. In Germany, carsharing is available in 79 out of the 80 major cities and 2.29 million individuals were members of 181 carsharing organisations [2]. The newer service, ridesharing, is provided by eight organisations in 14 major cities [3]. To compare these services, the paper is guided by the following research question: What influences the acceptance of shared mobility services and to what extent does the acceptance of the two mobility services differ?
Rogers' model on the Diffusion of Innovations (DoI) [4] outlines individual adoption

decisions as influenced by the perceived attributes of the innovation (see below). The conceptual model of this study reflects the sequential relationships between the more basic dispositions (environmental identity [5] and routine seeking [6]) and the individually perceived attributes in the DoI concept, as well as general attitude and acceptance of the innovation (Figure 1).

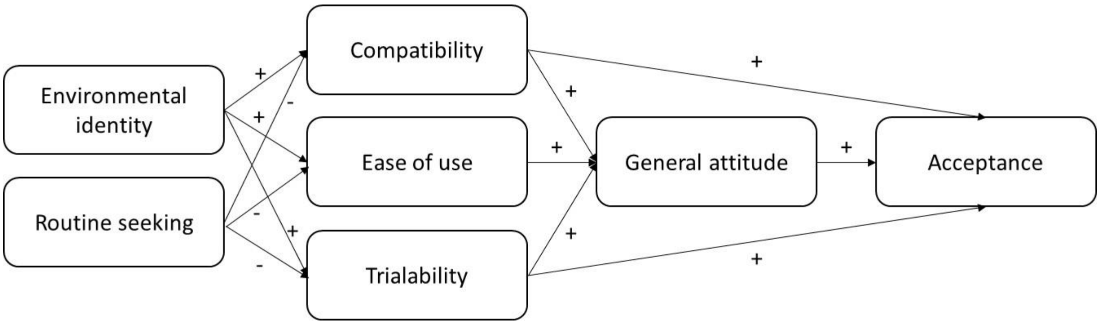

Figure 1 Conceptual model (initial model)

The data was collected in autumn 2019 via an online survey (N = 3,061) in German cities with more than 100,000 inhabitants. Participants were recruited from an online panel by a market research company and were randomly assigned to the sub-samples carsharing (CS) (n = 767), bikesharing (n = 764), e-kickscootersharing (n = 766) and ridesharing (RS) (n = 764), each receiving a different introductory paragraph. Sub-samples were quoted to be representative of the population in the selected city categories according to region, level of education and a gender-age category.

Measures for the statistical model include i) acceptance (actual and intended use of the services), ii) general attitude towards the services, iii) environmental identity, iv) routine seeking, and the DoI constructs of v) compatibility, vi) trialability, vii) complexity ("ease of use"), and viii) observability. Items on the relative advantages were not included in the questionnaire as they caused problems in an earlier study [7]. Environmental identity, routine seeking and the DoI constructs (except for trialability) were measured with items developed in studies by the authors' research team [8]. Item aggregation to scales was based on explorative factor analyses and estimations of Cronbach's α. This led to the expected one-factor solution for constructs iii-vii; two items were excluded from further analyses. As Cronbach's α was not sufficient for the scale on observability this factor was excluded.

A path analysis (PA) was used on the data with the model being identified properly and over-identified. Maximum Likelihood (ML) was selected with robust standard errors and a Satorra-Bentler scaled test statistic as the estimation method. The R package lavaan was used to test the model and to calculate the direct and indirect effects and the fit indices: Chi-Square (χ^2), Root-Mean-Square-Error of Approximation (RMSEA), Standardized Root-Mean-Residual (SRMR), Comparative Fit Index (CFI) and Tucker-Lewis-Index (TLI).

3. Results

For the variables in the path model, descriptive statistics were examined (Table 1).

Variables	Mean		SD		Min	Max
	CS	RS	CS	RS		
Acceptance	2.94	2.85	1.53	1.36	1	6
General attitude	4.08	3.97	1.72	1.62	1	7
Compatibility	2.67	2.64	1.55	1.50	1	6
Ease of use	4.48	4.42	1.35	1.36	1	6
Trialability	3.62	2.96	1.83	1.88	1	6
Routine Seeking	3.45	3.47	1.10	1.08	1	7
Environmental identity	5.46	5.48	1.41	1.45	1	7

Table 1 Descriptive statistics for the PA model variables (N Carsharing=614, N Ridesharing=539)

The initial model was modified by removing insignificant paths and by adding regression paths as suggested by the modification indices. The final PA models for carsharing and ridesharing demonstrated a good fit and no difference between the observed and expected matrices (χ^2=7.79 resp. 1.95, p=.17 resp. p=.75). RMSEA and SRMR are less than .05 and CFI and TLI range from 0.99 to 1.01. That is, all indices show good model fit.

Selected Fit Indices	CS	RS
χ^2	7.79	1.95
RMSEA	0.03	0.00
SRMR	0.02	0.01
CFI	0.99	1.00
TLI	0.99	1.01

Table 2 Fit indices of the carsharing and ridesharing model

The paths are significant (p<.05) and in the expected directions. In both models, the path between compatibility and the general attitude shows the largest positive standardized path coefficient (ß=.63 resp. .65), followed by the path between compatibility and acceptance (ß=.47 resp. .39). As expected, the general attitude has a positive effect on acceptance in both models. The remaining DoI variables trialability and ease of use have a positive impact on the general attitude in both models. Environmental identity has positive effects on compatibility and ease of use in the carsharing model, however, a negative impact on acceptance. In the ridesharing model environmental identitiy positively influences all DoI variables and the general attitude but not acceptance. Routine seeking negatively influences ease of use and acceptance in both models; in the ridesharing model there is also a negative influence on the general attitude. In the carsharing model, however, there is also a positive effect on compatibility (Figure 2, Figure 3).

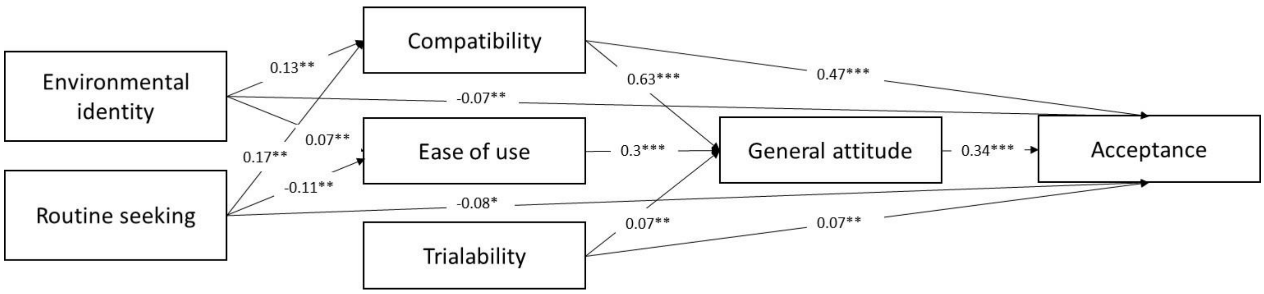

Figure 2 Final model for carsharing with standardized path coefficients

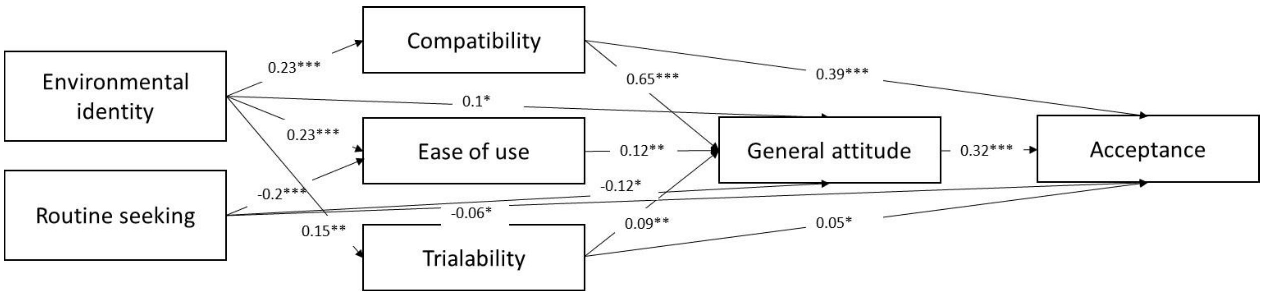

Figure 3 Final model for ridesharing with standardized path coefficients

4. Discussions and Conclusions

The PA revealed many significant correlations in the predicted directions, thus, the psychological variables in the model can predict whether or not individuals use and intend to use carsharing or ridesharing. For practitioners and policymakers this presents an interesting finding as it provides hints towards aspects that can be influenced to change the attitudes towards the sharing services and consequently their usage. Trialability can, for example, be influenced based on the availability of the services.

The relevance of environmental identity on the acceptance is mixed: Whereas the effects in the ridesharing model are clear - higher importance of environmental issues is associated with a more positive attitude - the effects for carsharing are more complex. One possible reason could be the preference for non-motorized means of transport of respondents with higher environmental protection attitudes. Routine seeking negatively influences some DoI constructs and the attitude and acceptance in both models. For carsharing, however, routine seeking shows a positive effect on compatibility. Routine behaviour might therefore not be detrimental for carsharing usage overall and these individuals could still be reached by such a service. In future studies, it would be interesting to differentiate here between station-based and free-floating systems.

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