An Empirical Study of Customers' Behavioral Intention to Use Ridepooling Services – An Extension of the Technology Acceptance Model

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Abstract. Shared mobility services for passenger transportation become increasingly popular all over the world. As services like carsharing are already well-established and well-accepted, ridepooling services are at their early stage and currently within first implementations. The most critical success factor of such services is the customer acceptance. We investigate the acceptance of 115 German questionnaire respondents using and extending the Technology Acceptance Model. Results indicate that the success factors of the developed model serve as useful predictors of the behavioral intention to use ridepooling services. Perceived compatibility was identified to have the strongest impact whereas perceived ease of use and perceived safety are not relevant for accepting ridepooling services. Based on these findings, our paper provides management implications and recommendations to improve acceptance and success of ridepooling services in Germany.

Keywords: Ridepooling, Passenger Transportation, Urban Mobility, Technology Acceptance Model, Structural Equation Modeling.

1 Introduction and Motivation

Urban areas are confronted with a multitude of challenges as high emissions, poor air quality, fossil fuel dependency, traffic volume, and congestion [1]. With increasing consciousness for sustainability and environmental responsibility, the need for innovative solutions tackling these problems is emerging. As a consequence, the sharing economy has been arisen from the idea that sharing a good or a service is often more advantageous than owning it as resource inefficiencies are reduced. Regarding passenger transportation, rideservices depict a possibility for individuals to share a car or a trip in different modes. Supported by technological developments and the digitalization of processes, companies are able to offer reliable modes of dynamic on-demand rideservices; concurrently, customers can participate easily through the use of immediate communication with connected mobile devices [1-3]. In this way, the

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information system (IS) domain can be characterized as enabler for digital economies and corresponding digital services as well as business models [4].

The most recent development of digitally supported rideservices is ridepooling (also referred to as shared ridehailing). Using big (geo) data analytics approaches together with intelligent algorithms, passengers are aggregated to groups and allocated to the best option of available vehicles in real-time and on-demand. Thereby, multiple passengers share a ride in the same vehicle to increase transport efficiency. Recent studies from New York City demonstrate ridepooling's efficiency, as it was shown that the traffic volume can be significantly reduced when using high-capacity ridepooling instead of individual taxi services [2, 5]. Due to this positive impact, ridepooling becomes of increasingly interest to cities worldwide. In Germany, potential ridepooling providers are planning to offer this service in order to take advantage of the untapped potential. Except of overcoming the legal barriers, the acceptance of ridepooling services is a critical factor for being successful in the long term. It represents the first step in the adaption process and results in actual usage. Especially in the early stages of innovation development, its investigation is of high relevance because a modification of the service is still possible based on changed customers' needs and requirements [6].

In the literature, the acceptance of innovations has been already investigated by different models regarding various contexts [7]. With the help of hypothesis-testing studies, pertinent factors for these acceptance models have been identified. The most used and established model is the Technology Acceptance Model (TAM) [8]. With regard to the ridepooling context neither a model nor success factors have been studied yet. To address this research gap, we investigate the customer acceptance using TAM as basic theory and extending it in order to fit the research field of ridepooling services. The following research question guides our examination:

RQ: Which constructs influence the customer acceptance of ridepooling?

To answer this question, the article is structured as follows: first, the background is explained containing urban mobility, TAM, and related literature. The methodology covering the hypothesis development, the study description, and the results build the third section. In the fourth section, obtained results are discussed and the contributions of our approach are highlighted. Recommendations, limitations, and further research are elaborated in the fifth section. At last, we complete our article with conclusions.

2 Research Background

2.1 Urban Mobility, New Mobility Services, and Ridepooling

As an outcome of numerous individuals' decisions, urban mobility describes passenger movements within the city environment. Regarding the travel behavior, passengers decide upon vehicle ownership, individual or collective transportation, and mode of transport (e.g., car, bike, feet, tram, etc.). In contrast to private vehicle ownership, people are able to choose Mobility-as-a-Service (MaaS) (e.g., bus, taxi, carsharing, bikesharing, mass transit, etc.) to carry out daily activities. The individuals' decisions are affected by several key factors which are dynamic and interacting [9]:

- *demographic trends* – population (e.g., age, growth, density), licensed drivers;
- *transportation options* – private vehicles, carsharing, mass transit, taxi;
- *infrastructure* – road network, traffic management systems;
- *user preferences* – social mobility preferences, residence;
- *transportation costs* – fuel, transit, parking, ownership costs; and
- *macroeconomic facts* – economic growth, global warming, employment, pollution.

Besides these factors, technological developments influence the way people move, as they address economic, ecological, and societal problems within people's environment [10]. This results in new mobility concepts, respectively new mobility services (NMS) as subcategory of MaaS. Emerging technologies – such as digitalization, high-speed computing, location data, accurate sensors, wireless connectivity, social media expansion, and new usage-based pricing schemes – serve as enabler for NMS [9]. Thereby, NMS represent potential solutions to allow for a more convenient, efficient, and flexible transportation for different individual purposes of travelling. NMS contribute to a mobility evolution because they incrementally change the travel behavior towards a multimodal and less car-centric system, particularly in urban areas. They dissolve the boundaries of what is owned and shared [9]. Present trends take a stronger shift towards sharing with a special focus on sustainability [11]. As the use of shared transportation modes partially substitutes private car ownership, the number of cars on and off the road can be reduced. Consequently, traffic density, travel costs and time, fuel consumption per person, and air pollution are reduced [12, 13]. One reason for choosing NMS instead of owning a car is the problem of missing parking space in urban areas. Compared to public transportation, NMS have the advantage of high flexibility, especially regarding point-to-point service. In addition, short waiting times and easy payment methods are further benefits [14]. The following list gives an overview of the latest NMS including a brief explanation [15]:

- *Carsharing*: Users pay money based on the used time or distance for renting a car (variants: business-to-consumer or consumer-to-consumer; station-based or free-floating).
- *Carpooling* or *Ridesharing*: A vehicle is used by individuals who take a ride at the same time in the same car from and to similar destinations. The matching is done by an intermediary company or by an informal system of the users.
- *Ridehailing*: Determining the trip's start and end point, a passenger demands a transport service offered by companies or individuals.
- *Ridepooling* or *Shared Ridehaling*: Users hail a shuttle to designated pick-up points near their location. Passengers with similar routes are matched and transported together in one vehicle.

The most recent development regarding NMS is the shared travelling respectively pooling of users with overlapping routes. Thus, customers share the costs of the trip resulting in prices between taxi and mass transit charges. Exemplary services are *uberPOOL*, *Lyft Line*, and *MOIA*. The concept of ridepooling comprises that users hail shuttles via an app and get on the shuttle at designated pick-up points near their location. An algorithm optimizes each vehicle's route in terms of travel time and capacity to enable shared trips with overlapping routes. As a result, the number of cars and thereby road traffic's negative impacts can be reduced significantly. Dealing with the urban mobility in an American context, a study by Alonso-Mora et al. [2] predicts that 99% of the taxi demand in New York City could be served by 25% of the utilized vehicles if using high capacity ridepooling. Due to the economic, environmental, and societal advantages, ridepooling offers a high potential to different target groups. Besides competition and political issues, an important barrier to overcome appears to be the acceptance and the conclusive usage by the population.

2.2 Technology Acceptance Model

Consumer acceptance can be defined as the "relatively enduring cognitive and affective perceptual orientation of an individual" [8]. Thereby, the acceptance process of individuals depends on the tradeoff between benefit and effort of using an innovation or technology [16]. Investigating these psychology processes causing special human behavior is complex and difficult [17]. For solving this problem, lots of social-psychological models have been developed in the last decades to explain and predict technology acceptance as well as usage of individuals [18].

In scientific literature, the most popular cited model for that is TAM [8]. TAM is an adaption of the Theory of Reasoned Action (TRA) which was originally developed by Fishbein and Ajzen [19] to predict human behavior [20]. Davis [21] and Davis et al. [22] adopted TRA to the acceptance research in IS contexts and used it as a basic theory to explain the relationship between the individual's reaction of using a technology, the intention, and the actual usage of it [23]. For that it utilizes behavioral intention to use (BI) to predict actual behavior and focuses on the identification of relevant factors for adopting an innovation or technology [24]. TAM can also be transformed into a measurement of customer acceptance in other varieties of settings and technologies like internet banking, mobile service, online tax service, or teacher's technology usage which has been investigated by several researchers (e.g., [6], [20], [25]). Both models, TRA and TAM, are based on individual beliefs which determine and affect its attitude towards a technology in a given situation [26]. Beliefs are defined as "the person's subjective probability that performing the target behavior will result in salient consequence" [21]. These beliefs are the internal psychological variables, for instance, the individuals' characteristics in the models. They function as mediators of all external variables like individuals' characteristics which also may affect the usage of an innovation [27]. Therefore, they have an indirect effect on the BI [21]. In TAM, these beliefs consist of the two factors perceived usefulness (PU) and perceived ease of use (PEOU) which have a relationship to each other. At TRA, attitude towards use (ATU) and subjective norm (SN) represent the beliefs [28]. In addition, TAM represents the motivational variables which lead to the actual system usage. They reflect a tendency which is built directly at the beginning of being in contact with the innovation. This enables researchers to test the innovation in an early stage [21]. Because of the mentioned descriptions, we make use of TAM in combination with constructs of the TRA in order to measure the acceptance factors of ridepooling.

2.3 Related Research

Chowdhury and Ceder [29] provide a literature overview of public transport studies analyzing willingness to ride as well as the related acceptance. Investigations on the acceptance of NMS are not contained within the review. However, there are some studies that deal with the different carsharing variants and their acceptance. Ohta et al. [30] present an article that examines the acceptance of carsharing in Japan. As result, the attitude to conduct carsharing for car-owners was low and the BI was quite high for non-owners. People living in urban areas had a greater acceptance for carsharing than rural inhabitants. Dütschke and Peters [31] conduct an empirical analysis on sustainable modes of transport like carsharing and electric vehicles. As a result, perceived compatibility (PC) was the most influencing factor towards ATU carsharing across all sociodemographic groups. Fleury et al. [32] examine the acceptance of corporate carsharing in France based on the Unified Theory of Acceptance and Use of Technology (UTAUT) framework. The most important dimension in determining behavioral intentions about corporate carsharing was effort expectancy. Besides, the added perceived environmental friendliness had only a small effect on behavioral intentions, mediated by performance expectancy. Another quantitative study by Efthymiou et al. [33] investigate the factors affecting the adoption of carsharing systems by young drivers. Further, Cheng et al. [34] examine the motivation of users to participate on a carsharing platform.

Regarding ridesharing, Giang et al. [26] investigate the customers' BI such services. The authors ascertained the positive effect of ATU ridesharing applications on BI them based on a Vietnamese study. Results demonstrate that PU and PEOU had positive influence on attitude toward ridesharing behaviors. The constructs ATU, SN, and perceived behavior control further played critical roles in predicting the BI ridesharing applications. Another article by Wang et al. [35] investigate the customers' BI such services extending TAM on the new constructs personal innovativeness, environmental awareness, and perceived risk (PR). Results demonstrate that these constructs were positively associated with customers' BI ridesharing services. On the other hand, PR was negatively associated with the BI as well as PU. Further, personal innovativeness was negatively related to PR. Other quantitative analyses are for instance Delhomme and Gheorghiu [36], who conduct a French study of users and non-users, or Wright et al. [37], who focus on the acceptance of a ridesharing-platform.

Concerning acceptance analyses on ridehailing or ridepooling, literature lacks using common applications of theories like TAM, TRA, or others. To the best of our knowledge, no article focuses on the acceptance of these services itself. There exist only short surveys revealing that around 79% of the ridehailing-users would use ridepooling, depending on factors like costs and number of passengers extracted from a Brazilian study [38]. Clewlow and Mishra [15] investigate the adoption and use of ridehailing services in San Francisco. Studies on the acceptance of apps or platforms for ridehailing services are more frequent, as for instance, Tan et al. [39] or Ruangkanjanases and Chayanee [40]. For ridepooling service apps or platforms, no scientific studies are existent. Thus, ridepooling is a quite new concept which currently starts being implemented and has not been addressed in acceptance studies so far.

3 Methodology

3.1 Hypothesis Development

One of the goals of TAM is the quantification of the influence of behavioral intentions on actual systems usage. Measuring the actual system usage is in most contexts difficult, especially if the acceptance of a system is investigated which is still at its early stage of implementation, such as ridepooling [41]. The actual system usage is influenced by the BI a technology. It measures the strength "of one's willingness to exert effort while performing certain behaviors" [41]. By a high degree of accuracy, the actual system usage can be very well approximated by behavioral intentions which a lot of studies already found out in different contexts [17]. According to the TRA, behavioral intention is the direct factor of the appropriate behavior [25]. Furthermore, it is more suitable "for a survey-based research", because beliefs can be measured at the same time [27]. Based on this relationship, we choose the BI ridepooling as the dependent variable in our approach. BI is directly influenced by ATU. It describes "the degree to which using a technology is positively or negatively valued by an individual" [42]. According to the NMS context, Giang et al. [26] explore the positive effect of ATU ridesharing applications on BI. In view of these findings regarding ridepooling services it can be hypothesized:

H1: ATU has a significant positive effect on the BI ridepooling services.

ATU does not only represent the main antecedent of BI but also functions as the key mediator between it and the other influencing factors [43]. According to the TRA, attitude will be developed by individual beliefs. These beliefs arise through learning processes and consequently affect attitudes [27]. Therefore, a better understanding of ridepooling may lead to a superior ATU ridepooling and consequently to a higher acceptance. These beliefs are represented by the constructs of PU and PEOU. Therefore, the following hypotheses can be derived:

H2: PU has a significant positive effect on ATU ridepooling services.

H3: PU has a significant positive effect on BI ridepooling services.

According to TAM, PEOU is another driver of ATU and represents also a crucial belief [7]. This term addresses the complexity degree of an innovation "to which (…) [it] is perceived as relatively difficult to understand and use" [16]. In a ridepooling context, the mobile application to order the service should work without errors, its functions should be instinctively understandable, and the user should be able to choose between different payment methods. Besides, the amount of effort must be in a proportionate relation to the usage. Therefore, the following hypothesis can be developed:

H4: PEOU has a significant positive effect on ATU ridepooling services.

Apart from the direct effect of PEOU on ATU, Davis [16] found the indirect effect via PU. The easier the innovation is perceived to be, the higher seems its usefulness in the case that more effort can be put into other activities. Therefore, the advantage of PU on ATU would be weakened by the uneasiness to use [16]. For this reason, the following hypothesis can be derived:

H5: PEOU has a significant positive effect on PU of ridepooling services.

According to the diffusion theory of Rogers [44] several factors are responsible for the adaptation of innovations. Being quite similar to the belief concept of TAM, it proposes PC as one of the core factors for customer acceptance of new technologies [45]. It can be defined as "the degree to which an innovation is perceived as being consistent with the existing values, needs and past experiences of the potential adopters" [41]. In the literature, lots of studies discovered the high importance of compatibility for measuring and explaining technology acceptance behavior. For example, Schierz et al. [8] already found the positive effect of PC on ATU, PU, and BI a technology. Based on these studies the following hypotheses can be developed:

H6: PC has a significant positive effect on the PU of ridepooling services.

H7: PC has a significant positive effect on the ATU ridepooling services.

H8: PC has a significant positive effect on the BI ridepooling services.

Apart from reaching benefits of using new technologies (e.g., PU and PEOU), it is still hard to evaluate the unknown [8]. As new technologies are uncertain in their outcomes, they seem to be riskier for customers [46]. Especially when it comes to transportation modes, feelings of safety are associated with PR that is why the selection of transportation modes is dependent on perceived safety (PS). That is why PS is a relevant issue in the car context regarding the acceptance which Osswald et al. [6] confirmed in their study. They defined this construct "as the degree to which an individual believes that using a system will affect his or her well-being" [6]. It addresses the capability of an individual to estimate the situation as being dangerous or safe. Regarding to the context of ridepooling services, the element of safety exemplarily includes the estimation of the driver's ability and trustworthiness [6]. Another safety problem might be the traveling with unfamiliar passengers [29]. Therefore, we construct the following hypothesis:

H9: PS has a significant positive effect on the ATU ridepooling services.

Especially at the beginning of a diffusion or development of an innovation, the social context plays a major role within the adaptation process. The influence of the social context is represented by the factor SN which can be "defined person's perception that most people who are important to him think he should or should not perform the behavior in question" [19]. Already Davis et al. [22] suggested to further research the relationship between TAM and the effect of social influences on usage behavior. That is why the following hypothesis can be set:

H10: SN has a significant positive effect on the BI ridepooling services.

3.2 Description of Our Study

Primary data was collected through an online-survey. We shared our questionnaire to German participants only. Therefore, the complete questionnaire was translated into German before. To generate high response rates in different areas, the survey was spread over social media, forums, and via e-mail using our existing network on transportation research. We conducted our examination in the first half of March 2018.

Our questionnaire begins with a short definition of ridepooling services to ensure similar knowledge of the respondents. The measurement items base on different applications and were modified to suit the research context of ridepooling services. We adapted the items for the construct ATU from Cheng et al. [34] and Delhomme and Gheorghui [36]. Items for PU and PEOU were adapted from Davis [16]. SN was adapted from Madigan et al. [18]. Items for the constructs PC and BI were taken and adapted from Schierz et al. [8]. As described, we added the construct PS to our model, adapting the items from the study of Osswald et al. [6]. For instance, we asked questions about concerns with unfamiliar passengers or trust into the driver of a ridepooling vehicle. For measuring the items, a seven-point Likert scale was used, ranging from 1 ("strongly disagree") to 7 ("strongly agree"). The underlying codebook is presented in Table 1.

Regarding demographics, 115 respondents took part in the survey, whereas 48 (42%) were female and 66 (57%) were male. Regarding the age, 94 participants responded to the group of 20-29 years old, representing 70% of our total data set, 15 people (13%) were between 30-39 years. In terms of their profession, 48 were students (42%) and 48 employees (42%). We asked some general questions about the usage of ridepooling services in the past and relevant factors for the future. The additional questions could be answered on a multiple selection with an open text field. 77 (67%) of the participants have already heard of ridepooling services. 91 out of 115 people surveyed (79%) did not used ridepooling services in the past. We asked also about the (possible) purposes to use a ridepooling services. Most frequently, participants would use ridepooling to drive to a train station or airport (mentioned 74 times) and to drive to a nightclub in their leisure time (mentioned 70 times).

Table 1. Presentation of underlying Codebook

Constructs	*Items*	*Constructs*	*Items*
ATU 1	More comfortable mode of transportation	PC 1	Usage depends on transportation possibilities
ATU 2	Independence of movement	PC 2	Usage fits lifestyle
ATU 3	Pleasant service	PC 3	Preferring of ridepooling services
ATU 4	Advantageousness of usage	PEOU 1	Easy execution of the steps to usage
ATU 5	Good idea to use	PEOU 2	Precise and comprehensible interaction
BI 1	Usage in contrast to other transportation modes	PEOU 3	Easy usage
BI 2	Probability of usage in the future	PEOU 4	Learning would be easy
BI 3	Willingness of usage in the future	PS 1	Dangerous usage
BI 4	Intention of usage in the future	PS 2	Ride with unfamiliar passengers
SN 1	Importance by family and friends	PS 3	Trust in the driver
SN 2	Good idea by family and fiends	PU 1	Useful mode of transportation
SN 3	Recommendation by family and friends	PU 2	Simplification of the transport
		PU 3	Fast transport possible
SN 4	Usage by family and friends	PU 4	Improvement of the transportation selection

Notes: ATU: Attitude towards Use; BI: Behavioral Intention to Use; SN: Subjective Norm; PC: Perceived Compatibility; PEOU: Perceived Ease of Use; PS: Perceived Safety; PU: Perceived Usefulness

3.3 Results

We performed Structural Equation Modeling with the help of the software package *SmartPLS* (version 3.2.7). For validating the reflective measurement models the indicator reliability must be given. This is proven by a factor analysis which tests if more than 50% of the variance of an indicator can be traced back to the associated latent variable. The indicator can remain in the dataset if the factor loadings are above 0.5 [47]. The factor analysis show factor loadings above the critical value for all indicators except of two. In consequence, we dropped SN 4 and PC 2 for our investigations. Our scale reliability tests found Cronbach´s alpha values greater or equal 0.7. Therefore, we found an acceptable internal consistency [48]. Table 2 shows the mean values, the standard deviations (Std. Dev.), and the discriminant validity analysis of our model. We compared the roots square of average variance extracted (AVE) values and the correlations between the constructs [49]. The diagonal elements in bold face in Table 2 represent the square root of AVE values. All of them are larger than the correlations among constructs. In result, convergent and discriminant validity are verified [50].

Table 2. Mean Values, Std. Dev., and Discriminant Validity of the Structural Equation Model

Construct	Mean	Std. Dev.	ATU	BI	PC	PEOU	PS	PU	SN
ATU	4.73	1.40	**.899**						
BI	4.41	1.69	.800	**.894**					
PC	3.93	1.63	.747	.814	**.905**				
PEOU	5.58	1.27	.453	.477	.518	**.904**			
PS	5.57	1.16	.428	.479	.411	.394	**.872**		
PU	4.27	1.45	.841	.783	.792	.475	.401	**.862**	
SN	4.70	1.37	.697	.664	.566	.441	.403	.662	**.951**

In support of H1, there is a positive significant, but moderate influence of ATU ridepooling services on BI them (β=0.29; $p<0.001$). Moreover, the path coefficient of β=0.65, ($p<0.001$), points to a strong positive relationship between PU of ridepooling services and the ATU them. Thus, H2 can be affirmed. Regarding H3, even though the structural link from PU to BI ridepooling services is still positive (β=0.09; $p\geq0.1$), no significant relationship can be proved. In addition, the results do not provide significant evidence for the effects of PEOU of ridepooling services on ATU them (β= 0.01; $p\geq0.1$) and on PU (β=0.09; $p\geq0.1$). As result, H4 and H5 are not supported. The strongest significant influence is found at PC of ridepooling services on PU of them with a beta of 0.75 and a p-value<0.001, as hypothesized and supported in H6. Furthermore, a positive influence reveals PC on ATU ridepooling services (β=0.19; $p<0.01$) so that H7 can also be supported. As hypothesized in H8, with a path coefficient of β=0.44, PC has a positive impact on BI ridepooling services ($p<0.001$) and is therefore supported. The hypothesized significant effect of ridepooling services' PS on the ATU them was found to be nonsignificant (β=0.08; $p\geq0.1$), thus H9 is rejected. The hypothesized assumption of the influence of SN on BI ridepooling services (H10) can be confirmed to be significant (β=0.16; $p<0.1$). Due to these results, H1, H2, H6, H7, H8, and H10 can be accepted, whereas H3, H4, H5, and H9 need to be rejected.

Apart from investigating the path coefficients, the quality of the endogenous variables must be checked as well. The construct of PU of ridepooling services is explained by its exogenous variables of adjusted $R^2 = 0.63$. ATU ridepooling services as well as BI them are quite similar: the former shows an explanatory power of adjusted $R^2=0.72$; the second of adjusted $R^2=0.75$. With regard to the definition, these results are satisfactory. Figure 1 summarizes the results of our path analysis presented before.

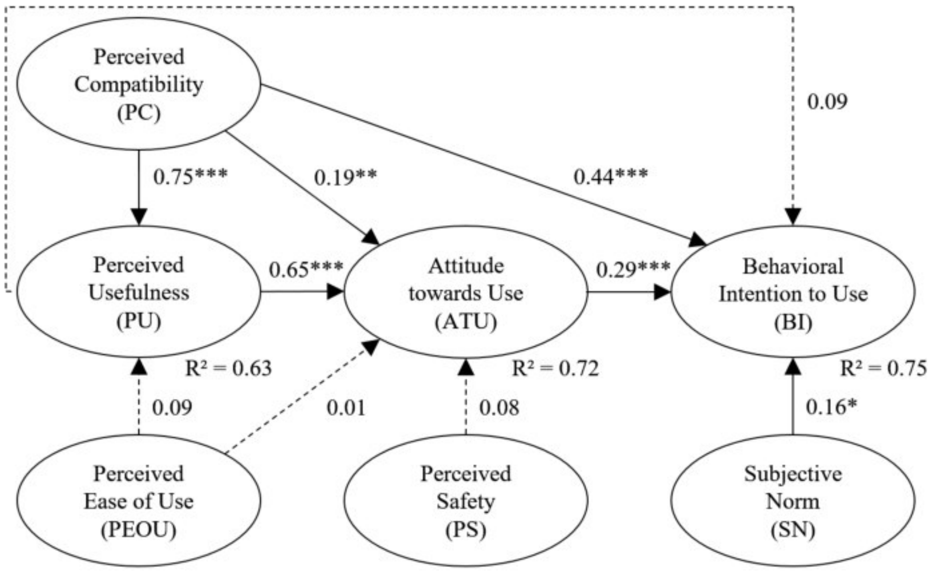

Figure 1. Results of the Path Analysis
*Notes:*p<0.1; **p<0.01; ***p<0.001; n=115; Dotted lines represent insignificant paths*

4 Discussion and Contributions

The insignificant direct influence of PU on BI (H3) is quite unexpected as this relationship has been confirmed in the literature many times in other contexts. For instance, Wang et al. [35] who analyzes the customers' BI ridesharing found a significant positive relationship between PU on BI. Regarding the ridesharing context, the service is seen as useful and has therefore, in contrast to ridepooling, an influence on BI. PU represents a fundamental driver of BI and counts therefore to the key constructs of the TAM [51]. However, a possible reason could be that the majority of respondents have not yet used ridepooling services. Under certain circumstances, it may be not the usefulness but the experience and its accompanying pleasure that is a reason for participating in such a concept. The journey in a modern and appealing vehicle with a slight cost disadvantage compared to conventional mass transport could be an explanation for this. According to these results, the direct relationship cannot be transferred to the ridepooling context with the empirical data of our study. Consequently, the mentioned direct effect of beliefs on BI ridepooling services cannot be affirmed. In addition, Lee et al. [41] found ten non-significant and even 17 not applicable relationships of in total 101 investigated studies in their literature review. This refers to the fact that there are also other studies with the same inexplicable results.

In contrary to that, the role of PEOU in the TAM is already critically discussed in the literature. Many researchers question this construct as a fixed component in the TAM due to the existence of many controversy studies regarding the unstable measurement of PEOU. Therefore, rejecting H4 and H5 is not quite unexpected. PEOU of ridepooling has no significant influence on PU and ATU of ridepooling. In contrast to our results, Giang et al. [26] found a significant relationship of PEOU on ATU in a ridesharing contexts. Lee et al. [41] summarized that there are 13 non-significant and 19 not applicable relationships between PEOU and PU as well as 24 non-significant and 19 not applicable relationships between PEOU and BI. This result already shows the doubtfulness of this construct [41]. According to Subramanian [52] the low or not existing importance of PEOU on the acceptance process arises at innovations which are intuitively easy to use, so this factor has no impact on this process any more. This argumentation comes along with the mean value of 5.58 for PEOU (see Table 2) which is the highest of all constructs and therefore an indicator for the easiness to use ridepooling services. Moreover, literature often mentions that the impact of PU on ATU is stronger than PEOU on ATU. This points out the subordinate role of PEOU in the TAM [6, 26]. This can also be confirmed in our study as PU is the more important construct for predicting the ATU ridepooling services. Therefore, the construct of PEOU plays a subordinate role for explaining the acceptance of ridepooling services.

By rejecting H9, it was shown that the introduced variable of PS is not relevant for the acceptance process, or to be more precise on the ATU in a ridepooling context. A possible reason for this not significant relationship is that the journey with instructed drivers or other passengers is not considered unsafe as shared transportation means or MaaS are already used and therefore has no influence on the acceptance of ridepooling. This stands in contrast to the findings of Agatz et al. [53], who state that factors as security and safety must be ensured.

Concluding, the model and its connections can be largely confirmed. Most of the extended TAM variables contribute to the prediction of BI ridepooling services. As a core variable of TRA, SN is identified as having a low influence on BI ridepooling services and therefore contributes to a better prediction of its acceptance. This is in line with the findings of Giang et al. [26] who found a significant positive relationship between SN and BI. As already suggested, this extension should be a core variable in the model, in particular regarding innovations with unexperienced users. In addition, the high relevance of PC in the context of ridepooling services has been identified. Thus, for accepting ridepooling services, the technology and service itself must be compatible to the individual lifestyle. These strong effects observed in the data suggest to include this construct as a permanent factor in the TAM regarding the context of ridepooling services. Also, the influence of PEOU and PU deviated from expectations in some cases because the data was too inconsistent for accepting H3, H4, and H5. As a result, the suggestion of the available theory cannot be totally confirmed by the empirical data. This gives cause to rethink their roles in the model especially in the context of ridepooling services.

5 Recommendations, Limitations, and Future Research

The results indicate a stronger preferred use of ridepooling services for leisure activities, while daily commuter trips are not the main objective of such services. Respondents do not seem to have any problems regarding the handling of the service, as they evaluated PEOU very high. Scientific research suggests, that perceived behavioral control has a positive influence on the adoption of innovations [54]. As the general acceptance of ridepooling services is existent, providers must ensure the availability and reliability of the booking process as well as the service itself. Therefore, the level of travel costs as well as the use of ecologically friendly vehicles play a crucial role for the success of a ridepooling service provider.

Since ridepooling is, especially in Germany, a rather new mobility concept, relatively little information for customers about this concept exists. With greater awareness and more practical implementations, ridepooling's acceptance might be different. As our study focuses on Germany, comparative studies across other countries or cultures can be conducted to identify similarities or differences. In order to achieve better predictive results, the contextual factors and external variables as for example gender, income, system characteristics, design features, and personality traits which are neglected in our research can be also included. According to Davis [16], they have a direct effect on PU and PEOU. In addition, some of the correlations among our constructs are very high as presented in Table 2, e.g., PU and ATU with a correlation of 0.841. Possible explanation of this could be a lacking differentiation of the constructs and the corresponding items. To counteract this points, future research can base on other items or other theories, as for instance UTAUT by Venkatesh et al. [23], since moderating variables are included in the analysis. Future research can also replicate the same study after a period of time in order to identify differences caused by more ridepooling providers or more experience with ridepooling services. Thus, a longitudinal study is recommended, ideally with an evenly distributed sample of participants. In this way, it can be measured whether potential customers will accept, adopt, and actually use ridepooling services.

6 Conclusions

Our paper gives insights regarding the customer acceptance of ridepooling services which support the society's shift towards a digital and shared economy using various IS solutions. As this field of research is still underdeveloped in the literature, our study addresses this research gap to satisfy the increasing interest and importance of this topic in practice. The TAM with its core determinants was used in combination with constructs of the TRA. To fit the research context of ridepooling services, it was extended by the constructs PC and PS. The results of the analysis show that BI ridepooling services is well explained by the developed model. Unexpectedly, the relationship between PU of ridepooling services as well as the BI them plays only a subordinate role. In addition, the results do not provide significant evidence for the impact of PEOU and PS on ATU ridepooling services. In contrary to that, the high relevance of PC for predicting the acceptance of ridepooling services has been identified as it has the most significant impact of BI them. This finding shows that the acceptance process of ridepooling services has already started. The trend of ridepooling is getting adopted by Germans as well. Therefore, companies must tackle this challenge to exploit the high potential this market offers. Analysis have revealed that companies can increase their acceptance, for instance, using electric vehicles or offering low costs.

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