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User Acceptance of Mobile Services to Support and Enable Car Sharing: A First Empirical Study

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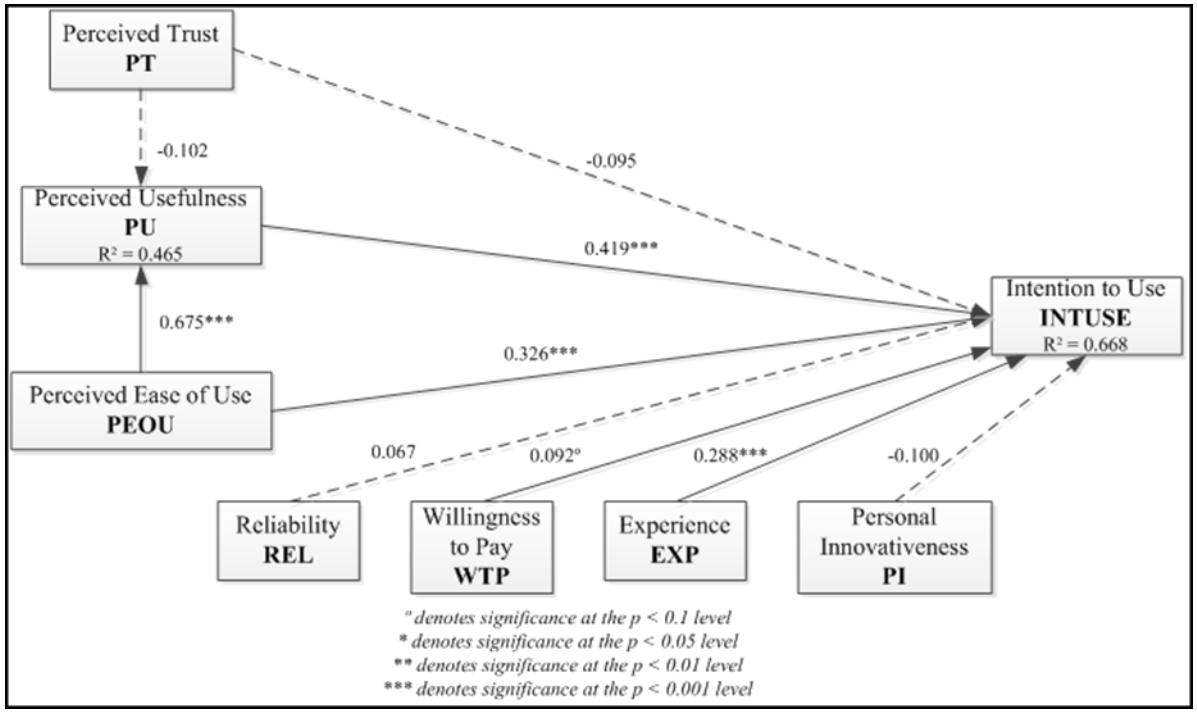

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Abstract

In today's mobile world there is a high potential for many mobile services, but the mere existence of such services does not mean that the market is ready for them. Mobile services in the context of car sharing must add some value to attract users. The spread of car sharing offerings mainly in urban areas is another trend influencing the automotive industry and mobility as well as transportation in general. We conduct an online survey to collect data which we use to carry out a technology acceptance analysis using a structural equation model (SEM). The research model arises from the findings of a priori explorative study and a comprehensive literature review. The evaluation results, which are based on an extended technology acceptance model (TAM), show that user acceptance is positively affected by perceived ease of use, perceived usefulness, willingness to pay and experience.

Keywords: Mobile Systems, Car Sharing, Technology Acceptance Model (TAM), Structural Equation Modeling (SEM)

1 Introduction

Over the past decades, owning a car has been very important to people because automobiles represented a significant status symbol but nowadays some key urbanization trends like mega cities and mega regions, technology developments, new economic developments, standardization and harmonization, smart and sustainable cities and integrated mobility, that drive the development of new mobility solutions.
Information technologies are almost omnipresent in everyday life. Not only do the technologies shape the working environment, they also shape people's daily lives. With the remarkable spread of smartphones, the importance of mobile devices grows. Current analyses show that mobile penetration rates already exceed 100% in industrialized countries [1] and more than every second mobile phone that was sold in 2011 among young adults less than 30 years in Germany was a smartphone [2]. The recognition of these developments is reflected in the fact that mobile systems increasingly find their way into other industries for instance even the automobile industry. Another important characteristic of today's digital natives is that they are favoring the concept of sharing more and more. Especially in industrialized countries where people feel to have almost everything they need, sharing has started to become popular. Owning assets as a status symbol still exists but the objects of utility are sometimes different ones among younger people. The mentality of sharing is not only restricted to cars, but also triggered by a person's attitude towards information and information technol technology in general. With web-enabled mobile devices young people are used working with digital content in every aspect of life and are used to being able to share information and content of all kinds, always and everywhere.
To analyze the acceptance of mobile systems in car sharing, we conduct a study that used an extended technology acceptance model (TAM) to examine the impact of different influencing factors on a person's intention to use mobile applications in car sharing. The research model is developed based on a metaanalysis. Given the challenges in the environment of mobility and of mobile systems, the aim of the current study is to analyze the technology acceptance of mobile applications in car

sharing. System acceptance and usage is increasingly viewed as an important element for the measurement of information systems success [3].
For this purpose, we give an overview of the current state of car sharing and mobile applications in the context of car sharing. Section 3 describes the research design and the underlying hypotheses. Section 4 presents the data collection, data analysis and modeling. Section 5 presents and discusses the results, followed by the limitations of this study. Ultimately, section 6 gives a conclusion from the findings and an outlook for further research.

2 Study Background and Purpose

To understand what drives mobility today, it is necessary to take a closer look at characteristics of today's young generation who are customers of the future. A major characteristic is the so-called "always-on"-condition. As of December 2011, more than 845 million people were connected via Facebook worldwide [4], which means around 12% of the global population. The number of privately owned computer devices such as smartphones, tablets and notebooks, that support an "always-on"-mentality, is rapidly advancing as well. These are crucial requirements for new business models and mobility offerings which rely heavily on connectivity and information technologies.
Being connected anytime and anywhere, having the mindset of sharing and being used to work with digital content, are all characteristics of a new customer group for whom the possession of an own car is not predominantly most important, but who are mainly interested in being flexible, being connected and being on the move in the most convenient way [5-7]. Of course, not possessing an own car does not signify the lack of need for individual mobility. But instead of owning a car, these people cover their mobility needs with other transportation modes such as public transportation, train, bike, or car sharing. This is the important target group for car sharing offerings because it is a concept that targets all these above mentioned characteristics, with the features of enhancing individual mobility in a convenient way and offering a service that is not bound to time- or placebond.

2.1 Car Sharing

The spread of car sharing offerings mainly in urban settings is another trend influencing the automotive environment, mobility, and transportation in general. Besides technical progress, further signifying developments influence current and prospective everydaylife. The need for multimodal transportation that integrates different transportation modes, increasing sharing trends in general, and new technological foundations are key trends that drive the development of new mobility solutions such as car sharing [8]. An adequate and efficient car sharing program is characterized by ecological and economic benefits, and increases the individual mobility of its users. Though newer car sharing offerings are becoming citycentric, consumer are not relieved of hassles such as purchase, parking, insurance, inspection, congestion and maintenance but they can take advantage of the benefits of private cars [9]. To meet customers' demands for flexible, spontaneous, one way trips, a dense network, complex systems and reliable fleet man-agement are necessary. In this

way, car sharing complements existing transportation modes and even fills the missing link between existing offerings such as train, subway, bus, cycling or walking. Among others, information technologies and particularly mobile systems contribute to the success and growth of customer-friendly car sharing programs.
An important issue that needs to be assessed in this context is:

- What drives the acceptance of mobile systems in car sharing to make car sharing an additional business opportunity for automotive manufactures to improve customer retention and long term sustainability?

Certainly, their success crucially depends on the fact that people accept and use mobile systems instead of rejecting them. Future mobility is not just about vehicles and mobile systems or services, it is a convergence of different industry sectors that is interacts seamlessly, e.g. payment engine, charging and telematics provider, technology solution providers, online mobility booking agencies, transportation operators and telecommunication operators. Mobile applications increasingly find their way into the automotive industry.

2.2 Mobile Applications in the Context of Car Sharing

Based on changing consumer behavior including the demand for mobile systems and their integration into automobiles, vehicle manufacturers are also starting to offer mobile applications to their customers. The numerous purposes range from telematics-related apps, over vehicle information apps, navigation-related apps, entertainment and gaming apps, to location based services (LBS) apps [10]. In addition to roadside assistance, telematics related apps such as Mercedes mbrace provide in-vehicle safety and security functions, navigation, and convenience services from concierge support. BMW offers similar apps with its BMW Roadside Assistance App, which handles roadside assistance and offers emergency and concierge services. With My BMW Remote, the company offers remote services such as climate control, door lock and unlock, and vehicle finder in addition to navigation services. The Audi Roadside app offers vehicle registration, roadside assistance by collaborating with roadside assistance partners, and finding a dealer close by. Most navigation-related applications for smartphones are comparable to conventional standalone navigation devices (e.g. apps by TomTom or Navigon). In addition to navigation while driving, several applications offer navigation for vehicle-finding purposes (e.g. Park Me). Vehicle information apps like Ciao Fiat, include handbooks, vehicle finder, due dates and a dealer locator. As part of the development of electric vehicles, there are also applications that are designed to help monitor the state of charge, the charging process and to check for nearby charging stations. For example, PlugShare displays electric vehicle charging networks to help reduce range anxiety. GreenCharge monitors charging costs, analyzes driving patterns and calculates the associated environmental impact. Nissan created the Nissan LEAF app to provide interested people with information, configuration possibilities, and interactive views but also to help owners of this electric vehicle in terms of charging, driving and other important areas [11]. An app that also focuses on LBS is for instance OnStar RemoteLink, which was introduced by General Motors to execute remote services and provide access to real time data from the vehicle. In addition to navi-

gation services, locking and unlocking of doors, the possibility to remotely start the car, as well as horn and light activation to find the vehicle, it provides information regarding the fuel status and range, mileage, oil level and tire pressure information [12]. For electric vehicles, it is also possible to check the state of charge, the remaining range, miles electrically driven, and the time to charge. Some manufacturers present their brand or car models, like gaming, entertainment or lifestyle. Most of these approaches are primarily service-oriented with safety, convenience and entertainment functionalities. In addition to applications provided by vehicle manufacturers, there is already a multitude of applications of other, independent suppliers. Many functionalities can also be helpful in car sharing. Besides localization of cars, navigation and personalization functionalities could be interesting in the future and make car sharing offerings even more attractive, because the degree of individualization would increase. Support services such as assistance in case of accidents could also be interesting, since it is not the own car. For fleets with electric vehicles, vehicle-to-grid services and monitoring services are probably an effective way of reducing range anxiety and network coverage concerns.
Existing mobile applications in car sharing includes first of all localization functionalities and reservation options. The official car2go app offers reservation service, cost calculation, localization of available cars, display of car2go gas stations and parking spaces reserved for car2go as well as navigation to the next available car, gas stations and parking spaces. While the fee for this app is currently 0.79€, the DriveNow app is for free. The DriveNow app offers the follow-ing functionalities: localization of available cars (also with augmented reality), reservations, and navigation to next free car and account management. The Flink-ster app offers localization of available cars and reservation as well. The Zipcar app offers localization of available cars by time and by car model, reservation services, honking the horn to find the car when a person is nearby, as well as unlocking and locking the car.
Overall, deciding on a solution (web-based, native or hybrid) depends on the required functionalities and features, the targeted customer group and their characteristics, as well as the temporal, financial and human resources available for mobile application development.
In order to develop a successful mobile application that is frequently used by customers, it is necessary to take a closer look at crucial factors determining users' acceptance of such technologies.

3 Research Design and Hypotheses Generation

TAM, as one of the most frequently used theories in IS research, was inspired by the theory of reasoned action (TRA) of [13] and was early attempt to apply psychological factors to computer and IS adoption. TAM models how users accept and use a technology and was originally introduced and developed by [14]. TAM adopts the TRA model's causal relationships to explain an individual's IS acceptance behavior and is a specific, renowned theory of technology acceptance in IS research. Two critical success factors (CSF) determine user acceptance:

- Perceived usefulness (PU) is defined as the subjective probability that a prospective user expects a specific application system to increase his or her job performance within an organizational context.

- Perceived ease-of-use (PEOU) refers to the degree to which the prospective user expects the target system to be free of effort.

In an empirical study, [15] determined that the frequency and intensity of use of computer technology can be reasonably well predicted from a person's intentions. PU is a major determinant of people's intention to use computer technology (INTUSE) and PEOU is a significant secondary determinant of the same. Beyond PU and PEOU, the user's attitude towards using technology influences INTUSE, which is in turn influenced by PU and PEOU. The explanatory power of TAM is just as good as without regarding the originally included construct of 'attitude towards using' [16]. TAM posits that PU is influenced by PEOU because, all being equal, the easier a technology is to use, the more useful it can be. Consistent with the TRA, TAM suggests that the effect of external variables (e.g. system design characteristics) on INTUSE is mediated by the key beliefs (i.e., PEOU and PU) [17]. Therefore, we propose the following hypothesis:

- **H1:** PEOU will have a positive effect on PU. PEOU has a direct effect on the INTUSE a technology, and an indirect effect on INTUSE via PU. This is in consequence an initial hurdle that must be overcome for acceptance and finally adoption and usage of a system or service [14].

- **H2:** PEOU will have a positive effect on INTUSE.

- **H3:** PU will have a positive effect on INTUSE.

The multidimensional construct of trust whose causes and effects has gained increased acknowledgement and interest in literature during the last decades and which plays an important role in many Information Systems (IS-)enabled situations, is seen as one of the most important factors in maintaining and developing fruitful relationships. The literature suggests that trust has a significant affect on consumer behavior and can be defined as "the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other party will perform a particular action important to the truster" [18-20]. Trust is usually thought to consist of three dimensions: system trust, interpersonal trust and dispositional trust [21,18]. Perceived Trust (PT) in the context of car sharing can be described as the belief that car sharing operators will behave in a socially responsible manner and, by doing so, will fulfill consumer expectations without taking advantage of their vulnerability [22]. Thus, this study focuses on system trust, whereas dispositional and interpersonal trust was excluded. Future visions like mobile services for car sharing present solutions where information about the user (e.g. name, address, phone number, information regarding billing and payment) is increasingly collected and transferred to the providers, for instance to provide users with more personally and contextually relevant services. If users were not able to trust the supplier of this mobile application and the car sharing supplier, that would hinder acceptance of the mobile application. Therefore, if the mobile application and its supplier are more trustworthy, customers are more likely to use the mobile applications when using car sharing and are more likely to perceive mobile systems in car sharing as useful. The user needs to feel that they are in control while still having their privacy pro-

tected. When users increasingly rely on mobile services in their everyday lives, the reliability of the technology and conveying information about reliability to the users become more important. Trust takes a long time to build, is easily destroyed, and hard to regain.

We therefore posit:

- **H4:** PT associated with a mobile application in the context of car sharing will have a positive effect on INTUSE.

- **H5:** PT associated with a mobile application in the context of car sharing will have a positive effect on PU.

Many factors contribute to the success or failure of a mobile application, including reliability. Reliability (REL) can be described as the ability to perform and deliver the promised service accurately and consistently from a technical point of view in its normal operational mode [23], [24].The authors of [25] argue that reliability is one of the highest important factors in the context of consumer behavior. With regard to mobile applications in car sharing this corresponds to the availability of dependable mobile network coverage, reliable functionality, which includes the actuality and correctness of delivered information. A frictionless car sharing usage process can only be guaranteed if the systems are reliable. The information delivered by the mobile application about available cars, their locations, fuel status or status of charge need to be absolutely correct. During the reservation process, all data, modifications and confirmations need to be absolutely faultless. Billing and payment processes are especially sensitive and if they are handled by the mobile application as well, a flawless performance is of high importance. If the application does not function correctly in these situations, it could lead to situations that lead users to doubt the reliability of the application leading to a lower intent to use it.

- **H6:** REL of a mobile application in the context of car sharing will have a posi-tive effect on INTUSE.

The potential offered by mobile services for car sharing needs appropriate business models to be successfully and sustainably introduced onto the market. The sustainability of every business model is strongly determined by appropriate revenue sub models. For this purpose, the application does need to present an identifiable and clear added value to the user. If the service itself is not for free, consumers have to pay to purchase and/or use the mobile application. It is important to differentiate between the cost for car sharing usage and cost for mobile applications. This analysis only focuses on the possible costs for the application. The willingness to accept possible costs is called willingness to pay (WTP). Different accounting systems could be deployed: users pay once to download or register for this application, users pay a regularly fee to use the application, or users pay for each usage. Due to the fact that customers already pay for car sharing itself and that the use of other channels for reservations etc. is mostly costfree, customers would expect a mobile solution in the context of car sharing to be free of charge. Therefore, the willingness to pay

use a mobile application indicates a higher intent among customers to use it in car sharing. We therefore posit:

- **H7:** WTP for a mobile application in the context of car sharing will have a positive effect on INTUSE.

Furthermore, individual variables directly influence the intention to use. The individual factor experience (EXP) includes previous experience with information technology in general, mobile systems, and functionalities such as reservation or payment processes using mobile devices. Consumers that adopted mobile systems in general in the past are more likely to accept and intend to use mobile systems in car sharing.

- **H8:** EXP with mobile technology in general will have a positive effect on INTUSE.

Personal innovativeness (PI) is the general openness to new technologies and the interest in new devices, functionalities, and systems [26]. Consumers that are more interested in technology and open to new technological innovations are more likely to be interested in trying out and using new applications. Therefore, their intention to use mobile applications in car sharing is higher than the intention of less innovative and less technology affine consumers.

- **H9:** PI will have a positive effect on INTUSE.

4 Data Collection, Data Analysis and Modeling

4.1 Explorative Data Collection Procedures

A preliminary questionnaire was designed and pretested by researchers who had practical and academic experience with mobile services and systems and/or car sharing to ensure that question meaning aligned with research intentions as well as assess feasibility of survey approach. Based on the pilot test, we estimate that the survey would take 15 to 20 minutes to complete. To test the relationships implied by the research model and the research hypotheses, this study used a survey instrument for data collection. An invitation to complete an online survey, which consisted of closed-ended questions on a five point Likert type scale (5 – totally agree, 4 – rather agree, 3 – neutral, 2– rather disagree, 1 – totally disagree) was sent by e-mail to the participants (74% Germany, 8% United States, 5% Austria, 6% UK, 3% Australia, 1% France, 1% Netherlands, 1% Canada, 1% not stated). Additionally, the survey is distributed with the help of social networks, relevant blogs and platforms e. g. www.motortalk.de, World CarShare Consortium. We used a Likert scale because it is a standard of measurement that is frequently used in questionnaires [27].

Table 1. Demographic Data

Socio-demographic details	**Frequency**	**Percentage**	**Cumulative Percentage**
Age			
20 – 30	60	57.7%	57.7%
31 – 40	26	25.0%	82.7%
41 – 50	11	10.6%	93.3%
51 – 60	7	6.7%	100.0%
Gender			
Male	66	63.5%	63.5%
Female	38	38.5%	100.0%
Level of education			
High school diploma	3	2.9%	2.9%
Advanced technical certificate	14	13.5%	16.3%
A-levels	20	19.2%	35.6%
Completed vocational Training	10	9.6%	45.2%
College (Bachelor, Master, Doctorate)	56	53.8%	99.0%
no degree	1	1.0%	100.0%
Current position			
Employee	45	43.3%	43.3%
Manager/executive	12	11.5%	54.8%
Self-employed	10	9.6%	64.4%
Freelancer	2	1.9%	66.3%
Civil servant	2	1.9%	68.3%
Apprentice	2	1.9%	70.2%
Student	30	28.8%	99.0%
Job-seeker	1	1.0%	100.0%
Monthly household net earnings			
< 500€	4	4.9%	4.9%
500 – 1,000€	10	12.2%	17.1%
1,000 – 2,000€	18	22.0%	39.0%
2,000 – 3,000€	14	17.1%	56.1%
3,000 – 4,000€	13	15.9%	72.0%
4,000 – 5,000€	3	3.7%	75.6%
> 5,000€	5	6.1%	81.7%

no answer	15	18.3%	100.0%
Smartphone ownership			
Yes	85	81.7%	81.7%
No	19	18.3%	100.0%

Similar to the instrument used by [28], respondents were instructed to indicate how strongly they agree or disagree with a number of statements relating to their perceived magnitude of some barriers to embracing mobile services with a special relevance to car sharing. Five hundred questionnaires were issued and 179 people responded, for an initial response rate of 35.8%. Incomplete or otherwise unusable entries were discarded from the data set, leaving 104 usable responses (20.8%).

4.2 Measurement and Model Testing

The literature was examined for validated measures involving the constructs already mentioned. The TAM scales of PU, PEOU and INTUSE were measured using indicators adapted from [14-15] and [29]. Concerning the additional constructs, multiitem scales from previous research were employed whenever possible to empirically test the hypotheses. Perceived trust was measured with indicators adopted from [32, 30, 31], experience with indicators adopted from [29, 33-34]. Due to the large number of indicators in the questionnaire, a factor analysis was conducted as a dimensional reduction method. The factor analysis was conducted using varimax rotation as the extraction method. The indicators were indentified based on an eigenvalue that was greater than one.

Empirical data is analyzed with SEM to test the causal-effect relations among the latent constructs. This method is based on latent variable modeling, where the measurement error is minimized through the use of multiple indicators of latent variables before testing model fit. SEM provides the flexibility to model a relationship among criterion variables and multiple predictors, such as model errors in measurements for observed variables, to design unobservable latent variables, and statistically test a priori theoretical and measurement assumptions against empirical data [35]. Measurement validation and model testing were conducted using SmartPLS (Partial Least Squares) version 2.0.M3, a variance analytical structural equation modeling technique that utilizes a component-based approach to estimation. The PLS approach [35] to test our research model, using the empirical data from the survey. PLS is advantageous when the research model has variety indicators, is relatively complex, and the measures are not well established [36]. It does not impose a normality requirement on the data and can handle both reflective and formative constructs, both of which we use in our study.

The measurement model analyzes the relationship between the latent constructs and their associated indicators. Indicators, also known as items or measures, are quantifiable, observable scores obtained through empirical means such as quantitative study [37]. In information systems literature, reflective constructs are used for concepts such as PU, satisfaction, PEOU, and predicted usage, where the unobservable can be considered to be giving "rise to something observed" [38-39]. Researchers believed the measures in TAM were well-specified reflectively [40]. All constructs in this study are conceptualized as reflective, due to the direction of the

causality, the interchangeability of the indicators, the co variation among the indicators, and the nomological net of the constructs , which should not differ [41, 38].

4.2 Measurement Validation

To ensure content validity, a thorough review of the literature on the subject of the study was conducted. The questionnaire was also pilot tested by having a panel of experts (professors and IS professionals) review it, after which necessary changes were made to improve both the content and clarity of the questionnaire. Then, a sample of respondents separate from those included in the pilot test was asked to check the questionnaire. These and all pilot test respondents were excluded from the main sample used for reliability testing, construct validation, and hypothesis testing.
First, the reflective constructs were analyzed. In this context the composite reliability and the convergent and discriminate validity were examined. The composite reliability (also known as internal consistency reliability ICR) is similar to Cronbach's alpha and measures internal consistency, except that the latter presumes, a priori, that each indicator of a construct contributes equally (i.e. the loadings are set to unity) [35, 42]. [42] argued that their measure is superior to Cronbach's alpha because it uses the actual item loadings obtained within the nomological network to calculate internal consistency reliability. This measure, which is unaffected by scale length, is more general than Cronbach's alpha, but the interpretation of the values obtained is similar and the guidelines offered by Nunnally can be adopted" [43]. ICR should be 0.70 or higher [44].

Table 2. Quality Criteria – Measurment Model

Reliability and Validity Criterions					
Construct	Composite Reliability (ICR) ($\rho \geq 0.7$)	Loadings ($\geq 0{,}50$)[a]	Average Variance Extracted AVE(ξ_i) ≥ 0.5[a]	Fornell/Larcker Criteria (AVE > Φ^2)[b]	Factor Loadings (factors load stronger on dedicated indicators)[c]
WTP	0.893	0.744	0.737	0.737 > 0.035	✓
EXP	0.873	0.752	0.633	0.633 > 0.422	✓
INTUSE	0.935	0.880	0.828	0.828 > 0.530	✓
PI	0.942	0.888	0.803	0.803 > 0.422	✓
PU	0.905	0.620	0.617	0.617 > 0.530	✓
PEOU	0.712	0.534	0.538	0.538 > 0.485	✓
REL	0.818	0.669	0.605	0.605 >	✓

				0.178	
PT	0.753	0.529	0.578	0.578 > 0.178	✓
[a] Loadings - Smallest indicator loading for each construct [b] Convergent validity; [c] Discriminant validity; [cd] Nomological validity					

Here, ICR is above the threshold (smallest ICR: 0.712), so that the internal consistency reliability exists, see Table 2. Convergent and discriminant validity by the average variance extracted (AVE) were assessed. AVE represents the overall amount of variance in the indicators accounted by the latent construct. The reported values provide evidence of discriminant and convergent validity since the AVE is well above the recommended level of 0.50 [45]. The AVE values for all constructs in this model are higher than the recommended threshold value of 0.50 for all four countries (smallest AVE: 0.538) see Table 2, which demonstrates the convergent validity of the scale [45]. Overall, the evidence of reliability, convergent validity, and discriminant validity indicates that the measurement model was appropriate for testing the structural model at a subsequent stage. The constructs of the structural equation model fulfill all of the quality criteria regarding validity and reliability.

5 Results, Discussion and Limitations

5.1 Results and Discussion

The conclusion about the hypotheses raised in section 3 can be drawn on the basis of the derived path coefficients (Fig. 1). The perceived ease of use has the highest path coefficient ($ß = 0.675$, $t = 11.123$, $p < 0.001$) in the whole model, i.e. the influence of perceived ease of use on perceived usefulness is positive and very strong.

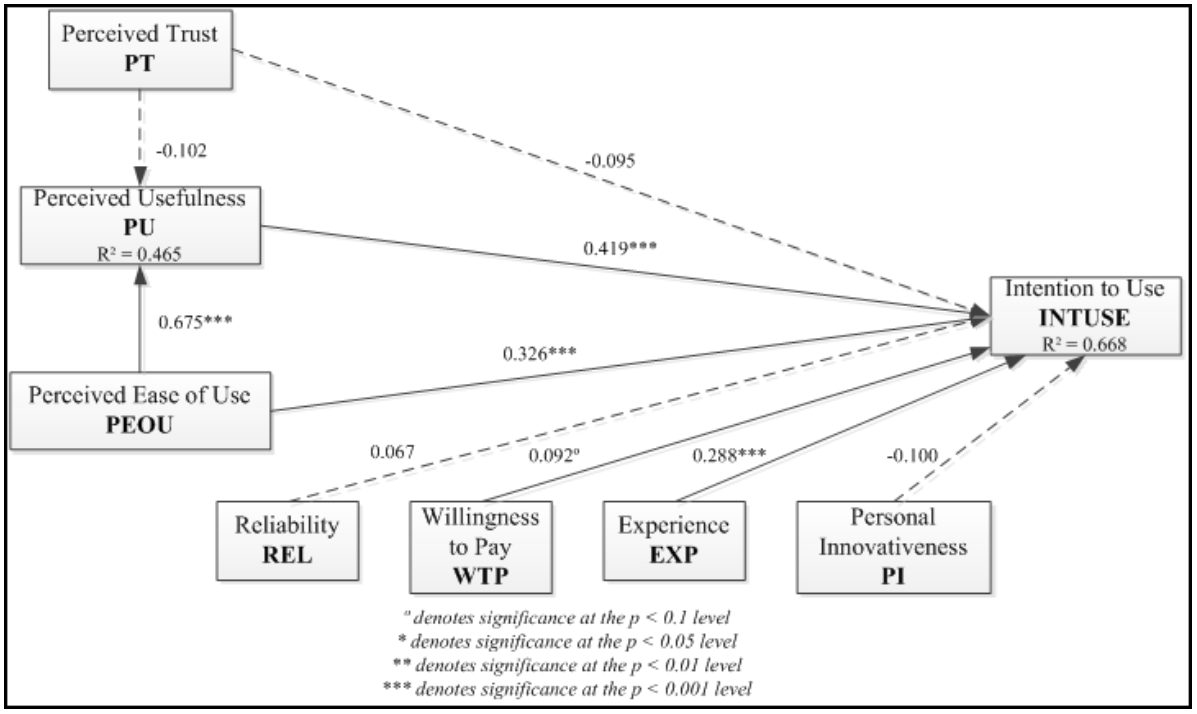

Fig. 1. Research model results

Perceived usefulness has the most powerful positive impact on the intention to use mobile services to support and enable car sharing, as its path coefficient (ß = 0.419, t = 4.622, p = 0.001) is the highest among all explanatory variables for intention to use. In addition to the main focus of our study, the results indicate a strong statistical significance (p < 0.001) of perceived ease of use and the individual factor experience as main predictors of an individual intention to use mo-bile services to support and enable car sharing. Our findings further suggest that the willingness to pay (p < 0.1) is positively related to intention to use mobile applications to support and enable car sharing.

Summarizing the results and arguments mentioned above, we can assert that hypotheses H1, H2, H3, H7, and H8 are validated, H4, H5, H6, and H9 are not statistically significant. The presented research model is less technology-centric than models that have previously been used to explain technology acceptance.

These results imply that the intention to use and therefore accept mobile applications in the car sharing environment depends on how useful users perceive the application to be and how experienced they are with information technologies in general and more specifically, mobile systems. The more experienced they are, and the more useful they evaluate the application, the higher is their intention to use it during the car sharing process. Consequently, it seems more promising to target younger groups, as they tend to be the primary target group for car sharing. When targeting older groups, it is more promising to approach customers who are already experienced with mobile systems and applications in general. It is easier to gain their acceptance because their fears of contact are probably lower and they are already used to deal with such systems and digital content. When developing an application for car sharing offerings, providers need to place emphasis on functionalities and attributes. In this regard, it is most important to assess customers' expec-

tations to meet their demands. The better this match is, the more useful they will perceive the application to be and therefore will be more likely to use the application. The effect of their willingness-to-pay for such services shows at least the expected positive relation with the overall usage intention, but its influence is only weakly statistically significant. When respondents are asked what they are actually willing to pay for such a kind of application, out of 104, more than half of them answer that the application should be completely free of charge. Almost 11% are willing to pay a onetime fee of up to 1€. A further 11% would even agree to be charged 2€ once. Around 5% approve of a charge up to 3€, while further 11% are content with a one time fee of up to 5€. The peak charge of up to 10€ was agreed by more than 5%. Only two respondents are prepared to pay regular monthly fees of up to 2€ and one respondent would agree to pay per use. The extent of general openness of users towards new technologies shows a negative relation with usage intention, but the effect is not significantly influential. A possible reason for the different direction of relation could be that the items in the questionnaire do not actually measure personal innovativeness, or the rather small sample size of 104 leads to distortions. Furthermore, the as-sumed direct relation between innovativeness and the intention to use could be wrong. It could be possible that being open to new technologies has a stronger influence on how the usefulness of mobile applications in car sharing is evaluated than it does on how usage intention is evaluated.

5.2 Limitations

The study is subject to following limitations. First and foremost, there is a bias because the sample is self selected. Second, the subjects are participants from German-speaking countries. Culturally driven individual differences are not part of this model. Caution must be taken when generalizing the findings to any industries. Third, there are many different car sharing offerings on the market and the demarcation is not always clear. This study only focuses on professional organized providers, and excludes programs which are organized mainly privately among friends and neighborhoods as well as carpooling programs. Peer to peer programs, commercializing shared cars, are not considered as well.

6 Conclusion and Further Research

From the theoretical point of view, our paper contributes to acceptance research by providing a better understanding of the impact of factors that influence the acceptance of mobile services to support and enable car sharing. For this purpose, an extended technology acceptance model is carried out. The structural equation modeling technique is used to validate measurements and examine the model testing. We also sought to extend the model and create a second study on the basis of a specific application. With regard to the constructs, further differentiation is required. Trust, for example, is defined primarily in terms of trust in people or organizations without regard for trust in the technology itself [47]. While individuals may perceive mobile services with more interest, others might feel more concerned. Therefore, future research should examine perception and behavior, as well as individual's personality traits with regard to the tendency to use technology (technology readiness). Future studies could also expand to include an international context by inte-

grating cultural differences and legal requirements into the evaluation of mobile services for car sharing using the framework by [46]. [46] singles out power distance (PDI), masculinity (MAS), individualism (IDV) long-term orientation (LTO) and uncertainty avoidance (UAI) as five major dimensions that characterize a particular culture.

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