Intentions to participate in carsharing: The role of self- and social identity

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Foreword

Dear reader,

In front of you is my thesis on "Intentions to participate in carsharing: The role of self- and social identity". This Master's thesis was written as graduation research for the research master Urban and Economic Geography at Utrecht University. For this thesis I collected data in two neighbourhoods in Berlin, where I stayed for three months to gain international research experience. I thought it was an exciting, sometimes stressful, but also educational experience to be abroad alone, even though Berlin is not very far away.

I would like to thank my supervisor Dr. Dea van Lierop for all the feedback and support she has given me over the past year. Dea, I really learned a lot from you. sometimes I got really stuck and lost my confidence, but your feedback and support really positively contributed to my progress and confidence. Thank you so much!

I would also like to thank my boyfriend Joris, my family and my friends for their support over the past two years, and for visiting me in Berlin. Those days in Berlin were always nice days. Also, thank you for understanding when I was a bit cranky when I had to survey again while you were visiting me.

I would also like to thank all respondents for participating in my survey. Furthermore, I'd like to thank Dr. Heike Link and and Dr. Francisco J. Bahamonde Birke for arranging a temporary workplace at the DIW during the data collection phase in Berlin. Finally, I would like to thank Dr. Hannah Roberts for her feedback on the analysis.

I hope you enjoy reading my thesis!

Loes Derikx

Utrecht, 2nd of May 2020

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Abstract

Carsharing is becoming an increasingly popular mode of transportation in many cities around the world. Previous research has revealed that users tend to be young, are highly educated, have high incomes and live in densely populated neighbourhoods. However, this does not explain why people who have similar socioeconomic characteristics do not adopt carsharing when residing in comparable urban contexts. To assess the critical differences between users and non-users of carsharing, the current research uses the Theory of Planned Behaviour as a theoretical framework to analyse how aspects of an individual's social and self-identity determine their intentions to participate in carsharing. In-person intercept questionnaire data was collected in the Berlin neighbourhoods Schloßstraße, Steglitz and Glasower Straße, Neukölln in the Fall of 2019 (*N* = 216). Exploratory and Confirmatory Factor Analysis and Structural Equation Modelling were used to analyse the collected data. The model results suggest that having a technological self-identity and negative pro-car identity is significantly associated with an individual's intentions to participate in carsharing. These associations are present in both the structural and alternative model and no significant differences were found between the two neighbourhoods. Moreover, both models indicate a negative relationship between individuals' degree of environmental self-identity and the degree of their pro-car identity. The results of the study suggest that in order to promote carsharing, regional governments should focus on attracting new users who are currently already using mobility technology. The findings can be used by regional governments to identify potential carsharing users and specifically target individuals who are likely to be willing to adopt and participate in carsharing.

Keywords

Carsharing intentions; Theory of Planned Behaviour; Self-identity; Social identity; Structural Equation Modelling

1. Introduction

Carsharing is becoming an increasingly popular mode of transport in many cities and around the world (Dhingra & Stanich, 2013; Machado, Hue, Berssaneti, & Quintanilha, 2018; Prieto, Baltas, & Stan, 2017), and can be defined as an activity in which people with a carsharing membership gain short-term access to locally available, non-privately owned car fleets at a preferred time of the day and (usually) including all costs per use, such as user fee, gas and insurance (Bardhi & Eckhardt, 2012; Bundesverband CarSharing, 2007; Duncan, 2011; Münzel, Boon, Frenken, & Vaskelainen, 2018; Shaheen & Martin, 2016).

Carsharing is a popular sector within the 'sharing economy' and can be offered through different business models. The concept of the sharing economy comprises "several ICT developments and technologies, […] which endorse sharing the consumption of goods and services through online platforms" (Hamari, Sjöklint, & Ukkonen, 2016, pp. 2047–2048). Carsharing through the Business-to-Consumer (B2C) business model is central to this research, and refers to businesses with a fleet of cars that are rented out to users for shorter or longer periods of time. This business model is different from carsharing based on the peer-to-peer principle (P2P), whereby private vehicles are rented out by one car owner to another person (Münzel et al., 2018).

Various studies have shown that shared mobility, such as carsharing, can contribute to the transition to environmentally sustainable urban mobility (Cohen & Shaheen, 2018; Giesel & Nobis, 2016; E. Martin, Shaheen, & Lidicker, 2010; Nijland & van Meerkerk, 2017; Shaheen, Mallery, & Kingsley, 2012). For example, studies have shown that individuals with a carsharing membership increasingly sold their car after joining a carsharing program and that fewer people purchased a new car (Giesel & Nobis, 2016). In addition, people with a carsharing membership tend to travel fewer kilometres by car overall after joining a carsharing organisation (C. J. Martin, 2016), resulting in substantially reduced CO2 emissions (Nijland & van Meerkerk, 2017; Shaheen & Martin, 2016).

According to Schaefers (2013, p. 69) it is "one of the key challenges for carsharing providers as well as for public institutions planning for carsharing services […] to successfully expand consumer acceptance of carsharing services." Various studies have assessed which factors influence participation in the sharing economy (Böcker & Meelen, 2017; Hamari et al., 2016; Joo, 2017), the motivations and preferences which drive the adoption of carsharing (De Luca & Di Pace, 2015; Dias et al., 2017; Schaefers, 2013), and the behaviours of people already participating is a carsharing program (Costain, Ardron, & Habib, 2012). According to Dias et al. (2017, p. 1320), users of carsharing services are often young people with a high educational background, well-paid jobs and living in densely populated neighbourhoods. However, according to Heinen, Maat and Van Wee (Heinen, 2016; 2011), many studies are grounded in utility theory, which assumes that people choose their means of transport on the basis of financial and time efficiency (Fishburn, 1970). While previous studies have revealed the sociodemographic factors that influence individuals to adopt carsharing, little is known about why people in similar contexts and with similar socioeconomic characteristics differ in mode choice and travel behaviour (Heinen, 2016; Heinen et al., 2011).

Other studies have assessed the personal characteristics of (potential) carsharing users, such as attitudes, lifestyles or different aspects of identities (Anable, 2005; Heinen, 2016; Van Acker, Goodwin, & Witlox, 2016). Several authors have provided evidence that social and self-identity are important predictors of intended transport behaviour and mode choice (Heinen, 2016; Lois, Moriano, & Rondinella, 2015; Murtagh, Gatersleben, & Uzzell, 2012; Schuitema, Anable, Skippon, & Kinnear, 2013). The Theory of Planned Behaviour is a commonly used framework for analysing individuals' intended and actual behaviour (Ajzen, 1991), which theorises that the intention of an individual to perform a certain behaviour is determined by his or her attitudes towards the behaviour, the subjective norm and the person's perceived behavioural control (Ajzen, 1991). This framework has been used to analyse (changes in) travel behaviour (Busch-Geertsema & Lanzendorf, 2015; Fu & Juan, 2017) and to assess individuals' intentions to participate in the sharing economy (Kim, Woo, & Nam, 2018). Yet, to the authors' knowledge, the role of identity has not been previously assessed in the context of participation intention in carsharing.

The goal of this study is to analyse how the influence of individuals' social- and self-identity determines their intentions to participate in carsharing. The findings of this study can be used to identify potential carsharing

users and target individuals with specific identity aspects (e.g. identifying as environmentally friendly or as a user of new technologies) to adopt and participate in carsharing.

2. Theoretical background

2.1 Theory of planned behaviour and transport research

The theory of Planned Behaviour (TPB) theorises that the intention of an individual to perform a certain behaviour is determined by his or her attitudes towards the behaviour (ATT), the subjective norms (SN) towards the behaviour and the person's perceived behavioural control (PBC) (Ajzen, 1991). Subsequently, the intended behaviour influences the performance of the actual behaviour (Ajzen, 1991).

Additionally, previous research has suggested that when an individual has performed a certain behaviour in the past, the individual often is more likely to have the intention to practice this behaviour again in the future (Bamberg, Ajzen, & Schmidt, 2003). Moreover, transport habits have demonstrated to be a resistant factor towards intended mode change. For example, evidence from a study on public transportation mode choice (Nordfjærn, Şimşekoğlu, & Rundmo, 2014) revealed that habitual car use prevents individuals intentions to use public transport modes. This study, in which the TPB was also used as research framework, also showed that when controlled for habitual car use, positive attitudes towards using public transport were less strongly associated with public transport use intentions (Nordfjærn et al., 2014).

2.1.1 Attitudes towards behaviour

Attitudes towards behaviour can be defined as "one's positive or negative evaluation of the benefits and drawbacks of performing a specific behavior" (Fishbein, 1979 as cited by Kim et al., 2018, p. 111). Attitudes towards a behaviour are formed by more general attitudes and personality traits of an individual, however, these general attitudes usually only indirectly predict an individual's intention and behaviour (Ajzen, 1991). Consequently, if an individual believes in a positive outcome after executing a certain behaviour, this will likely increase their intention to engage in a behaviour. Moreover, previous research has shown that attitudes can be formed by conscious as well as subconscious associations and evaluations towards a behaviour (Fishbein & Ajzen, 2011; Gawronski & Bodenhausen, 2007).

In the context of this research, we suggest that attitudes can, for example, be grounded in attitudes towards carsharing as opposed to car ownership, or can be grounded in more general environmental attitudes. For example, Bardhi & Eckhardt (2012) provide evidence from semi-structured interviews with young professionals with carsharing memberships, residing in urbanised areas, that access-based carsharing is thought of as a popular and sustainable alternative to car ownership. Evidence from a study on commuting change showed that environmental attitudes are an influential factor in transport behaviour change (Clark, Chatterjee, & Melia, 2016). However, others authors suggest that individuals can hold onto negative attitudes towards carsharing, when they consider owning a car a status symbol (Pojani, Van Acker, & Pojani, 2018; Steg, Vlek, & Slotegraaf, 2001; Wright & Egan, 2000).

2.1.2 Subjective Norms towards behaviour

Subjective norms (SN) have been defined as the extent to which a person perceives social pressure towards performing a certain behaviour (Ajzen, 1991). These social pressures can be experienced through the opinions of people who are important to an individual, or who play another important role in the person's decision making process (Kim et al., 2018). When an individual perceives that the people close to him or her have positive (or negative) opinions about a certain behaviour (participation in carsharing), this can have a positive (or negative) influence on whether the person intents to participate in a certain behaviour or specific activity. For example Barth, Jugert, and Fritsche (2016) assessed the role of social (subjective) norms and collective efficacy on the acceptance of electric vehicles (EV's), which showed to have stronger effects than cost-related factors on the acceptance of EV's. Although EV's and carsharing are not the necessarily the same, research on the early adopters of carsharing and EV's have shown that these groups often have similar demographic characteristics (Kawgan-Kagan, 2015; Plötz, Schneider, Globisch, & Dütschke, 2014). Barth et al. (2016) grounded their research in social

identity theory (Tajfel & Turner, 1979), which is based on the idea that individuals identify themselves as being part of certain social groups, and that they think and behave as an individual might be in line with what is perceived to be the norm within this social group. This also shows how identities are related to the formation of people's subjective norms.

2.1.3 Perceived Behavioural Control towards behaviour

Perceived behavioural control (PBC) refers to the extent to which a person thinks it is easy or difficult to perform a certain behaviour or participate in a specific activity (Ajzen, 1991, 2002). This can be due to limiting internal factors such as the level of confidence or the level of autonomy a person perceives to have to participate in a certain activity (Ajzen, 1991, 2002), or due to external factors such as lack of time, money or knowledge (Ajzen, 1991, 2002; Kim et al., 2018). Furthermore, PBC affects the intended behaviour as well as on the actual behaviour (Ajzen, 1991). In previous research, PBC has shown to have a stronger effect on the intention to perform a behaviour than the attitudes and perceived norms towards performing a certain behaviour (Armitage & Conner, 2001). For example, Falco and Kleinhans (2018) identified digital illiteracy to be one of the challenges for using digital platforms in local civic engagement. In the case of carsharing, low levels of digital literacy may result in individuals' inability to use the digital platforms on which shared cars are offered. People might also perceive that carsharing is inaccessible, because carsharing is not offered nearby the starting point of their trip (Hazée, Delcourt, & Van Vaerenbergh, 2017).

2.2 Extending the Theory of Planned Behaviour with social and self-identities

Different concepts and examples of identities have been included as a determinant in research using TPB as a framework (Fielding, Terry, Masser, & Hogg, 2008; Sparks & Shepherd, 1992) and in research towards travel mode choice and behaviours (Heinen, 2016). Identity is a concept that is conceptualised in different ways: it can either refer to an individual's (1) social identity, (2) self-identity and (3) culture and ethnicity (Stets & Burke, 2000; Stryker & Burke, 2000). Self-categorisation is inherently linked to the process of identity formation, and self- and social identity are also often mentioned in connection with behavioural intentions or (un-)willingness to change behaviours (Stets & Burke, 2000).

Social identities refer to people identifying themselves as part of a social group or categorisation with a certain role within society (Stets & Burke, 2000; Tajfel & Turner, 1992). There are many examples of social identities, since people can identify as part of multiple categories or groups. In previous research, social identities related to e.g. parenthood, employment (Heinen, 2016), and related to specific modes such as being a car driver or cyclist (Heinen, 2016; Lois et al., 2015; Steg, 2005) have shown to be determinants for transport behaviour. For example, in a study on motives related to car use, Steg (2005) demonstrated that not only instrumental factors based on the convenience of car use influence its popularity, but also symbolic and affective factors such as how people can express themselves or their social position through their car (Steg, 2005). In the context of carsharing, people expressing a stronger social identity related to car use could therefore have a lower intention to use shared cars.

Rather than identifying with a certain functional role within society, someone's self-identity (or self-concept) refers to more personal characteristics or lifestyles that a person identifies with. Examples from self-identities in transportation research include environmentally friendliness (Cătălin & Andreea, 2014; Heinen, 2016), user of new technologies (King, Burgess, & Harris, 2019; Wolf & Seebauer, 2014), being sporty and healthy (Heinen, 2016) or are related to green consumerism (Sparks & Shepherd, 1992). In the context of carsharing, people who see themselves as environmentally friendly could have a higher intention to participate in carsharing than people who do not see themselves as environmentally friendly (Clark et al., 2016; Van der Werff, Steg, & Keizer, 2014). Moreover, in a study on stereotyping threats of battery electric vehicle (BEV) users, pro-technological and environmental identities were formulated personal characteristics of early users of BEVs (King et al., 2019). However, the authors warn for negatively stereotyping people identifying with these characteristics and advocate to promote people categorising themselves with these characteristics and using BEVs as desirable for developing the future sustainable car market (King et al., 2019).

Among the different identities people identify with, there may be differences with regard to which

identities are more important for shaping the attitude towards a certain situation or behaviour; this hierarchy of identities is called identity salience (Stryker & Burke, 2000). In the context of behavioural intentions, individuals consider (consciously or subconsciously) which attitude is most important in relation to what is the perceived norm towards a certain behaviour of people identifying with this same social group or category (Fielding et al., 2008). Someone can have a pro-car identity, but based on the identity as a local resident, this person can be annoyed by the amount of cars parked in the street.

Furthermore, Murtagh et al. (2012, p. 522) suggest that in addition to determinants such as social and self-identity, contextual determinants such as geographical location could be taken into account. Moreover, also identities related to a geographic location can be incorporated in studies. However, results from a study on identities and intended mode change in Utrecht, the Netherlands, indicated that 'place identities' (I see myself as Utrechter; Dutch) did not affect people's intention to reduce car use (Heinen, 2016). Also, a study by Murtagh, Gatersleben and Uzzell (2010) showed that there was no significant association between identifying with the local community and commuting mode choice. Moreover, previous research showed differences between geographical locations explained only few differences in intended green behaviour (Mancha & Yoder, 2015).

2.3 Conceptual framework and hypotheses

Based on the review of the literature we hypothesise the following:

H1a: Positive attitudes towards CS have a positive effect on intentions to participate in CS
H1b: Positive evaluation of subjective norms towards CS have a positive effect on the intention to participate in CS
H1c: Positive evaluation of PBC towards CS has a positive effect on the intention to participate in CS
H2: A pro-car identity has a negative (indirect) effect on the intention to participate in CS
H3: Identifying as environmentally friendly has a positive (indirect) effect on the intention to participate in CS
H4: Identifying as being a user of new technologies has a positive (indirect) effect on the intention to participate in CS
H5: Past use of CS had a significant positive effect on the intention to participate in CS again
H6: Geographic location does not cause differences in an individual's intentions to participate in CS

Figure 1 demonstrates how these hypotheses are conceptually related to each other. The current study focuses on the role of social- and self-identities on intentions to participate in carsharing and we are using the Theory of Planned Behaviour as a framework to assess the effects of social- and self-identities on carsharing intentions. As carsharing participation has been previously researched from a utility study perspective, actual carsharing participation is not within the scope of the current study, and intention to participate is therefore the focus on this study. Past use of carsharing services will be taken into account, however, past use is not the same as the actual behaviour that occurs after the expression of intention.

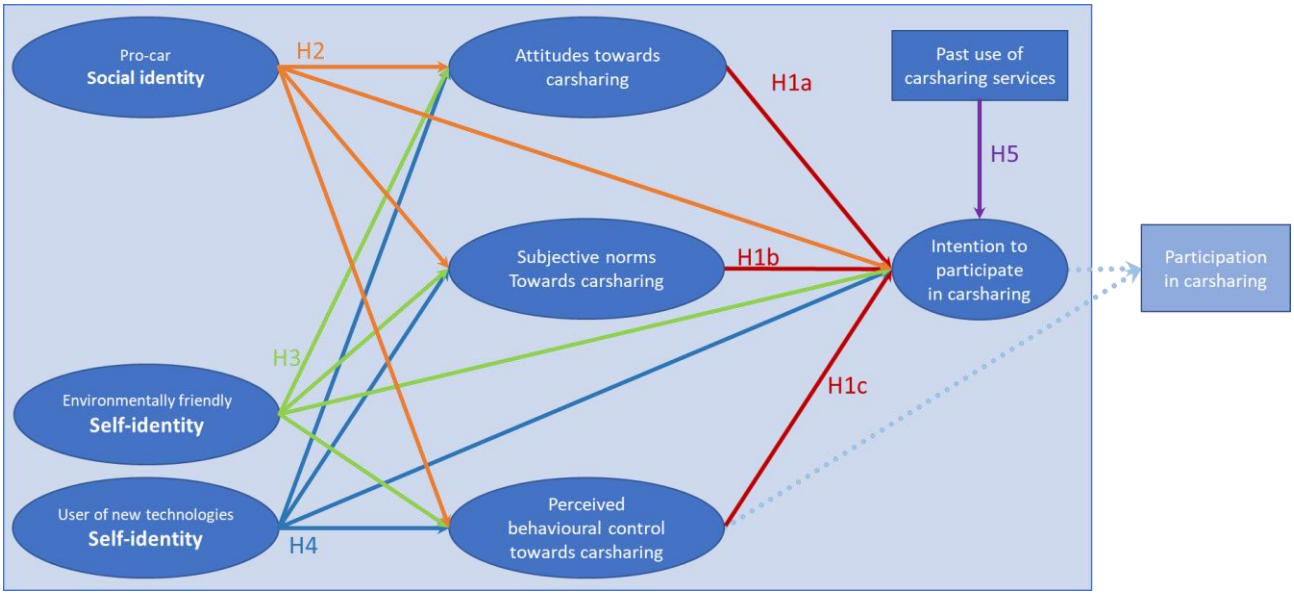


Figure 1: Conceptual framework and hypotheses

3. Methodology

3.1 Context

The current study focuses on Berlin, Germany. In 2019, Germany had 83,02 million inhabitants (Eurostat, 2019), of which 3,7 million people lived in Berlin (Amt für Statistik Berlin-Brandenburg, 2020). Berlin was selected for the purposes of this study because the city's government increasingly promotes and implements alternative and environmentally sustainable forms of urban mobility, including carsharing (Rode, Hoffmann, Kandt, Smith, & Graff, 2015). Moreover, in 2018, the municipality of Berlin presented the Berlin Mobility Act, with which they attempt to reduce private car use by developing the public transport system into the most attractive and efficient transport option (Senatsverwaltung für Umwelt Verkehr und Klimaschutz, 2018).

Compared to the national average of 561 cars per 1000 inhabitants, the motorisation rate in Berlin was lower at the time of the study, with 326 cars per 1000 inhabitants, (European Commission, 2017; Steinmeyer & Herrmann-Fiechtner, 2017). In 2017 and 2019, respectively 78.4% and 77.1% of German households had one or more cars (Statistisches Bundesamt, 2019), compared to 48.9% of Berlin's households in 2018 (Amt für Statistik Berlin-Brandenburg, 2018).

3.1.1 Carsharing in Germany

In Germany, the popularity of carsharing has been growing since it was first introduced in Berlin in 1988 (Bundesverband CarSharing, n.d.). Between 2018 and 2019, the number of registered carsharing participants in Germany increased by 16.6 percent and the number of available cars increased by 12.5 percent (Bundesverband CarSharing, 2019). Despite its increasing popularity, barely 3% of Germany's population is registered as member in a carsharing service (Statista, 2019b).

In Germany, ShareNow (formerly DriveNow and Car2Go) is the supplier with the largest fleet of free-floating shared cars offered through the B2C business model. People using free-floating carsharing can pick up and drop-off the shared car in any parking spot in the area where the carsharing service allows picking up and returning the shared car (IoT Business News, 2018), while with station-based carsharing, the vehicle must be collected at a fixed location, for example at the same or different terminal of a carsharing provider (Münzel et al., 2018).

3.1.2 Mobility and carsharing in Berlin

Berlin's public transport system is widely accessible and integrates multi-modes, including shared mobility (Deloitte, 2019; Here, 2019; Senatsverwaltung für Umwelt Verkehr und Klimaschutz, 2017). Public transportation modes include S-bahn (train), U-bahn (metro), tram and local bus services, which provide the city with 0.76 public transport stops per 1000 inhabitants (Here, 2019).

In recent years, a wide range of shared mobility services, including shared cars, shared bicycles, shared e-scooters and shared scooters have also become available on city streets. In 2019, there were 5814 carsharing vehicles available in Berlin, which was the highest number in Germany (Statista, 2019a). However, compared to other German cities where carsharing is offered, Berlin was in fourth place with 1.6 shared cars per 1000 inhabitants in terms of the number of shared cars offered per inhabitant in 2019 (Bundesverband CarSharing, 2019). Per 1000 inhabitants there were 1.43 free-floating shared cars and 0.17 cars offered through station-based carsharing (Bundesverband CarSharing, 2019). ShareNow is also the largest provider in Berlin with over 1400 shared cars (DriveNow, 2018).

3.2 Data collection and participant selection

Quantitative survey data was collected in two neighbourhoods in Berlin: Schloßstraße, Steglitz and Glasower Straße, Neukölln (see figure 2). The areas were selected based on their residential function, population density, socio-economic status and availability of carsharing offers. Both neighbourhoods are primarily residential, however, Glasower Straße, Neukölln is part of the inner city, while Schloßstraße, Steglitz is part of the outer city (see figure 2). Neighbourhoods with residential function located further away from the city centre were selected to avoid approaching non-residents such as tourists to participate in the study.

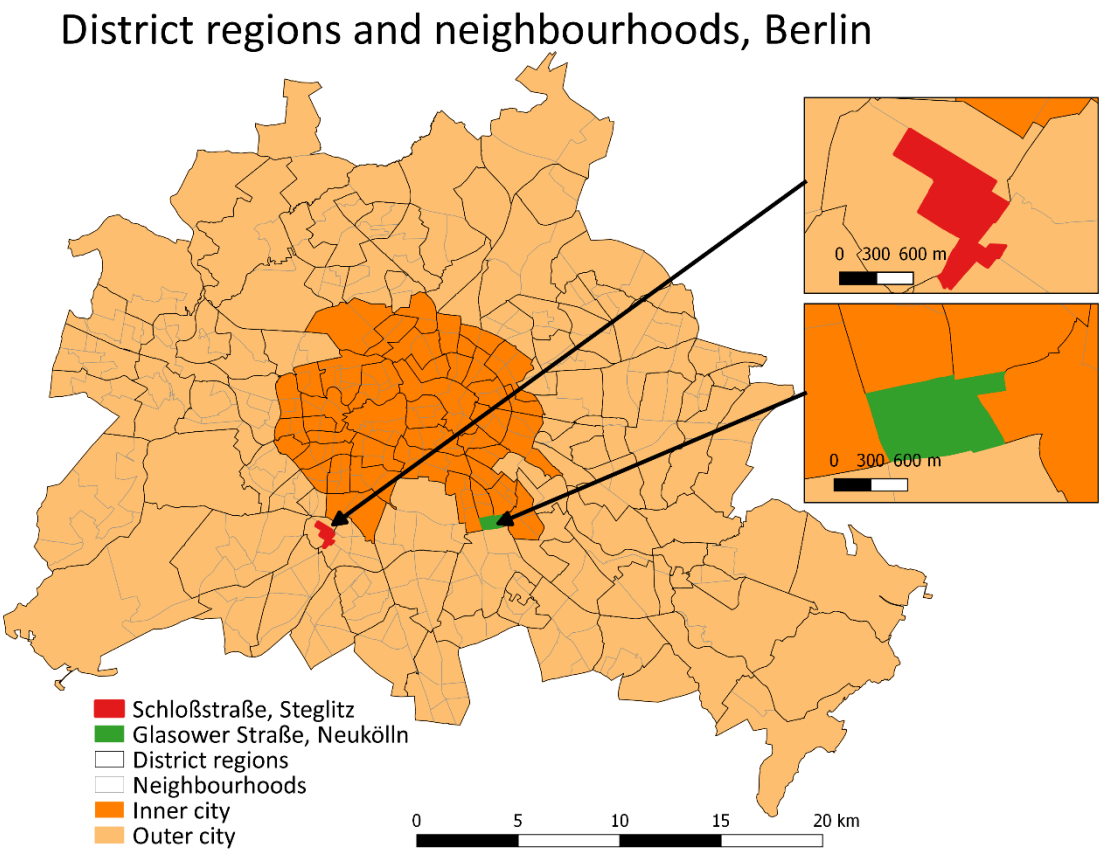


Figure 2: Map of Berlin's inner and outer city and the selected research areas (adapted from Amt für Statistik Berlin-Brandenburg, 2019b).

The selected neighbourhoods have a similar amount of inhabitants, but differ in population density (see table 1). Moreover, table 1 shows that the neighbourhoods differ in socioeconomic status and have a different percentage of registered inhabitants with a migration background, meaning people who are not German nationals, or who were born outside Germany (and have been naturalised). Neighbourhoods with different socioeconomic characteristics were selected, because previous research showed that similar socioeconomic characteristics did not explain individuals' differences in mode choice (Heinen, 2016; Heinen et al., 2011). We included neighbourhoods with different socioeconomic characteristics (differences in the degree of unemployment, social security benefits granted and child poverty in the neighbourhood) to control for these differences, and to demonstrate that social and self-identities of individuals are not necessarily associated with socioeconomic or local geographic context.

Table 1: Sociodemographic and socioeconomic indicators of selected neighbourhoods (data obtained from Amt für Statistik Berlin-Brandenburg, 2019b, 2019a; Nagel, Beer, & Schnur, 2018; Senatsverwaltung für Stadtentwicklung und Umwelt, 2017).

	Schloßstraße, Steglitz	**Glasower Straße, Neukölln**
Inhabitants	8818	8378
Inhabitants 18+ (%)	7542 (85,5)	7055 (84,2)
Population density (km2)	18047,70	14221,98
Area size (km2)	0,488594	0,589088
Inhabitants female (%)	4641 (52.6)	3993 (47.7)
Inhabitants migration background (%)	1709 (19.4)	3246 (38.7)
Status/Dynamics Index[1]	Status: average, Dynamics: stable	Status: very low, Dynamics: stable

[1]Social status indicator of a neighbourhood. Status index consists of the degree of (long-term) unemployment, social security benefits granted and child poverty in the neighbourhood. Dynamics index refers to the degree of change in the status index compared to two years earlier.

Data was collected in-person through passer-by surveying at different central locations in the areas e.g. close to supermarkets and public transport stops. To avoid selection bias, every 4th passer-by was asked to participate in the research (Scott, 2012). Carsharing users as well as non-carsharing users were asked to participate in study.

Passers-by were informed that the study was about the kinds of transportation they used and their intentions to participate in carsharing. It was not explicitly stated that the study was about identity, to prevent people from giving socially desirable answers.

The survey was administered from October 7th and November 7th 2019 at different times of the day between 12:00 and 20:00, during peak and off peak travel times to select a diverse sample of people with different daily schedules. The survey was presented to the respondents using a tablet, and participants were asked to fill out a Google Forms questionnaire in either German or English. Questions were read to the respondents and the respondents could click on the preferred answers themselves, or verbally indicate their answers, after which the researcher registered the answers for them. People that indicated they did not have time to complete the survey at that moment were offered a small flyer with a QR code to give them the opportunity to complete the survey at a later moment. Approximately 10% of the respondents filled in the questionnaire by themselves in their own time, using the QR code, while 90% of the surveys were filled in during the passer-by surveying. As an incentive respondents could enter their email address to join a raffle and win a € 15,- gift card of their choice. In total, 299 respondents submitted the questionnaire, of which were 154 collected in Schloßstraße, Steglitz and 145 in Glasower Straße, Neukölln.

3.3 Survey design

The survey contained 49 questions divided into three categories. The first part of the survey contained six questions about the transport context of the respondent, which included questions about whether the respondent had a valid carsharing membership, whether the respondent had used a carsharing service in the past 12 months, to which carsharing services the respondent had a memberships, and questions about perceived access and use of other modes of transport in the past 12 months.

The second part of the survey comprised 30 questions which contained standardised statements. Variables in the Theory of Planned Behaviour are not measured directly, but consist of several items that together make up the respective latent variables of 'Attitudes', 'Subjective Norms' and Perceived behavioural Control' (Ajzen, 2006; Hankins, French, & Horne, 2000). The answers on the standardised statements together shape the items within specific latent variables needed to answer the research questions. Although Ajzen (2006) suggests to measure variables reflecting TPB items on a seven point Likert scale, in transportation research five point scales are considered common practice (Anable, 2005; Haustein & Hunecke, 2007; Heinen et al., 2011; Schuitema et al., 2013; Wolf & Seebauer, 2014). Therefore, these statements were all measured on a five point scale ranging from 'I disagree' to 'I agree'. All questions in the second part of the survey also had the answer options 'I don't know' and 'does not apply', which were regarded as missing values in the dataset and in further analyses.

3.3.1 Intentions to participate in carsharing

To construct the latent variable 'Intentions', we derived two statements from Ajzen (2006), in which a time component (1. I intend to use carsharing services within the next three months) as well as a financial component (2. I am willing to spend money to use carsharing services) were incorporated.

3.3.2 Attitudes towards participation in carsharing

Attitudes towards participation in carsharing were measured using two statements with attitudes towards dimensions of carsharing (I think carsharing is good for: 1. my personal health; 2. the environment) and two general attitudes towards the respondents own transport behaviours (3. I make environmentally friendly transport choices; 4. I make transport choices that benefit my health). Based on the literature review, we also included three statements related to car-ownership, as existing literature suggested that car ownership can be a detracting factor towards participating in carsharing.

3.3.3 Subjective Norms towards participation in carsharing

To measure Subjective Norms towards carsharing, we derived three statements from Ajzen (2006) about the beliefs of most people that are important to the respondent (Most people who are important to me: 1.

participate in carsharing themselves; 2. would approve of my participation in carsharing; 3. would like to see me participating in carsharing).

3.3.4 Perceived Behavioural Control towards participation in carsharing

Statements to measure Perceived Behavioural Control towards carsharing were derived from Ajzen (2006) and included questions concerning the respondents confidence and decisional freedom towards participating in carsharing. Based on existing literature we also included three statements to measure a lack of perceived behavioural control due to digital illiteracy and lack of time (I can't participate in carsharing, 1. because I do not know how it works; 2. because I don't know how to work with smartphone apps; 3. because I don't have the time) (Falco & Kleinhans, 2018; Kim et al., 2018).

3.3.5 Social and self-identity variables

As suggested by several authors (Heinen, 2016; Van der Werff et al., 2014), questions regarding the respondents identity were asked by asking the respondent to what extent they see themselves as (I see myself as…), following a characteristic. The following identities were derived and included in the questionnaire: environmentally friendly (Cătălin & Andreea, 2014; Heinen, 2016; King et al., 2019), green consumer (Sparks & Shepherd, 1992), health-oriented, sporty, career oriented, family oriented, Berliner, German (Heinen, 2016), member of your neighbourhood community (Murtagh et al., 2010), user of new technologies (King et al., 2019), cyclist, pedestrian, user of public transport and car driver (Heinen, 2016; Murtagh et al., 2010). We also included identifying as being a user of new transport innovations, because it is more specific with regard to transport behaviour.

3.3.6 Contextual variables

To account for information about respondents' spatial and personal contexts, the last part of the survey contained 13 questions about the sociodemographic context of the respondent, such as in which neighbourhood the respondent lives, the respondent's age, gender, education level, monthly net household income, employment status, housing status, number of people in the household, number of children the respondent has, whether the respondent owns a car, a valid driver's licence and if the respondent has people that rely on them for their mobility needs. We also included a question about the national background the respondent identifies with. However, several respondents indicated that they identified themselves as European. As a result, this data could not be compared with the demographic statistics for the neighbourhoods.

3.4 Analysis

Structural equation modelling (SEM) was used to analyse the collected data, as it is suitable for research that explores structural relationships between latent variables and is an appropriate method for research that uses the TPB (Hankins et al., 2000; Haustein & Hunecke, 2007).

The analytical process involved three phases. First, summary statistics were analysed to test the quality of the data. The second step was to derive latent factors from the collected survey items using Exploratory Factor Analysis (EFA) using SPSS 25 and Confirmatory Factor Analysis (CFA) using Amos 25. In EFA, items are not restricted to load onto only one factor and can therefore (partially) load onto multiple factors, whereas in CFA, the respective items are restricted to load onto only one factor/latent variable. EFA's were performed for data reduction and to extract latent variables for the TPB factors as well as self- and social identity latent variables. Due to low factor loadings, however, not all variables collected with the survey were included in the final structural model.

After performing the EFA, we applied listwise deletion of cases with missing values for the variables used in the analyses (Kline, 2011), to avoid means and intercepts estimation for these missing variables in CFA. When means and intercepts are estimated, it is assumed that the missing data is missing (completely) at random (Kline, 2011). This was not the case in our dataset.

Subsequently, we performed CFA to confirm the factors we derived using EFA. The output of the CFA is the measurement model, which shows how well the data fits the factors that were derived from theory.

The third step in the process was to confirm the structural relations between the latent constructs using Structural Equation Modelling. The difference between CFA and SEM is that with SEM the causal relationships between latent variables can be estimated. We first tested the initial model and hypotheses based on the TPB, as proposed in our conceptual framework. Furthermore, as suggested by Kline (2011), we tested several equivalent and near-equivalent models with our data to find out if there were any alternative models that fit the data better, or to confirm that the structural model based on the literature best fits the data. Finally, model fit indicators were used to assess the overall model fit for the measurement model as well as for the structural models.

Cases from respondents residing across the border in surrounding postal code areas were also included in the analyses. When respondents were approached to participate in the study, they were asked whether they lived in the neighbourhood. Some respondents indicated that they did not reside in the research area, but relatively close. In the survey, these respondents were asked to indicate their postal code. Although these individuals do live close to the research areas, care should be taken with interpreting the role of the unit we defined as the neighbourhood with regards to the Modifiable Areal Unit Problem (MAUP)(Guo & Bhat, 2004). However, a simple sensitivity analysis using Mann-Whitney U tests showed no significant distributional differences between the cases inside and outside the unit we defined as the neighbourhood. Moreover, the borders of what people define as their neighbourhood are often different than the defined units (Guo & Bhat, 2004).

3.5 Description of the collected sample

Table 2 demonstrates the summary statistics for the control variables collected in the current research. After removing cases with missing data, 216 cases were suitable to be used in analyses. In the final sample, 50.9% (N = 110/216) of the cases were collected in Schloßstraße, Steglitz and 49.1% (N = 106/216) in Glasower Straße, Neukölln. Respondents' ages ranged between 18 and 80 years old (*M* = 41.57*; SD* = 1.027). Table 2 also shows that 46.3% of the sample identified as female (N = 100/216) and 52.3 % identified as male (N = 113/216). One respondent did not identify as either male or female (0.5%) and two respondents did not want to report their gender (0.9%). While nearly a quarter of the respondents (23.6%) indicated that they lived in a one-person household (N = 51/216), 38% were part of a two-person household (N = 82/216) and 38.5% lived in a household with more than two people (N = 83/216).

Furthermore, 46.3% indicated having one or more children (N = 100), while 23.6% of respondents stated to have children or other people that relied on them for mobility needs (N = 51). The majority of the sample rented private housing (76.5%; N = 163/213). Also, the majority of the sample indicated having completed a higher education level (63%; N=136/216), as opposed to 22.2% that completed medium education (N = 48) and 14.8% that completed lower education levels (N = 32). People with a higher educational background therefore seem to be overrepresented in this sample.

Table 2 demonstrates that nearly half of the sample was employed full-time (46.8 %; N = 101/216). Other large employment categories within this sample are people who are self-employed (16.2%; N = 35/216), those who identify as being a student (12%; N = 26/216) and those who are employed part-time (9.3 %; N = 20/216).

With regard to respondents' net household income, 39.4% (N = 85/216) indicated having a household income equal to or higher than € 2601,- per month, meaning that at least 39.4% of the sample has monthly net household income that is higher than the German average, which is € 2555,- per month (OECD, 2019).

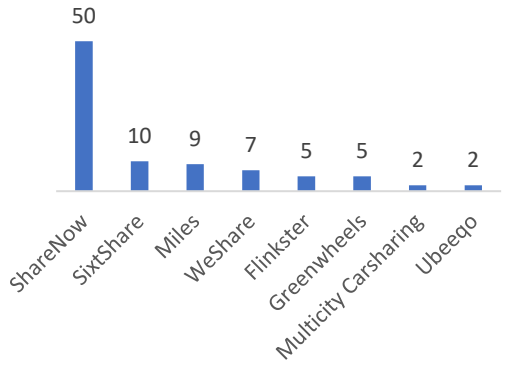


Figure 3: The carsharing services used by respondents (multiple answers possible)

Although 84.3% of the respondents was in the possession of a valid car driver's licence (N = 182), only 43.5% reported owning car (N = 94). Moreover, 25.5% of

the respondents indicated having a valid carsharing membership (N = 55/216) and 23.1% reported having used a carsharing service in the past 12 months (N = 50/216). Figure 3 shows which services the respondents had active memberships for at the time of the study.

Table 2: Summary statistics

Variables	Freq.	%	*M*	SE	SD	Var.	Min.	Max.
Neighbourhood where data was collected (N = 216)			1.49	.034	.501	.251	1	2
Steglitz	110	50.9						
Neukölln	106	49.1						
Age (N = 216)			41.57	1.027	15.088	227.642	18	80
18-24	21	9.7						
25-34	64	29.6						
35-44	53	24.5						
45-54	32	14.8						
55-64	27	12.5						
65-74	11	5.1						
75-80	8	3.7						
Gender (N = 216)			.56	.038	.559	0.313	0	3
Female	100	46.3						
Male	113	52.3						
Genderfluid or Non-binary	1	.5						
I do not want to say	2	.9						
Number of people in household (N = 216)			2.39	.080	1.176	1.384	1	7
1 person	51	23.6						
2 people	82	38.0						
3 people	43	19.9						
4 people	32	14.8						
5 people	4	1.9						
6 people	3	1.4						
More than 6 people	1	.5						
Number of children respondent (N = 216)			.75	.064	.946	.895	0	5
No children	116	53.7						
1 child	48	22.2						
2 children	45	20.8						
3 children	5	2.3						
4 children	1	0.5						
More than 4 children	1	0.5						
Do people rely on respondent for mobility needs (N = 216)			.24	.029	.426	.181	0	1
No	165	76.4						
Yes	51	23.6						
Housing situation (N = 213)			0.63	0.087	1.273	1.62	0	5
Private housing	163	76.5						
Social housing	7	3.3						
Student/shared housing	18	8.5						
Home owner (pay mortgage)	11	5.2						
Home owner (no mortgage)	11	5.2						
With parents	3	1.4						
Primary employment status (N = 216)			2.66	.143	2.100	4.411	0	9
Unemployed	3	1.4						
Employed full-time	101	46.8						
Employed part-time	20	9.3						
Self-employed	35	16.2						
High school student	3	1.4						
Student	26	12						
Retired	20	9.3						
Fulltime unpaid caretaker	1	0.5						
Unable to work	3	1.4						
Other	4	1.9						
Education levels (N = 216)			2.48	.050	.741	.548	1	3
Low (No education, primary or lower secondary education)	32	14.8						
Medium (Upper secondary education, vocational training and education)	48	22.2						
High (Bachelor's, Master's, Doctoral degree or equivalent)	136	63.0						
Monthly net household income (N = 216)			4.59	.183	2.696	7.267	0	9
< 900 EUR	14	6.5						
901 - 1300 EUR	26	12						
1301 - 1500 EUR	13	6						
1501 - 2000 EUR	26	12						
2001 - 2600 EUR	24	11.1						
2601 - 3200 EUR	22	10.2						
3201 - 4500 EUR	41	19						
4501 - 6000 EUR	17	7.9						
> 6001 EUR	7	3.2						
I do not want to say	26	12						
Valid car driver's license (N = 216)			.84	.054	.365	.133	0	1
No	34	15.7						
Yes	182	84.3						
Car ownership (N = 216)			.44	.034	.497	.247	0	1
No	122	56.5						
Yes	94	43.5						
Carsharing membership (N = 216)			.25	.030	.437	.191	0	1
No	161	74.5						
Yes	55	25.5						
Carsharing used within past 12 months (N = 216)			.23	.029	.423	.179	0	1
No	166	76.9						
Yes	50	23.1						

4. Findings

4.1 Descriptive statistics

The items included in the EFA and CFA have means ranging from 2.18 to 4.72. While some items have substantially negatively skewed distributions (values exceeding ±1), and others have substantially high and low levels of Kurtosis (values exceeding ±1), due to the sample size, we assume that the sampling distribution is normally distributed (Field, 2009). Other statistics such as Cook's distance (all distances were below 0.1, tested for both items that load onto the dependent latent variable 'Intention to participate in CS'), the Variable Inflation Factor (VIF) (all values were < 3.0) and Tolerance statistic (all values were > 0.1) indicated there were no multivariate assumptions that were violated.

4.2 Exploratory and Confirmatory Factor Analysis

Principal Component Analysis was conducted using a varimax rotation, because the values in the factor correlation matrix did not trespass the cut-off value of ±0,32 (Tabachnick & Fidell, 2013). The final factors and items included in the EFA are reported in table 3, as well as their respective Cronbach's alpha, Eigenvalue and variance explained by the factor. Based on the scree plot's point of inflection six factors were manually extracted, which together explained 70.4% of the total variance. The factors derived from the EFA are respectively related to a Pro-Car Identity (PCID), Subjective Norms (SN), Technological Self-Identity (TSID), Environmental Self-identity (ESID), Perceived Behavioural control (BPC) and Attitudes (ATT) (see table 3).

The items loaded slightly different than expected based on the theoretical framework proposed using the TPB, which means that the latent construct 'Attitudes' measures more general beliefs about the respondent's own transport behaviour. However, this factor makes up a plausible latent variable that can be supported by theory, because this latent variable measures more general beliefs that are aligned with the TPB (Ajzen, 1991).

Cronbach's alpha for to Pro-car Identity (α = 0.825), Subjective Norms (α = 0.708), Environmental Self-identity (α = 0.781) and Perceived Behavioural control (α = 0.720) all suggest a good internal consistency with alpha's above 0.7. The dependent construct 'Intention to participate in CS' was not included in the EFA, but also showed to have a good internal consistency (α = 0.748).

The Cronbach's alpha for 'Attitudes towards own transport behaviour' is under the cut-off value of 0.7 (α = 0.525), however, the average inter-item correlation between the two items in the factor (0.356) suggests that the items do have an acceptable internal consistency (Piedmont, 2014). Moreover, since this factor is a necessary component in TPB, the factor will still be used in further analyses. In a similar study on youth attitudes toward sustainable transport (Pojani et al., 2018), Cronbach's alpha's with similar values are also used in further analyses. The authors of the current study suggest that these factors can still be included, but should be interpreted with care.

The Cronbach's alpha for the 'technological self-identity' factor is also lower than 0.7 (α = 0.616). However, the average inter-item correlation between the two items in the factor (0.364) suggests that the items do have an acceptable internal consistency (Piedmont, 2014), and can be used for the analysis. Since one of the aims of this study is to find whether a technological identity has an effect on the intentions to participate in carsharing, this factor will also be included in further analyses. Both factors do have significantly high factor loadings above the cut-off value of 0.5.

Table 3: Rotated Component Matrix with factor loadings, Cronbach's alpha, Eigenvalue and variance explained

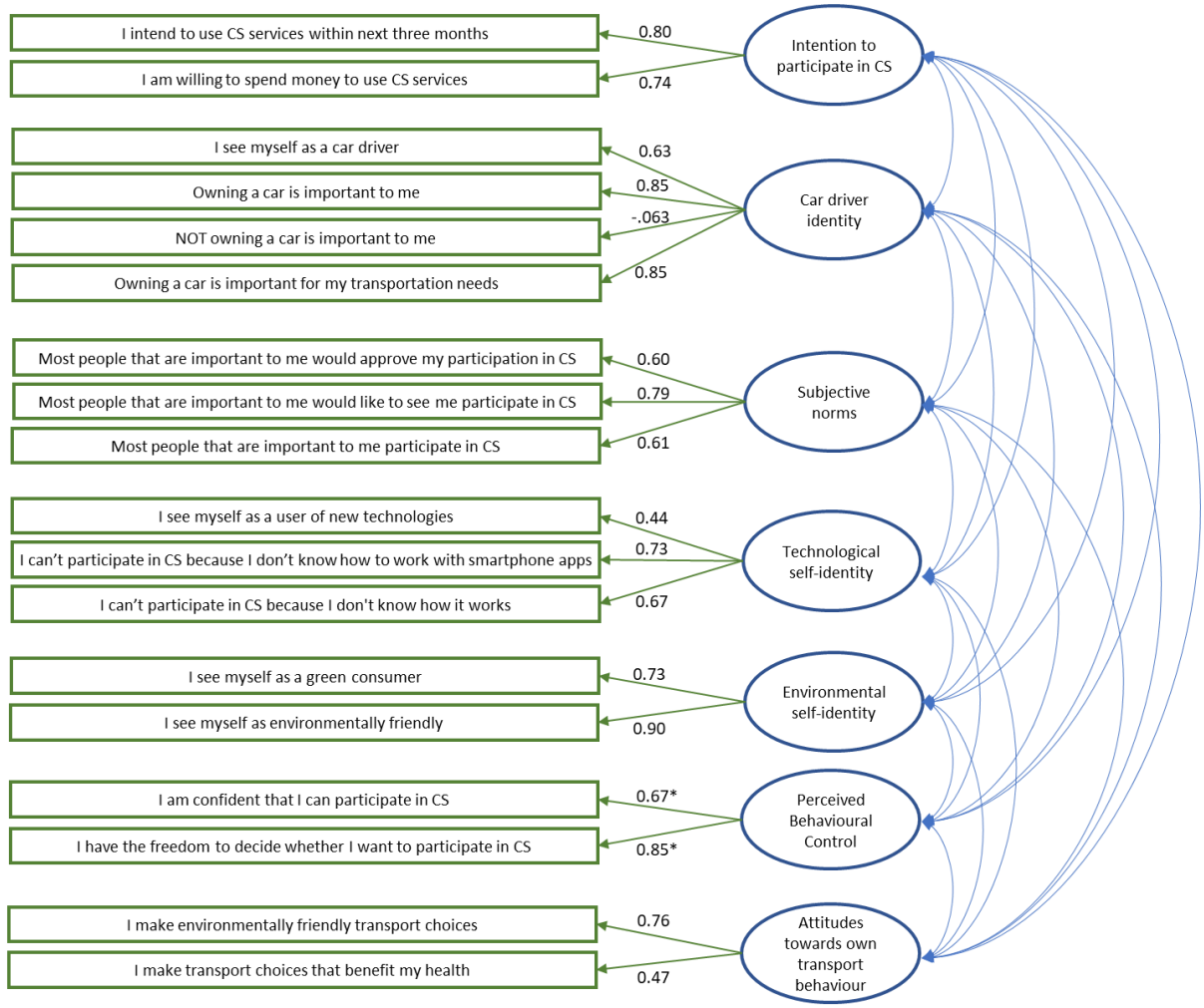
	Factors					
Items	PCID	SN	TSID	ESID	PBC	ATT
1. Owning a car is important to me	**0.867**	-0.047	0.027	-0.114	-0.083	0.008
2. NOT owning a car is important to me	**-0.721**	0.052	-0.049	0.109	-0.038	0.100
3. Owning a car is important for my transportation needs	**0.876**	-0.034	-0.030	-0.026	0.004	0.055
4. I see myself as car driver	**0.709**	-0.018	-0.056	-0.060	0.333	-0.182
5. Most people who are important to me would approve my participation in CS	-0.285	**0.681**	0.133	-0.060	0.213	0.099
6. Most people who are important to me would like to see me participating in CS	0.009	**0.805**	0.091	0.092	0.025	0.116
7. Most people that are important to me are participating in CS	0.034	**0.834**	0.040	0.041	0.039	-0.051
8. I can't participate in CS. because I don't know how to work with smartphone apps	-0.062	0.032	**0.826**	-0.078	0.131	-0.023
9. I can't participate in CS because I do not know how it works	-0.001	0.081	**0.766**	-0.116	0.189	0.075
10. I see myself as user of new technologies	0.129	0.246	**0.616**	0.364	-0.082	-0.193
11. I see myself as environmentally friendly	-0.187	0.040	-0.110	**0.801**	0.020	0.272
12. I see myself as green consumer	-0.114	0.029	0.019	**0.877**	0.077	0.153
13. I am confident that I can participate in CS	-0.003	0.099	0.205	0.014	**0.830**	0.023
14. I have the freedom to decide whether I want to participate in CS	0.138	0.105	0.073	0.073	**0.865**	-0.068
15. I make environmentally friendly transport choices	-0.285	0.198	0.118	0.279	-0.149	**0.628**
16. I make transport choices that benefit my health	0.040	0.010	-0.110	0.190	0.035	**0.851**
Cronbach's α	0.825	0.708	0.614	0.781	0.720	0.525
Eigenvalue	3.361	2.635	1.813	1.361	1.243	0.849
% of Variance explained	21.0	16.5	11.3	8.5	7.8	5.3

Extraction Method: Principal Component Analysis; Rotation Method: Varimax with Kaiser Normalisation; KMO (0,715); Bartlett's test of Sphericity (χ2 = 1023,091; p = 0,000). Cut-off value for factor loadings: > 0,50. Items 8 and 9 are reversely coded. For the reliability analysis, item 2 was also reversely coded.

The next step was performing Confirmatory Factor Analyses (CFA) to confirm the structural relationships between the extracted factors in the EFA. The final output of the measurement model is presented in figure 4.

The Goodness of fit indicators such as χ^2/df (1.666), CFI (0.932), GFI (0.916), AGFI (0.874), SRMR (0.063), RMSEA (0.056) and PCLOSE (0.242) suggest that the CFA has good model fit. Indicators have the following preferred cut-off: χ^2/df (< 3), CFI (> .90), GFI (> .90), AGFI (> .8), SRMR (< .09), RMSEA (preferably > 0.05; .05 - .10 indicates moderate fit) and PCLOSE (> .05) (Hair, Black, Babin, & Anderson, 2010; Hu & Bentler, 1999). χ^2 (191.611(115); $p < .001$) is preferred to be not significant, however, it is common that the χ^2 can be significant, even when there is appropriate model fit (Hair et al., 2010). Although the AIC suggests that the measurement model has a better fit without the item 'identifying as a user of new technologies' (AIC = 273.668) than with the item included (AIC = 303.611), we include this item in the analysis, as the factor 'technological self-identity' in order to include an identity question, which is advantageous for the testing the previously established research hypotheses.

The item 'I am confident that I can participate in carsharing' indicated to be a Heywood case, meaning that the item had a negative error variance (Kline, 2011). Allowing Heywood cases is not recommended, because the occurrence of negative variances in a population is impossible (Kolenikov & Bollen, 2012).There are multiple causes for Heywood cases, but a likely cause for the occurrence in our model is using only two items in a factor (Kline, 2011). A way to resolve this is by constraining both item parameters with equality constraints and fixing the variance of the respective latent variable 'Perceived Behavioural Control' to 1 (Gaskin, 2015; Kline, 2011).



Note: * pathway constrained with string constraint

Figure 4: Confirmatory Factor Analysis output of the final measurement model

4.3 Structural models and testing hypotheses

In a next step we identified the structural relationships between the latent constructs using Structural Equation Modelling. The structural relationships, as proposed in the conceptual framework in figure 1, were tested. Figure 5 presents the relationships that were significant. The dashed arrow between 'Attitudes towards own transport behaviour' and 'Pro-car identity' is part of our alternative model we propose and further discuss in section 4.4.

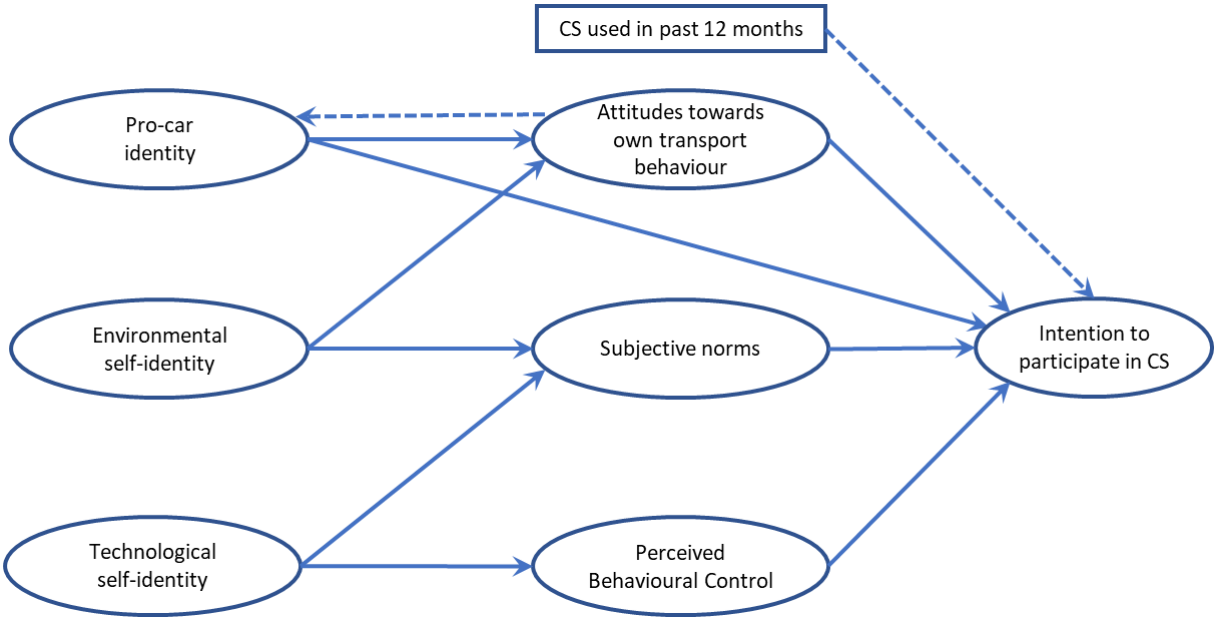


Figure 5: Structural model

Table 4 reports the output of the structural model and indicates that 'attitudes towards own transport behaviour' has a significant effect on people's 'intentions to participate in carsharing' (p = .013). Surprisingly, however, the effect of 'attitudes towards own transport behaviour' on carsharing intentions is negative, meaning that when people see their own transportation behaviours as environmentally friendly or as beneficial to their personal health, their intention to participate in CS is lower. Individuals who perceive higher social pressures (SN) towards carsharing also have higher intentions to participate in carsharing (p < .001) and people that perceive to have more behavioural control towards participating in carsharing also have higher intentions to participate (p < .001). Moreover, of all constructs, subjective norms contributes most towards carsharing participation intentions.

Table 4 shows that there is a significant negative and direct effect (p = .016) from pro-car identity towards Intentions to participate in carsharing. This suggests that the stronger an individual's pro-car identity is, the less likely they are to report carsharing participation intentions. Furthermore, table 4 shows that there is also a significant positive indirect effect from pro-car identity towards intentions to participate in carsharing through 'attitudes towards own transport behaviour' (p = .053) and a significant negative total effect on the 'intentions to participate in carsharing' (p = .056), meaning that the more an individual evaluates their own transport behaviour as being healthy and environmentally friendly, the less negative the effect is of their pro-car identity on their intentions to participate in carsharing.

There also is no significant positive direct effect from environmental self-identity towards Intentions to participate in carsharing. There was a significant negative indirect effect from environmental self-identity through 'Attitudes towards own transport behaviour' (p = .004), meaning that when people reported a higher environmental self-identity, their attitudes towards their transport behaviour were also likely higher, but their intentions become lower. Environmental self-identity also showed to have a significant positive indirect effect through 'Subjective norms' (p = .024). This means that the more someone identifies as environmentally friendly, the more likely an individual is to perceive social pressure to participate in carsharing from people that are important to this individual. Moreover, the more an individual perceives these social pressures, the more likely this individual is to have intentions to participate in carsharing. However, the total effect of environmental self-identity on 'Intentions to participate in carsharing' is not significant (p = .973).

Table 4 shows that there is no significant positive direct effect from technological self-identity towards intentions to participate in carsharing, but does show significant positive indirect effects from 'technological self-identity' through 'Subjective norms' (p = .002) and through 'Perceived behavioural control' (p = .007). This implies that the more an individual identifies as a user of new technologies, the more likely he or she is to perceive social

pressure to participate in carsharing from people that are important to this individual and the more likely this individual is to have intentions to participate in carsharing. Regarding 'perceived behavioural control', the more someone identifies as a user of new technologies, the more likely this individual is to perceive confidence and decisional freedom towards participating in carsharing, and the more likely this individual is to have intentions to participate in carsharing. Table 4 also shows that 'technological self-identity' has a significant positive total effect on the 'Intentions to participate in carsharing' (p = .002).

Multigroup analysis indicated there was no significant difference between the models when the neighbourhood was controlled for (p = .289), meaning that the geographic locations do not explain differences between the planned intentions of people from both neighbourhoods.

The goodness of fit indicators such as χ^2 (207.687(124); p < .001), χ^2/df (1.675), CFI (0.926), GFI (0.910), AGFI (0.876), SRMR (0.071), RMSEA (0.056) and PCLOSE (0.221) suggest that the structural model has a good model fit (Hair et al., 2010; Hu & Bentler, 1999). The AIC for this model was 301.687.

Table 4: direct, indirect and total effects on 'Intentions to participate in carsharing' (Structural model).

	Direct	***Indirect***	***Total***
Effect on attitudes towards own transport behaviour	*Unstandardised estimate (standardised estimate)*		
Pro-car identity	-.109** (-.203)	N/A	-.109** (-.203)
Environmental self-identity	.545*** (.616)	N/A	.545*** (.616)
Effect on subjective norms	***Direct***	***Indirect***	***Total***
Environmental self-identity	.244** (.202)	N/A	.244** (.202)
Technological self-identity	.545*** (.356)	N/A	.545*** (.356)
Effect on perceived behavioural control	***Direct***	***Indirect***	***Total***
Technological self-identity	.561*** (.365)	N/A	.561*** (.365)
Effect on intentions to participate in carsharing	***Direct***	***Indirect***	***Total***
Attitudes towards own transport behaviour	-.400** (-.240)	N/A	-.400** (-.240)
Subjective norms	.872*** (.714)	N/A	.872*** (.714)
Perceived behavioural control	.320*** (.263)	N/A	.320*** (.263)
Pro-car identity	-.170** (-.190)	.044* (.049)	-.127* (-.141)
Environmental self-identity	-	-	-
through Attitudes towards transport behaviour	N/A	-.218***	N/A
through Subjective norms	N/A	.213**	N/A
Technological self-identity	-	.655*** (.350)	.655*** (.350)
through Subjective norms	N/A	.475***	N/A
through Perceived behavioural control	N/A	.179***	N/A

*Notes: N/A = not applicable; - = effect was not significant. * significant at 90% level; ** significant at 95% level; *** significant at 99% level.*

Table 5 shows the results when the variable 'carsharing used in past 12 months' is included in the model. The results indicate that 'carsharing used in past 12 months' has a significant positive effect on 'Intention to participate in carsharing' (p < .001). However, with this variable included in the model, the direct effect from 'attitudes towards own transport behaviour' on 'intentions to participate in carsharing' is no longer significant. This means that when people have previously used carsharing, this is a stronger predictor than their attitudes towards their own transport behaviour. Moreover, the indirect effect from 'pro-car identity' on 'intentions to participate in carsharing' is also no longer significant, meaning that individuals' attitudes towards their own transport behaviour do not mediate their intentions to participate in carsharing.

Other variables showed similar effects compared to the model in which past use of carsharing services is not controlled for. However, goodness of fit indicators such as χ^2 (262.760 (138); p < .001), χ^2/df (1.904), CFI (0.901), GFI (0.893), AGFI (0.852), SRMR (0.078), RMSEA (0.065), PCLOSE (0.022) and AIC (366.760) indicate that this model has a less good fit than the model without past use, and also a less good overall model fit.

Table 5: direct, indirect and total effects on 'Intentions to participate in carsharing' (Structural model with 'past use').

	Direct	***Indirect***	***Total***
Effect on attitudes towards own transport behaviour	*Unstandardised estimate (standardised estimate)*		
Pro-car identity	-.108** (-.201)	N/A	-.108** (-.201)
Environmental self-identity	.543*** (.616)	N/A	.543*** (.616)
Effect on subjective norms	***Direct***	***Indirect***	***Total***
Environmental self-identity	.237** (.201)	N/A	.237** (.201)
Technological self-identity	.612*** (.412)	N/A	.612*** (.412)
Effect on perceived behavioural control	***Direct***	***Indirect***	***Total***
Technological self-identity	.591*** (.386)	N/A	.591*** (.386)
Effect on intentions to participate in carsharing	***Direct***	***Indirect***	***Total***
Attitudes towards own transport behaviour	-	N/A	-
Subjective norms	.597*** (.457)	N/A	.597*** (.457)
Perceived behavioural control	.201** (.158)	N/A	.201** (.158)
Pro-car identity	-.154** (-.163)	-	-.140** (-.149)
Environmental self-identity	-	-	-
through Attitudes towards transport behaviour	N/A	-	N/A
through Subjective norms	N/A	.142*	N/A
Technological self-identity	-	.484** (.249)	.484** (.249)
through Subjective norms	N/A	.366**	N/A
through Perceived behavioural control	N/A	.119**	N/A
Carsharing used in past 12 months	1.851*** (.568)	N/A	1.851*** (.568)

*Notes: N/A = not applicable; - = effect was not significant. * significant at 90% level; ** significant at 95% level; *** significant at 99% level.*

4.4 Assessing a near-equivalent alternative model

Our first structural model (figure 4) indicated that 'pro-car identity' had a direct as well as an indirect effect on 'intentions to participate in carsharing'. Moreover, previous models both indicated significant negative covariance between 'pro-car identity' and 'environmental self-identity' (respectively -.360, p = .001 and -.361, p = .002). As Kline (2011) suggested to also test equivalent and near-equivalent models, we selected to assess a theoretically viable alternative model, as it may be possible that when an individual identifies his or her own transport behaviour as environmentally friendly and beneficial for their personal health, the less they would have a pro-car self-image. Moreover, this is also consistent Ajzen's (1991) interpretation that general attitudes affect more specific aspects related to a behaviour. In other words, identities may influence attitudes, but attitudes may just as well affect an individual's reported identity. Therefore, we tested an alternative model by changing the directionality between 'pro-car identity' and 'attitudes towards own transport behaviour' (see dashed arrow in figure 5). The results of the alternative model are presented in table 6.

In the alternative model, 'pro-car identity' again has a negative direct effect on 'intentions to participate in carsharing' (p = .012), meaning that the more individuals consider a pro-car identity, the less likely they are to have intentions to participate in carsharing. 'Attitudes towards own transport behaviour' also has a significant negative effect on people's 'intentions to participate in carsharing' (p = .011), which is positively mediated by 'pro-car identity' (p = .013). This means that the more respondents evaluate their own transport behaviour as healthy and environmentally friendly, the less likely they are to have intentions to participate in carsharing. However, this effect becomes increasingly less negative when individuals increasingly have a pro-car identity.

Moreover, the model shows a negative indirect effect from 'environmental self-identity' to 'pro-car identity' through 'attitudes towards own transport behaviour. This means that the more individuals report an environmental self-identity, the more they evaluate their own transport behaviour as environmentally friendly and beneficial for their personal health, which in turn leads to a lesser degree of pro-car identity.

Also, the alternative model indicates that when people perceiving higher social pressures (SN) towards carsharing also have higher intentions to participate in carsharing (p < .001) and people that perceive to have more behavioural control towards participating in carsharing also have more intentions to participate (p < .001). Although all indirect effects from 'environmental self-identity' on carsharing participation intention are significant, the total effect of 'environmental self-identity' as a predictor of carsharing participation intention remains not significant.

Also in the alternative model 'technological self-identity' affects 'intention to participate in carsharing' through 'Subjective norms' (p = .011) as well as through 'Perceived behavioural control' (p = .013), again resulting in a significant positive total effect (p = .013). This implies again that the more someone identifies as a user of new technologies, the more likely this individual is to perceive social pressure to participate in carsharing from people that are important to this individual and the more likely this individual is to have intentions to participate in carsharing. Regarding 'perceived behavioural control', the more someone identifies as a user of new technologies, the more likely this individual is to perceive confidence and decisional freedom towards participating in carsharing, and the more likely this individual is to have intentions to participate in carsharing. Multigroup analysis again indicated that geographic locations do not explain differences between the planned intentions of people from both neighbourhoods (p = .141).

Goodness of fit indicators such as χ^2/df (1.650), χ^2 (207.897(126); p < .001), CFI (0.928), GFI (0.910), AGFI (0.877), SRMR (0.072), RMSEA (0.056) and PCLOSE (0.260) indicate that this alternative model also has a good model fit (Hair et al., 2010; Hu & Bentler, 1999). AIC for this model was 297.897, which is slightly lower than the AIC of our structural model.

Similar to the structural model, the effect of 'attitudes towards own transport behaviour' is no longer significant when 'past use of carsharing services' is controlled for, meaning that when people have previously used carsharing, this is a stronger predictor than their attitudes towards their own transport behaviour (See Appendix A).

Table 6: direct, indirect and total effects on 'Intentions to participate in carsharing' (Alternative model).

	Direct	***Indirect***	***Total***
Effects on pro-car identity	*Unstandardised estimate (standardised estimate)*		
Attitudes towards own transport behaviour	-.724*** (-.387)	N/A	-.724*** (-.387)
Environmental self-identity			
through Attitudes towards transport behaviour	N/A	-.434*** (-.265)	-.434*** (-.265)
Effect on attitudes towards own transport behaviour	***Direct***	***Indirect***	***Total***
Environmental self-identity	.598*** (.684)	N/A	.598*** (.684)
Effect on subjective norms	***Direct***	***Indirect***	***Total***
Environmental self-identity	.245** (.203)	N/A	.245** (.203)
Technological self-identity	.544*** (.356)	N/A	.544*** (.356)
Effect on perceived behavioural control	***Direct***	***Indirect***	***Total***
Technological self-identity	.564*** (.367)	N/A	.564*** (.367)
Effect on intentions to participate in carsharing	***Direct***	***Indirect***	***Total***
Attitudes towards own transport behaviour	-.410** (-.244)	.127** (.076)	-.283** (-.168)
Subjective norms	.872*** (.715)	N/A	.872*** (.715)
Perceived behavioural control	.320*** (.264)	N/A	.320*** (.264)
Pro-car identity	-.175** (-.196)	N/A	-.175** (-.196)
Environmental self-identity	-	-	-
through Attitudes towards transport behaviour	N/A	-.245***	N/A
through Attitudes towards transport behaviour and pro-car identity	N/A	.076***	N/A
through Subjective norms	N/A	.214**	N/A
Technological self-identity	-	.655*** (.351)	.655*** (.351)
through Subjective norms	N/A	.474***	N/A
through Perceived behavioural control	N/A	.181***	N/A

*Notes: N/A = not applicable; - = effect was not significant. * significant at 90% level; ** significant at 95% level; *** significant at 99% level.*

We do not reject either model, as both provide a valid indication of individuals' carsharing participation intentions. Although the rest of the model stays stable, we identified that the directionality between individuals' attitudes towards their own behaviour and the degree of their pro-car identity is not clear yet, and requires future research. We also identified that there is an interaction between identity aspects, and in this case, also between 'pro-car identity' and 'environmental self-identity'. These results are unsurprising, as individuals can have multiple social and self-identities, that may be active to a greater or lesser extent at any given time (Fielding et al., 2008; Stryker & Burke, 2000).

5. Discussion and conclusion

This study demonstrates to what extent different personal identities play a role in an individual's intention to engage in carsharing. In line with the results of previous studies, the results of the current study reveal that pro-car identities and technological self-identities play significant roles in individuals intentions to participate in carsharing (Heinen, 2016; King et al., 2019; Pojani et al., 2018; Steg et al., 2001). Furthermore, the results demonstrate that Subjective Norms towards carsharing strengthen the role of environmental and technological self-identities on individuals' intentions to participate in carsharing. This means, that similarly to what was found by King et al. (2019), people who maintain self-images such as being a user of new technologies and environmentally friendly perceive pressures from people close to them to participate in carsharing.

Moreover, in previous research, Perceived Behavioural Control showed to be a stronger determinant on the intention to participate in carsharing than Subjective Norms (Armitage & Conner, 2001). However, this was not the case in the current study. These results indicate that in the context of carsharing intentions and an individual's perceived pressures to participate in carsharing from people who are important to this individual, are more important determinants than psychological ones such as self-confidence and autonomy, which in this study were used to measure Perceived Behavioural Control.

In contrast to Bardhi and Eckhardt (2012), who found that access-based carsharing is thought of as a popular and sustainable alternative to car ownership, the results of our study showed that people's attitudes towards their own transport behaviour were negatively associated with carsharing intentions. Specifically, the more individuals evaluated their own transport behaviour as healthy and environmentally friendly, the less they intentions they had to adopt carsharing. This result suggests that many individuals do not evaluate carsharing as an environmentally sustainable transport alternative. However, another explanation is that individuals who do not identify carsharing as an environmentally sustainable mode rarely use passenger cars to begin with and mainly utilise other, more environmentally sustainable modes such as cycling, walking and/or public transport. This could be explained by the degree of motorisation in Berlin, which is much lower than the average in Germany (European Commission, 2017; Steinmeyer & Herrmann-Fiechtner, 2017). Moreover, the city of Berlin already provides a diverse range of public and shared modes of transport that are more sustainable compared to both private and shared cars, such as shared bicycles and other public transport modes.

Moreover, and corresponding to results from previous studies (Bamberg et al., 2003), past use was an important determinant of behavioural intention: the results of the current study showed that individuals who have previously used carsharing have higher intentions to use carsharing than non-past users. Although there have been numerous studies using user data to show the personal and demographic characteristics of people who use carsharing as a mode of transport (Costain et al., 2012; De Luca & Di Pace, 2015; Dias et al., 2017), previous studies did not show why people with similar characteristics did not use carsharing. Therefore, one of the strengths of the current study is that the perceptions of non-users of carsharing have also been considered. Although it has been shown that pro-car and technological self-identities contribute to an increased intention to participate in carsharing, a limitation is that this study does not demonstrate whether these individuals eventually started using carsharing. Future research should, therefore, assess the long-term adoption of potential users, and carefully assess any barriers to adoption among individuals with pro-car and technological self-identities. We therefore also recommend further research using qualitative methods to explore the relationships between social- and self-identities in people's decision-making process to participate in carsharing. Moreover, we suggest a qualitative approach such as in-depth interviews among people maintaining pro-car identities to explore how the use of shared cars can become part of that pro-car identity, although we acknowledge that a strongly embedded identity often prevents behaviour change (Nordfjærn et al., 2014; Stets & Burke, 2000).

Furthermore, our alternative model showed that one aspect of identity can (negatively) influence another form of identity. Because individuals can identify as relating to multiple identities, which, depending on an individuals' active social role in that situation, can be active to a greater or lesser extent in different circumstances or activities, we believe this is a valid and logical outcome (Fielding et al., 2008; Stryker & Burke, 2000). However, because the effects of these role differences have not been fully explored in this study, we either suggest further research into social identity salience in the context of carsharing behaviour, or into the role of identities and carsharing intentions for use in various transport purposes (e.g. grocery shopping, bringing children to school, commuting to work, visiting family out of town). Furthermore, our alternative model

suggested that when individuals have positive evaluations towards their own healthy and environmentally friendly transport behaviour, this may negatively affect their degree of pro-car identity. Since previous research shows that it is more common for identity to influence attitudes, we suggest for further research into this relationship. However, we must note again that due to low factor loadings, our 'attitudes' latent variable was measuring attitudes towards individuals' own transport behaviour, and not towards participating in carsharing. Although these general attitudes do align with the Theory of Planned Behaviour, additional attitudinal dimensions could be explored in future research. Overall, we recognise the Theory of Planned Behaviour as a useful and valid research framework for analysing the effects of social and self-identities on carsharing intentions.

The promotion of carsharing participation can have a positive effect on the urban environment of cities and regions. Similar to the municipality of Berlin, many local governments around the world are already increasingly implementing environmentally sustainable transport systems and are attempting to decrease CO2 emissions through their urban development plans. Reducing car use and promoting carsharing can contribute to meeting the cities' and regions environmental sustainability goals. Moreover, participating in carsharing can be beneficial towards the use of public space on a local scale. Unnecessary parking lots and spaces could, for example, be transformed into public space that contributes to a positive experience of the living environment, such as benches, play areas for children and greenery (Bratina Jurkovič, 2014). In addition, the "pay per use" aspect of carsharing makes people assess whether they actually need to use a car for their transport trip, which can lead to reduced overall car use, more sustainable mobility behaviour and therefore lower levels of CO2 emissions and congestion (C. J. Martin, 2016; Nijland & van Meerkerk, 2017; Shaheen & Martin, 2016). Therefore, carsharing should be promoted by municipal and regional governments, not only with regard to the use of B2C shared cars, but also to P2P and community shared vehicles, to have citizens contribute to the overall health of neighbourhoods and cities. Based on the results of the current study, we suggest for carsharing providers and local and regional governments first promote carsharing adoption among those who are early adopters of new technologies through, for example, promotional campaigns on online (social) platforms. Moreover, as this study shows that people who have used carsharing before are much more likely to use carsharing again than individuals who have not, even a single use could increase future intentions. Moreover, as suggested by King et al. (2019) we recommend that policy makers use carsharing as a tool to further develop environmentally sustainable transportation futures. We suggest that nudging or incentives are used to promote carsharing amongst users who are currently already using other forms of mobility technology, although we warn as well for stereotyping threats (King et al., 2019). Furthermore, we suggest that promotional campaigns are used to confront individuals with pro-car identities to reconsider their car use, by advertising in places where drivers regularly come, such as petrol stations or parking lots.

To conclude, intentions to participate in carsharing may lie with the consumer, however, as a step towards achieving sustainable and accessible urban travel, carsharing adoption can be increased through policy implications by effectively promoting the use of carsharing.

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A. Appendix

Table A: direct, indirect and total effects on 'Intentions to participate in carsharing' (Alternative model with 'past use').

	Direct	***Indirect***	***Total***
Effects on pro-car identity	*Unstandardised estimate (standardised estimate)*		
Attitudes towards own transport behaviour	-.724*** (-.386)	N/A	-.724*** (-.386)
Environmental self-identity	N/A	-.431*** (-.264)	-.431*** (-.264)
Effect on attitudes towards own transport behaviour	***Direct***	***Indirect***	***Total***
Environmental self-identity	.596*** (.684)	N/A	.596*** (.684)
Effect on subjective norms	***Direct***	***Indirect***	***Total***
Environmental self-identity	.238** (.201)	N/A	.238** (.201)
Technological self-identity	.611*** (.411)	N/A	.611*** (.411)
Effect on perceived behavioural control	***Direct***	***Indirect***	***Total***
Technological self-identity	.593*** (.387)	N/A	.593*** (.387)
Effects on intentions to participate in carsharing	***Direct***	***Indirect***	***Total***
Attitudes towards own transport behaviour	-	.114*** (.064)	-
Subjective norms	.598*** (.459)	N/A	.598*** (.459)
Perceived behavioural control	.201** (.159)	N/A	.201** (.159)
Pro-car identity	-.157** (-.167)	N/A	-.157** (-.167)
Environmental self-identity	-	.128* (.083)	.128* (.083)
through Attitudes towards transport behaviour	N/A	-	N/A
through Attitudes towards transport behaviour and pro-car identity	N/A	.068***	N/A
through Subjective norms	N/A	.142**	N/A
Technological self-identity	-	.485*** (.250)	.485*** (.250)
through Subjective norms	N/A	.365***	N/A
through Perceived behavioural control	N/A	.119**	N/A
Carsharing used in past 12 months	1.850*** (.569)	N/A	1.850*** (.569)

*Notes: N/A = not applicable; - = effect was not significant. * significant at 90% level; ** significant at 95% level; *** significant at 99% level.*