Caring is sharing

the effects of compatibility framing and pro-environmental values on ridesharing intention

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Caring is Sharing: The Effects of Compatibility Framing and Pro-Environmental Values on Ridesharing Intention

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Abstract

Ridesharing could be a solution to reduce pollution and traffic congestion in cities and to reduce greenhouse gas (GHG) emissions worldwide. However, such promises are only fulfilled if people are willing to engage in ridesharing. Based on Rogers' (2003) work on distribution of innovation, the current research proposed that framing ridesharing as compatible with previously introduced ideas will lead to increased ridesharing intention. Confirming expectations, results showed that participants who were presented with ridesharing framed as compatible with previously introduced ideas showed a stronger ridesharing intention than participants who were presented with ridesharing framed as a new innovation. Furthermore, results showed that participants who had stronger biospheric values (which is expected to relate to pro-environmental behaviors and which were measured by the Environmental Portrait Value Questionnaire (E-PVQ)) had an increased ridesharing intention. The expected moderating effect of biospheric values on the effect of compatibility on ridesharing intention has not been found. These findings contribute to the understanding of the acceptance of ridesharing and might be useful to increase the acceptance: ridesharing is accepted more easily when presented to be just like earlier, comparable technology.

Acknowledgement

I am happy with writing the final words of this thesis and that my study at Eindhoven University of Technology is done. However, that does not mean that I am done with the topic of ridesharing. I don't know what the future may bring, but hopefully I can contribute to a sustainable future in mobility. I experienced writing my master thesis as a long process in which it is easy to get lost in details. Working at home, due to the corona crisis, made it even harder to stay focused. Luckily, the weekly meetings with my supervisors helped a lot to structure the process and to make sure that I booked progress. For me it was a weekly moment to work up to and I would like to thank my supervisors for this.

First of all, I would like to thank Jaap Ham for the help with the theoretical parts and for the interesting thoughts on the psychological aspects that came by. I am also thankful for his always positive attitude and constructive feedback.

For the background knowledge on ridesharing I would like to thank Hans Jeekel. During my bachelor he already inspired me. His enthusiasm made me realize that I find the future of mobility probably the most interesting challenge of today's world. His (sometimes political) insights on mobility are very useful for a broad and complete understanding of the challenges.

I am also thankful for the contribution of Wolmet Barendregt. She started as 'third supervisor' and quickly became a valuable addition to the team. She especially helped me in making important decisions about the research topic and the survey, besides that she provided extensive feedback on the written report.

I would also like to thank my friends (including the 'coffee club') and family for the full support during the graduation process. Lastly, a special thanks to Aart de Wilde for offering a place to work at *De Wilde Huiswerkbegeleiding* during the last month of my thesis.

Contents

Introduction

In cities all over the world, traffic congestion and air pollution are challenging problems. These problems arise mainly because of the number of cars in these cities (Künzli et al., 2000). But not only are those cars responsible for air pollution in their own city, they also contribute to the worldwide rise in temperature due to the emission of greenhouse gasses (Edenhofer, 2015). In 2018 cars were responsible for 12.2 percent of the total greenhouse gas (GHG) emissions in the EU (European Environment Agency, 2020), which is a big part of the total GHG emissions. Possible solutions to reduce this number would be reducing the number of trips, creating a shift towards public transportation or muscle powered transportation modes (cycling, skating, walking), reducing the pollution per vehicle, changing fuel type and improving the occupancy of vehicles. The latter, improving occupancy of vehicles, is the topic this paper investigates, by means of ridesharing. For public transportation it makes sense to improve its occupancy, since this is organized by companies or governments that aim to keep the costs low. However, for cars there are no organizations yet that successfully increased the occupancy on a large scale. An organization that successfully manages to structurally increase occupancy of cars and succeeds to change car use behavior has the potential to reduce the number of cars on the road and thereby GHG emissions will be cut. Ridesharing aims to increase the occupancy in cars, but changing behavior is difficult. The current paper's goal is to contribute to this behavioral change.

Ridesharing: State-of-the-art

Most cars are occupied by only one passenger and in many developed countries the average occupancy is still decreasing (Jeekel, 2018). For example, in the Netherlands the car occupancy decreased from 1.51 person per car in 2005 to 1.38 person per car in 2016 and similar trends can be seen in other developing countries (Jeekel, 2018). Even though most cars have four to seven seats, right now for most people the time, effort and social aspect to

find other passengers do not weigh up to the costs of driving alone. Therefore, occupancy of cars remains low. Ridesharing applications could offer a solution to increase the occupancy and reduce the number of vehicles on the road.

For a ridesharing application, it is possible to match different people who are strangers to each other in such a way that they can drive together. In this way the time and effort to find each other could be reduced. To illustrate this, a person who is going to travel from A to B could be matched by an application with another person who drives approximately the same route. Only one of the two would have to use the car. The travel mode of individuals sharing a vehicle in which travel costs are split with others who have similar itineraries and time schedules is the definition of ridesharing (Furuhata et al., 2013). Ridesharing might look a lot like carpooling. Indeed, ridesharing and carpooling are often used interchangeably, but they are subtly different. The main difference is that ridesharing is more technology supported and usually involves a smartphone-application, whereas carpooling is based on prearrangements between people, for example colleagues. Due to this similarity, a lot of literature on carpooling is also relevant for the current paper on ridesharing. However, psychologically, ridesharing is partly different from carpooling, due to the online aspect, which motivates the present study.

Below, I will describe three examples of existing ridesharing services to present a sketch of current initiatives. Two of these, BlaBlaCar (http://blablacar.com/) and Toogethr (http://toogethr.com/), offer ridesharing in the Netherlands. With BlaBlaCar drivers can offer seats in their car when making a trip. Individuals can book such a ride for the price that the driver decides. The number of ride offers decides the efficiency of the service. BlaBlaCar is mostly used for longer distances with flexible time schedules, and booking usually occurs days in advance. Toogethr offers ridesharing and parking services to companies. When all employees of an office start to use this application for commuting purposes, all of them will

have the same destination/origin and approximately the same arrival/departure time. This makes matching a lot easier than for companies that work region- or nationwide.

In contrast, applications like RideMyRoute (Wright, Nelson & Cottrill, 2020) combine ridesharing with public transportation. RideMyRoute claims that it can increase the likelihood of finding a suitable ride by a factor of 7 by bringing a person towards a public transportation hub on the route. This may help in multimodal transportation in suburban areas and has the potential to be included into Mobility as a Service (MaaS) platforms.

These existing applications all have their own strengths and weaknesses. Generally, ridesharing services promise to ease the matching, payment, navigation and communication between travelers (Furuhata et al., 2013). Also, ridesharing applications can support ridesharing on-demand, which makes it very flexible. This form of ridesharing is called dynamic ridesharing. However, next to these promises there are also challenges, such as safety, reliability and trust (Olsson, Maier and Friman, 2019). When a ridesharing application is used, with the purpose to get from A to B, not much trouble should be experienced with finding a ride. When no ride is found a user will stop using the system, meaning that a certain critical mass of drivers is necessary to make this system self-existing (Morris, 2008). To make it easier to reach this point, everything should work optimally. Optimizing in the real world by trial-and-error is undesirable, since deficient functioning of ridesharing might discourage the most willing subscribers from future use which should be avoided. To attain optimal functioning it is essential to evaluate existing technology adoption theories and see what we can learn from them.

Olsson et al. (2019) performed a meta-analysis in which they reduced the promises and challenges of carpooling to four main components: Two external factors (interventions and situational factors) which refer to the environmental context in which users find themselves and two internal factors (socio-demographic and judgmental) which refer to user

characteristics. Intervention factors are rewards and punishments for ridesharing such as subsidies and parking costs, which mostly depend on government policies. Situational factors are factors that depend on specific contextual situations, such as having low access to public transport. While socio-demographic factors cannot be influenced directly, differences in for example age, gender and income level could be taken into account when implementing policies to promote ridesharing. Finally, for companies offering ridesharing services, the judgmental or psychological factors, such as attitude and norms towards ridesharing, are of primary interest. As was concluded in the meta-analysis of Olsson et al. judgmental factors are of big influence on people's decision to carpool or not, but there is a theoretical gap between psychological theories and how they apply to carpooling. Therefore, one of the few theoretical approaches addressing the psychology of carpooling, which was introduced by Bachmann et al. (2018), will be discussed. Based on this discussion, a new theoretical approach will be introduced that will form the basis for this study.

Psychological Factors Influencing Ridesharing

Bachmann et al. (2018) proposed an adjusted version of the Theory of Planned Behavior (TPB; Ajzen, 1991) to predict carpooling behavior. As stated in the TPB; attitude, subjective norms and perceived behavioral control are of influence on behavioral intention, which after all leads to actual behavior (Ajzen, 1991). Herein, the attitude is "the degree to which a person has a favorable or unfavorable evaluation or appraisal of the behavior in question", the subjective norm refers to "the perceived social pressure to perform or not to perform the behavior", and perceived behavioral control is "the perceived ease or difficulty of performing the behavior" (Ajzen, 1991, p. 188).

In the adjusted version of Bachmann et al., the subjective norm in the TPB is replaced by the descriptive norm. This decision was based on evidence from the theory of normative conduct (Cialdini, Reno & Kallgren, 1990), which distinguishes social norms as injunctive

(specifying approval of others) and descriptive norms (specifying what most others do) and on evidence from Rivis and Sheeran (2003), who showed in a meta-analysis that the descriptive norm is a significant predictor of intention, whereas Ajzen's original TPB actually only looks at the injunctive norm. In some studies the injunctive norm is not even a significant predictor of intention at all, and only the descriptive norm is (de Leeuw, Valois, Ajzen & Schmidt, 2015). Therefore Bachmann et al. decided to leave out the injunctive norm and used the descriptive norm instead.

Bachmann et al. (2018) also proposed an additional predictor of behavioral intention, which is personal norm. Personal norm is defined as "self-expectations based on internalized values" (Bachmann et al., 2018, p. 261).

Bachmann et al. (2018) found that descriptive norm, perceived behavioral control and personal norm are significant predictors of carpooling intention (Figure 1 shows the results of Bachmann et al., 2018). However, in Bachmann et al., as opposed to other studies (Amirkiaee & Evangelopoulos, 2018; Becker, Ciari & Axhausen, 2017), attitude was not a significant predictor of carpooling intention. Bachmann et al. explained this by a finding of Smith, Hogg, Martin and Terry (2007) who found that people tend to use normative information in situations of uncertainty (carpooling is for most people an uncertain and infrequent behavior) instead of more systemic information which corresponds to attitudinal beliefs.

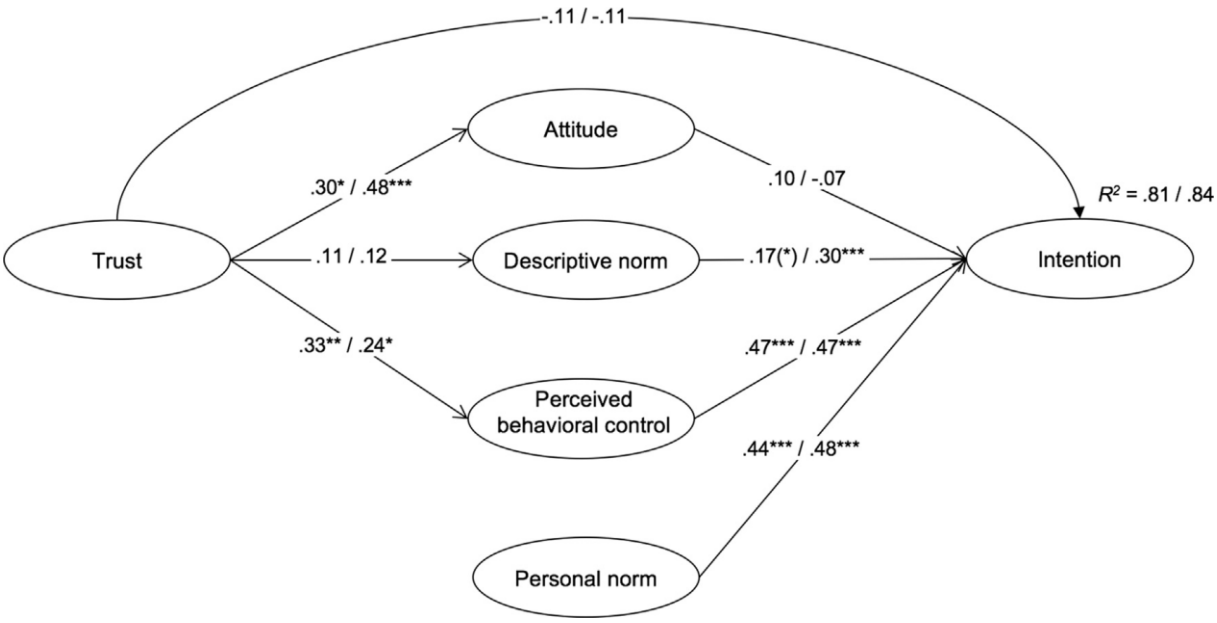

Figure 1. Standardized structural path coefficients of the final structural equation model. Values from the passengers subsample (n = 176) before slash, values from the drivers subsample (n = 158) after slash. (*) p < .1; *p < .05; **p < .01; ***p < .001. Reprinted from "What drives people to carpool? Explaining carpooling intention from the perspectives of carpooling passengers and drivers" by F. Bachmann, A. Hanimann, J. Artho, and K. Jonas, 2018, *Transportation research part F: traffic psychology and behaviour, 59*, p. 265. Copyright 2018 by Elsevier.

Therefore, the descriptive norm, perceived behavioral control and personal norm should be taken into account to increase ridesharing intention. Another more general perspective on innovation acceptance is proposed by Rogers (2003). Rogers proposed that *compatibility* is one of the five perceived attributes of innovation which are important predictors of the adoption of a certain technology. Next to compatibility these attributes are *relative advantage*, *complexity*, *trialability* and *observability*. *Relative advantage* and *compatibility* are the two strongest predictors of the rate of adoption of an innovation, and therefore the most interesting. The *relative advantages* of ridesharing, such as saving time and money, have been studied (see Olsson et al., 2019 for an overview). To our knowledge, the

second biggest predictor, *compatibility*, has not been studied in the context of ridesharing before. Therefore, the current paper will focus on compatibility.

Compatibility is defined as "the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters" (Rogers, 2003, p. 240). In this definition three types of compatibility are included: sociocultural values and beliefs, previously introduced ideas, and client needs for innovation. These types of compatibility will be discussed. First of all, a group of people (a cultural group or people living in the same area) usually has certain values and beliefs. These should be in line with the innovation for it to be successful. When these are incompatible, people will not adopt the innovation. This corresponds to other studies that state the importance of norms in the intention to do ridesharing (Bachmann et al., 2018; Smith et al., 2007). Second, for an innovation to be successfully adopted, it should also be compatible with previously introduced ideas. Familiar things help people to understand and accept something. Therefore, building on something that people already know is a good idea. In the case of ridesharing people may already be familiar with carpooling or a taxi service, with which it is comparable. Bachmann et al. argued that in uncertain situations people might fall back to normative information. Therefore, reducing the uncertainty by framing ridesharing as a previously introduced idea (such as carpooling or a taxi service) might increase the use of people's attitude towards ridesharing. Third, the needs of adopters should be taken into account. Innovations that fulfill a felt need of an adopter, even though the adopter might not know this beforehand, will be more likely to be adopted.

Important to notice is that Rogers (2003) studied the *perception* of attributes of innovation, therefore when implementing this knowledge the technology itself does not necessarily need to change as long as the perception of it changes. A way to do this is by framing the technology in the right way. To our knowledge no previous research has tried to

investigate whether it is possible to actively frame compatibility. When applying framing to the different types of compatibility (sociocultural values and beliefs, previously introduced ideas and client needs for innovation), the previously introduced ideas have the potential to be framed differently by either focussing on previously introduced ideas or not. Therefore, the current research will investigate the effect of framing ridesharing as a previously introduced idea on the behavioral intention to use ridesharing. This leads to the first research question.

Research question 1: Is there a positive effect of framing ridesharing applications in such a way that it is more compatible with previously introduced ideas, on the acceptance and behavioral intention to use ridesharing?

To investigate the framing of compatibility two explanations of ridesharing will be made (a compatible and an incompatible frame). Depending on the frame, certain aspects will be presented or not, such as introducing ridesharing as a new version of carpooling and telling that it is comparable with a taxi-service, but cheaper.

Hypothesis 1: In line with the theory to use compatibility to increase the rate of adoption of innovation (Rogers, 2003), framing ridesharing applications as being compatible with common uses of travelling will lead to a higher behavioral intention to use ridesharing.

Furthermore, the current study will also explore the role of a user's environmental values and beliefs on ridesharing intention. Bouman, Steg and Kiers (2018) found that biospheric or environmental values and beliefs are an indication of a pro-environmental personal norm. Biospheric values are defined as "a concern for the environment itself, without a clear link to human beings" (Bouman et al., 2018, p. 2). As mentioned before, personal norm was found to be of influence on carpooling intention (Bachmann et al., 2018). Therefore, the current research will also study whether a pro-environmental personal norm

increases ridesharing intention, since ridesharing can be seen as a pro-environmental behavior:

Research question 2 (RQ2): Is there an effect of environmental values and beliefs on the acceptation and behavioural intention to use ridesharing?

Hypothesis 2: Bachmann et al. (2018) found that personal norm was of influence on ridesharing intention. Since the goals of ridesharing include reducing air pollution and to help in stopping global warming, it could be expected that people with higher environmental values and beliefs will have a higher influence to do ridesharing.

People with a higher initial intention might be less strongly influenced by the compatibility framing because their intention cannot increase as much, which leads to the third research question.

Research question 3 (RQ3): Is there a moderating effect of environmental values and beliefs on the effectiveness of framing ridesharing applications in a more compatible way on acceptation and behavioural intention to use ridesharing?

Hypothesis RQ3: A moderating effect of environmental values and beliefs on the compatibility framing is expected. Bachmann et al. (2018) found that personal norm is an important predictor for one's behavioural intention to use ridesharing. Pro-environmental values and beliefs will translate into a personal norm, which may lead to a higher initial behavioural intention to use ridesharing, due to which the effect of compatibility is smaller.

Method

Research Design

The study consisted of a between groups experimental survey (framing as a compatible vs. an incompatible application) with compatibility as independent variable and

behavioral intention to use ridesharing as dependent variable in order to answer the first research question. The effect of environmental values on the behavioral intention and the moderating effect of environmental values on the effect of the compatibility framing on ridesharing intention were measured (see Figure 2) in order to answer the second and third research question.

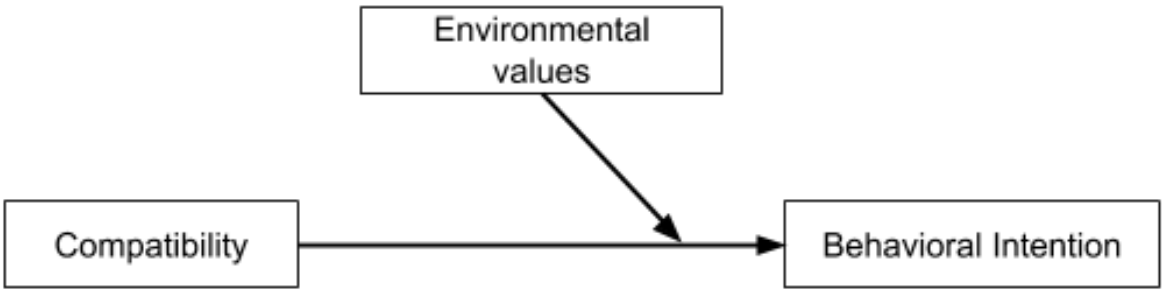

Figure 2. Representation of the model of the moderating effect of environmental values on the effect of compatibility on behavioral intention.

Participants

Participants were recruited through the online panel PanelClix (http://www.panelclix.nl/). Only participants from the Netherlands of 18 years and older, who owned a driver's license and a car were included. Two hundred and sixteen participants completed the survey (120 male, 95 female and one other/unspecified participant, age ranges from 19 to 83, with M = 44.0 and SD = 14.7). Twelve participants filled in the survey in less than three minutes, which was considered unrealistic to fill it in seriously. For this reason, these participants were excluded from the data. Without these participants there were 102 participants in each condition (115 male, 88 female and one unspecified, M = 44.5 years, SD = 14.9 years).

Materials

This part describes the compatibility manipulation, as well as the measurements of ridesharing intention, environmental values and some exploratory and confirmatory questions.

The entire survey was in Dutch, therefore examples of questions and sentences in the survey are literal translations from Dutch to English. The survey has been created in Limesurvey (http://www.limesurvey.org/).

The compatibility framing was as follows, in both conditions participants got a similar explanation of ridesharing, except for some changes. This was in order to make the compatible condition more compatible with previously introduced ideas than the incompatible condition. The original Dutch version of both scenarios can be found in Appendix A. The main difference between the two conditions was that the compatible condition focussed on the similarity between the for most people familiar concept of carpooling and the relatively new concept of ridesharing. The incompatible condition focussed on the novelty of ridesharing and avoided the more traditional view of carpooling, such as sharing a ride with colleagues, friends or acquaintances and the word 'carpooling' itself. The compatible condition also mentioned that it looks like a taxi service in which the costs are split equally. The incompatible condition adds that it could eventually lead to stop owning a car. Also the titles 'Ridesharing: The new carpooling' and 'Ridesharing: Your future in mobility?' were made compatible and incompatible, respectively, just like the picture that accompanied the conditions (see Appendix A).

To answer the research questions the behavioral intention to do ridesharing was needed. To test the behavioral intention to do ridesharing, six questions were posed. These questions are adjusted versions of behavioral intention measures used by Amirkiaee and Evangelopoulos (2018) and Bachmann et al. (2018). Half of the questions inquired about the intention to do ridesharing in one's own car (e.g., 'I would say yes to sharing a ride in MY CAR.'), the other half inquired about the intention to do ridesharing in someone else's car (e.g., 'I have the intention to use a ride IN SOMEONE ELSE'S CAR, if this is not too complicated for me.'). A principal component analysis (PCA) suggested that all six questions

loaded onto only one common factor, that is, intention. Therefore, we were able to create a reliable (Cronbach's alpha = .94) measure for intention by averaging these six questions.

Next to this, environmental values were measured using the environmental portrait value questionnaire (E-PVQ; Bouman et al., 2018). Bouman et al. (2018) found that biospheric values are related to pro-environmental personal norms. The E-PVQ consists of 17 questions which were used to measure four human values: biospheric, altruistic, egoistic and hedonic values. The questions asked people to rate how much the described person is like you on a scale from 1 ('totally not like you') to 7 ('totally like you'). The questions are gender matched which means that male participants were asked to rate 'him' and female participants rated 'her' (e.g. 'It is important to [him/her] to be in unity with nature.'). The 17 questions were presented to the participants in a random order.

As expected, when running a factor analysis on our data, this results in a best fit for four factors (eigenvalue = 0.69), which corresponds to the original four values (biospheric, altruistic, hedonic and egoistic). Even though based on these eigenvalue three factors would make more sense, four factors were chosen since the factor loadings are better for four factors. As a result of this factor analysis, four corresponding variables were created. When testing the hypotheses, the biospheric value was used as the measure for environmental values and beliefs.

Additionally, for exploratory purposes, prior experience with and prior knowledge about ridesharing was asked using some self-constructed variables. The survey inquired about ridesharing services that people knew and/or used before and about prior experiences with strangers in the car. Some of these answers were of a qualitative nature and therefore no numbers were attached to the frequency of these answers.

As a manipulation check, the participants were asked how much the described technology looks like carpooling. It was expected that the more compatible condition will be perceived as more similar to carpooling than the less compatible condition. However, results provided no evidence that participants who have been presented with a *compatible* framing of ridesharing applications evaluated the applications as more compatible (M = 5.10, SD = 1.20) than participants who had been represented with an *incompatible* framing of ridesharing applications (M = 4.93, SD = 1.41), $t(202) = 0.91$, $p = .182$. Still, the analyses were done as if the conditions were different. The discussion section will return to possible reasons for why this manipulation check did not work.

Procedure

After the participant clicked the link from PanelClix they would first get the participant information and needed to give informed consent before taking part. After this, participants randomly received one of two versions of the survey (compatible vs. incompatible). First of all, age and gender were asked (to define whether the male or female version of the E-PVQ is required). On the next page ridesharing was explained, either framed as compatible or as incompatible to previously introduced ideas. Directly after this part, the questions asking for the behavioral intention to use ridesharing were asked. This was followed by the E-PVQ on the next page and another page asked about prior knowledge and experience with ridesharing. On the final page, participants were asked how much ridesharing looks like carpooling, after which they were directed back to PanelClix. After completion, participants received a compensation of 75 Clix in their PanelClix account. These Clix can be transferred to money.

Analyses

The first research question is answered by testing whether the intention to use ridesharing is statistically higher for the compatible than for the incompatible condition using

a Wilcoxon rank-sum test. For the second research question the existence of a statistically significant correlation between biospheric values and ridesharing intention answered the question. A regression analysis answered whether a moderating effect of biospheric values on the effect of compatibility on ridesharing intention exists.

Results

The results section will first give the results for the three research questions. This is followed by a section of exploratory results.

Effect of compatibility on ridesharing intention. The first hypothesis stated that framing ridesharing as more compatible would result in a higher intention to use ridesharing than a less compatible framework. The data showed that ridesharing intention was not normally distributed, due to an overrepresentation of the value 1 (‘definitely no intention’, see Figure 3). Therefore, a non-parametric Wilcoxon rank-sum test had to be performed. Confirming our hypothesis (H1), results showed that participants who were given a more compatible framework had a stronger intention to use ridesharing (Mdn = 3) than participants who had a less compatible framework (Mdn = 2.58), as indicated by a one-sided Wilcoxon rank-sum test, $Z = 2.13$, $p = .017$, $r = .15$.

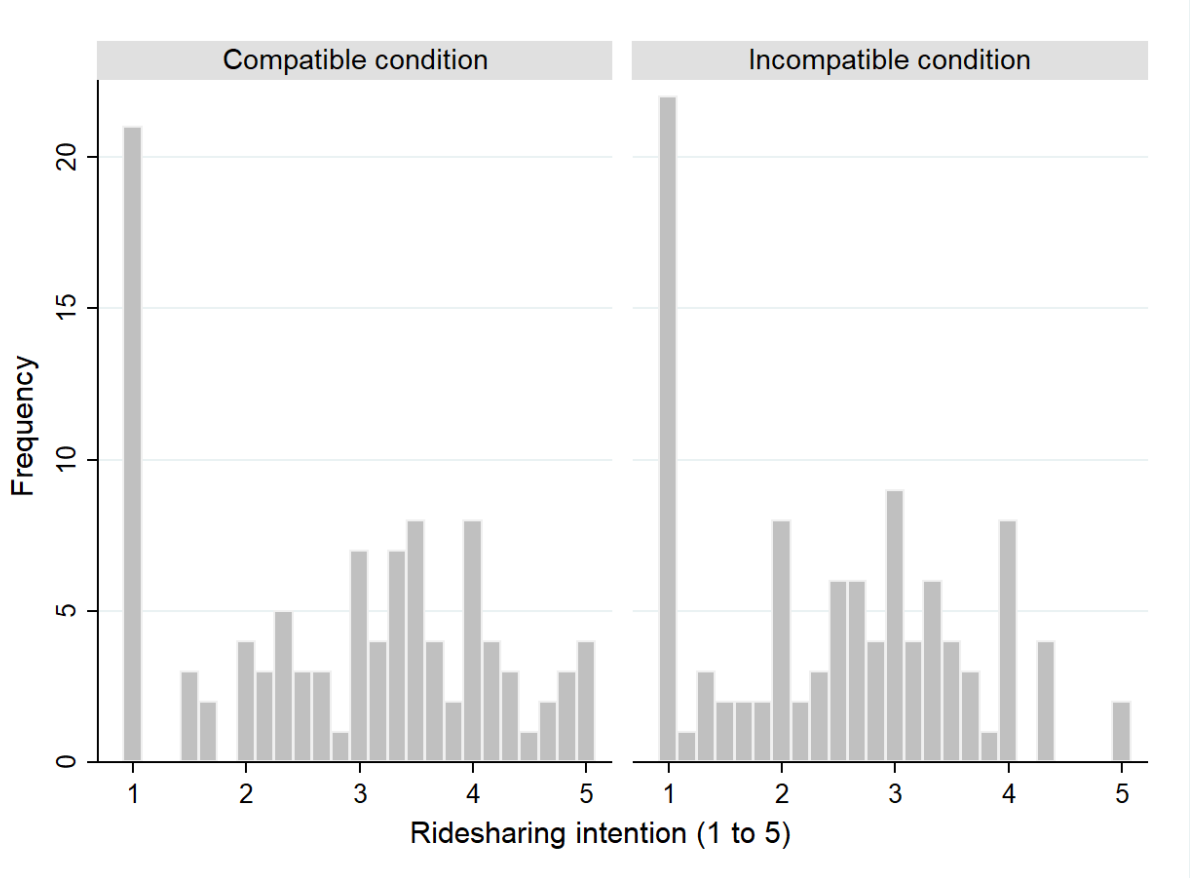

Figure 3. Ridesharing intention in the compatible and incompatible condition.

Effect of pro-environmental values on ridesharing intention. For the second hypothesis, an effect of biospheric values (M = 5.22, SD = 1.23) on ridesharing intention was expected. Confirming the second hypothesis results showed that people with higher biospheric values had a higher acceptance and behavioural intention to use ridesharing, $r(204) = .37$, $p < .001$. The data of both variables were not normally distributed, but the best fitting line seemed to fit the cloud of data points, which is somewhat funnel shaped (see Figure 4). The funnel showed us that people with higher biospheric values could either have the intention to do ridesharing or not, whereas people with low biospheric values were less likely to have the intention to engage in ridesharing.

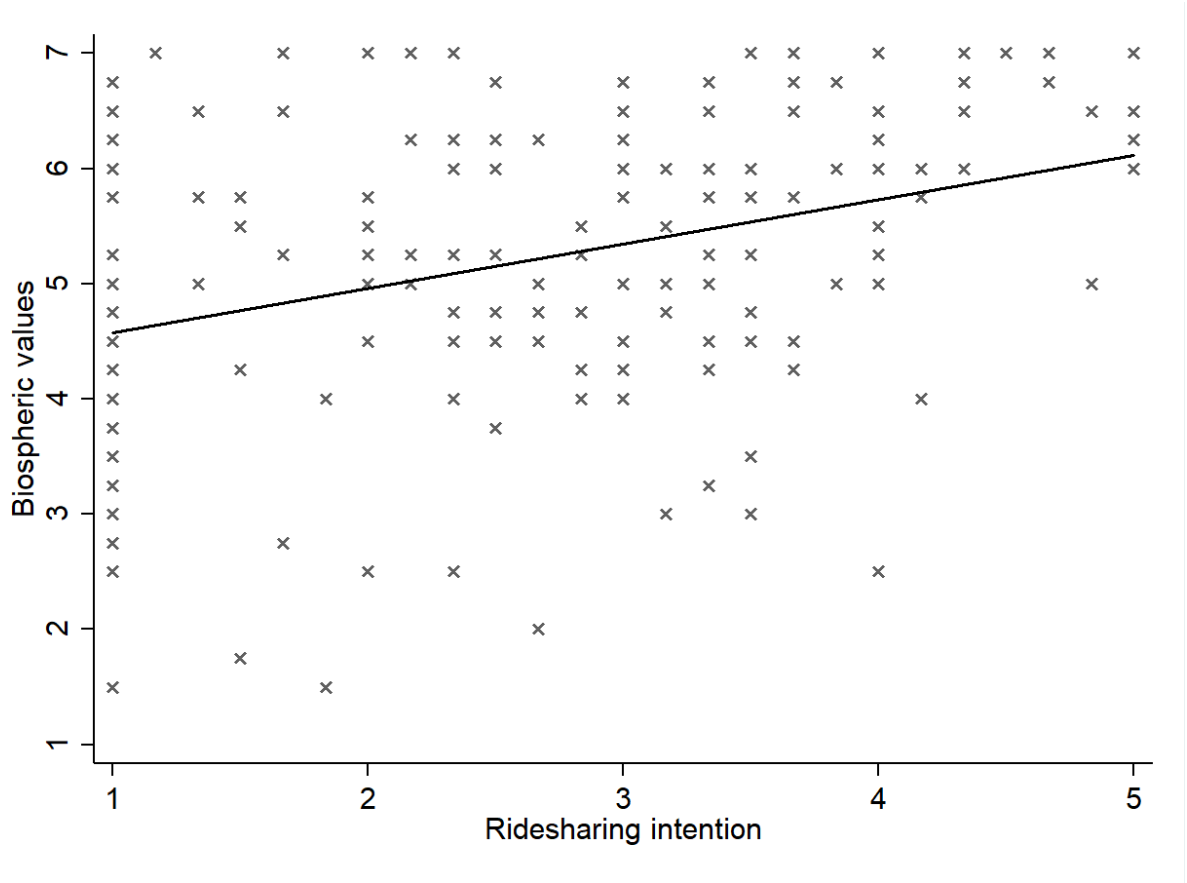

Figure 4. Ridesharing intention plotted against biospheric values.

Moderating effect of biospheric values on the effect of compatibility on ridesharing intention. Hypothesis 3 stated that a moderating effect of environmental values and beliefs on the effect of compatibility framing on intention would be expected. Running a multiple regression analysis with the compatibility manipulation, biospheric values and the interaction effect between the two as independent variables and the behavioral intention to use ridesharing as the dependent variable gave the following results ($F(3, 200) = 12.56$, $R^2 = .159$). Significant effects on ridesharing intention were found for compatibility ($t = -2.11$, $p = .036$) and biospheric values ($t = 4.03$, $p < .001$). The interaction effect between compatibility and biospheric values did not show a significant effect, $t = -0.14$, $p = .886$.

Exploratory results. Furthermore, results showed that there are some more factors in the data that showed a significant effect on ridesharing intention. A regression analysis with

compatibility, biospheric values, age, gender and being familiar with ridesharing services ($F(5, 198) = 14.26$, $R^2 = .265$) showed that age ($t = -2.37$, $p = .019$), gender ($t = -2.77$, $p = .006$) and knowing at least one ridesharing service ($t = 3.17$, $p = .002$) were significantly related to ridesharing intention. Compatibility was not a significant predictor ($t = -1.39$, $p = .165$) of ridesharing intention anymore when these other factors had been added. Also in this case biospheric values were a strong predictor of ridesharing intention ($t = 5.46$, $p < .001$).

Also, the E-PVQ values were interesting to report. Hedonic values scored the highest ($M = 5.87$, $SD = 0.83$), followed by altruistic ($M = 5.65$, $SD = 0.97$) and biospheric values ($M = 5.22$, $SD = 1.23$). Egoistic values scored the lowest ($M = 3.82$, $SD = 1.19$). This order was different from the findings of Bouman and Steg (2019) who recently found that in the Netherlands the altruistic values were the highest, closely followed by biospheric values. The hedonic values scored average and egoistic values scored the lowest. The most interesting result was the dissimilarity of hedonic values.

The survey asked ‘Did you ever take people in your car, who you didn’t know before?’. The majority of 70.1 percent answered ‘No’. An open question asked this group why they never took someone in their car. However, the most often mentioned reason was that the situation in which someone needed a ride did not occur. This reason neither said that a ride would be offered nor rejected. In line with this, a big majority of 77.9 percent reported not to know any ridesharing service. These results proofed that many people never got into contact with ridesharing, meaning that there is potential for growth. The other most often mentioned reasons for not taking a stranger in one’s car were trust and safety concerns, followed by a loss of privacy. Some people even stated that the current society is too dangerous to take strangers in your car. These results showed that psychological reasons, such as trust, safety perception and privacy, are the most prevalent challenge for ridesharing.

In the next section the results will be discussed, and interpreted and where possible conclusions will be drawn.

Discussion

To answer whether ridesharing intention was influenced by perceived compatibility, the current research manipulated compatibility by randomly allocating participants to a compatible or incompatible framing. The E-PVQ measured biospheric values in order to answer whether pro-environmental values resulted in a higher ridesharing intention. This section starts with the interpretation of the results, followed by limitations and suggestions for future research and ends with conclusions and implementation of the work.

Interpretation

Compatibility increases ridesharing intention. The results of the current study supported the first hypothesis that framing ridesharing as more compatible with previously introduced ideas results in a higher behavioral intention to use ridesharing, which is in line with Rogers (2003). This could be used when trying to convince people to start using ridesharing. Following these results, it would be better to frame ridesharing as an improved version of carpooling, instead of introducing it as a new idea.

Manipulating compatibility increases acceptance of innovation. To our knowledge, the current results are the first that provided evidence that a manipulation of the compatibility of an innovation with characteristics of an earlier, already known innovation leads to increased acceptance of that new innovation. Different from earlier research that presented only correlational evidence for this relationship between compatibility and acceptance (Al-Jabri & Sohail, 2012; Chen, Gillenson & Sherrell, 2004), the current research provided evidence for the causality. This is support for Rogers (2003) theory of the influence of the attributes of innovation, including compatibility, on the rate of adoption.

Pro-environmental values relate to ridesharing intention. The second hypothesis was supported by the data. When someone holds stronger biospheric values this person will be more likely to have the behavioral intention to act in a more pro-environmental way. This is in line with the relation between personal norms (in this case pro-environmental norms) and ridesharing intention, which was found by Bachmann et al. (2018). Generally, the intention to do ridesharing is significantly higher for people with stronger biospheric values. Important to notice is that people who score high on biospheric values do not necessarily have an increased ridesharing intention. Many reasons could be thought of that keep the ridesharing intention low. This could for example be caused by similar reasons as the results why people did not take strangers in their car yet, such as a lack of trust, safety concerns and a loss of privacy in the car.

Moderating effect of biospheric values not found. A moderating effect of biospheric values on the compatibility condition is not present. The data does not support a significant effect of biospheric values on the effect of compatibility on behavioral intention. Therefore, it seems that participants with stronger biospheric values are just as much influenced by the framing of the applications as participants holding lower biospheric values.

Other findings. Many participants (21.1 percent) reported to have definitely no intention to do ridesharing in any way. This group is least likely to adopt ridesharing and should probably be considered uninteresting in this starting phase of ridesharing. Also, about forty percent of the participants had at least a slightly above neutral intention to do ridesharing. This group should be taken into account as the possible early adopters and early majority, who are needed to reach the critical mass to make ridesharing self-existing.

Age, gender and familiarity with ridesharing services showed to be correlated with ridesharing intention. Younger people and men have a higher intention to engage in ridesharing than older people and women. Younger people could probably have a higher

ridesharing intention, since they might be more used to using smartphone applications and will probably be more adventurous than older people. The lower ridesharing intention for women could be caused by higher feelings of unsafety (Sarriera et al., 2017). People who knew at least one ridesharing service before taking part in the survey showed a higher intention to use ridesharing. This could be explained by the same theory on compatibility (Rogers, 2003) which was used before. For the people who are familiar with a ridesharing service, ridesharing is compatible with a previously introduced idea, namely the ridesharing service they are familiar with.

Contradictory to findings in previous research (Bouman & Steg, 2019), in the current study the hedonic values score the highest of the four values. Hedonic values are joy and pleasure related values. There is a strong confounding factor which might cause this abnormality. The data of this study was collected from the 10th until the 15th of April 2020, which corresponds to the peak of the corona crisis in the Netherlands (allecijfers.nl, 2020). During this period people had to stay inside their home as much as possible and real-life social contacts had to be kept to a minimum. This means that most joy and pleasure related activities outside the house, such as most sports, going to a bar or restaurant and a lot of hobbies were forbidden. From our own experiences, many people had to get used to being at home all day and they were a bit bored sometimes. This lack of joy and pleasurable activities could have led to a temporal increase of hedonic values.

Limitations

The manipulation check in which the question whether the scenario looked like carpooling was posed, did not distinguish between the two conditions. A possible explanation could be that this question is not asking for the right thing. It could be that naming the word *carpooling* in the control question of the incompatible condition (in this condition the word *carpooling* was avoided) makes people realize that it indeed looks like carpooling. More

fundamentally, the question whether the framing is compatible, is more about the feeling (or attitude) that people get, based on the posed story. In which the newer more modern scenario, might invoke less familiar feelings than the compatible scenario. In future comparable research the manipulation check should be done differently.

As was mentioned before, the data of this study was collected during the peak of the corona crisis in the Netherlands in April 2020 (allecijfers.nl, 2020), in which social contacts had to be kept to an absolute minimum. Therefore, ridesharing, although not explicitly forbidden, was not allowed at the time of data collection. Although during the survey people might have imagined ridesharing in a time before corona, it is recommended to validate the data when the corona crisis is over and when mobility levels are back to what is considered normal, in order to confirm if the corona crisis influenced the results. At the time being we do not know yet whether the corona crisis brought permanent changes to the field of mobility and if we ever get back to 'normal' mobility levels.

Future Research

The focus of the current study is on framing compatibility, which is one of the five perceived attributes of innovation that were defined by Rogers (2003). It could be interesting to investigate whether the other attributes of innovation (relative advantage, complexity, trialability and observability) could also be framed in such a way that they increase ridesharing intention. When more of these attributes could successfully be framed, it could significantly contribute to the acceptation of ridesharing.

The idea of the current study was to keep the text in the compatible and incompatible framing as much the same as possible, except for the compatibility. What could be interesting for further research is whether the impact of both scenarios on one's routine and traffic use is perceived equally. In case one of the two scenarios is perceived as more costly (in units of time, effort or money) this could influence the behavioral intention to use this mode.

Possible advantages of ridesharing are saving money, having social interaction, reduction of GHG and reduction of traffic congestion. However, different people might not give these advantages the same value. Maybe the advantages that a ridesharing application shows to people could be based on a person's values (for example the E-PVQ values). It could be that a person who scores high on egocentric values will be more likely to do ridesharing when this person is presented with more egocentric advantages of ridesharing such as saving money, saving time and having time to work instead of driving, whereas a person who scores higher on biospheric values might be more interested in environmental savings. Therefore, personalized recommendation stories for ridesharing could be an interesting topic for future research.

Conclusion and implementation

Knowing that a more compatible framing results in a higher behavioral intention to use ridesharing will be useful for the implementation of ridesharing applications. Creators and direct supporters of these applications will often be enthusiastic and progressive thinkers, who are big fans of innovations. However, the information that must be brought to potential customers should be more traditional and compatible with customers uses and knowledge in order to get them involved in ridesharing.

In conclusion, when the right information (e.g., framed in a compatible way), is brought to the right people (e.g., people with strong biospheric values) and the ridesharing service works properly (e.g., a dense network, with a reliable and safe service), it has the potential to grow and reach the critical mass to become self-existing. From this point it might grow and become widely adopted. Only then it has the potential to significantly reduce the amount of cars on the road, which will lead to a reduction of the emission of polluting greenhouse gasses and a reduction of traffic congestion.

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Appendix A: Scenarios

Two screenshots of the Dutch versions of the scenarios are given in this appendix. The screenshots are an exact representation of how the participants saw the scenario. Figure A1 represents the scenario of the compatible condition and Figure A2 represents the scenario of the incompatible condition.

Figure A1. The scenario of the compatible condition (in Dutch).

Figure A2. The scenario of the incompatible condition (in Dutch).