

## Research Article

# Analysis of Perceived Value and Travelers' Behavioral Intention to Adopt Ride-Hailing Services: Case of Nanjing, China

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This study explored travelers' behavioral intention to adopt ride-hailing services. With regard to perceived value, several factors related to perceived benefit and perceived sacrifice were considered. Moreover, subjective norm and perceived policy support were further introduced into the concept model. After the construction of the concept model, an empirical analysis was put forward to test the hypotheses proposed. In addition, the effect of sociodemographic factors and usage frequency was further investigated. The empirical analysis was based on a survey that put forward in Nanjing, China. The results demonstrate that perceived value is positively related to behavioral intention. And factors of perceived benefit are related to perceived value positively, while factors of perceived sacrifice have a negative effect on perceived value.

## 1. Introduction

In 2017, DiDi announced that its number of orders is 7.43 billion, which shown that ride-hailing services have been one of the most important travel modes in China. The popularity of ride-hailing services is based on the rapid development of mobile Internet technology. What is more, ride-hailing services also related to the development of vehicle technology and energy consumption [1, 2]. Ride-hailing platforms have provided new travel options to urban residents, and the role in urban transport is becoming more and more critical [3, 4]. In China, the new travel options that ride-hailing platforms offer include fast-ride, tailored-ride, and carpool [5]. Among them, fast-ride is cheaper and the quality or brand of car is standard. As for tailored-ride, the quality or brand of car is better and the price is higher. For carpool, the quality or brand of car is similar to fast-ride, but the price level is cheaper than fast-ride. Moreover, the target consumers of these travel options vary a lot. For fast-ride, the target consumers are typical travelers who pursue similar travel experience as a taxi. And the target consumers of tailored-ride mainly are business travelers. The target

consumers of carpool are travelers who willing to share a car with others. Similarly, Uber has also provided differentiated options that targeted on different traveler's groups, such as UberX, UberBlack, and UberVan.

People's travel behavior is gradually changing with the promotion of such new travel options facilitated by ride-hailing platforms. In assessing the potential of ride-hailing services for these travelers, behavioral intention toward ride-hailing provides a vital direction [6, 7]. What is more, methods of behavioral intention analysis have been introduced into the study of transportation services [8, 9]. And such purposes indicate future behavior and adoption rates of ride-hailing services. Also, it will be helpful for both ride-hailing platforms and government or transportation management organizations to understand travelers' behavioral intention of using ride-hailing services. For example, ride-hailing platforms may provide better service and yield more profit, while government or transportation management organizations can put forward more effective policies.

Most studies to date have focused on travelers' intention to adopt ride-hailing based on factors such as price, safety, convenience, and access, which have a significant effect on

the travelers' choice behavior [3, 10–12]. What is more, feelings related to travel plays an important role on the adoption of specific travel services [13]. In addition, more specific factors have been investigated as well, for example, social norm [14], environmental concern [15], performance and effort expectancy on ride-hailing services [16], and trust [17]. Besides, social influence has a direct effect on users' behavioral intention [18]. It shows that behavior of ride-hailing travelers was studied with the consideration of various factors. However, to our best knowledge, little research has been done from viewpoint of perceived value and the attention of social influence and perceived policy support can be strengthened.

Unlike current studies, this research is mainly studied based on the research of perceived value to reflect travelers' behavior more accurately. The definition of perceived value is "consumer's overall assessment of the utility of a product based on the perception of what is received and what it is given" [19]. Perceived value mainly focuses on people's judgment on a specific product or service especially from the aspects of benefit and sacrifice, which has shown to be an effective method in the research of consumer behavior. Since perceived benefit and perceived sacrifice can embody travelers' perceived value comprehensively, it can be helpful to understand travelers' intention to adopt ride-hailing services by considering it from two aspects, i.e., perceived benefit and perceived sacrifice. Hence, it is important to study travelers' behavior intention of ride-hailing services based on perceived value. Further, the effect of social influence and perceived policy support can be considered more comprehensively. As a result of the rapid growth of social media in recent days, people are easier to be influenced by social factors than before. And their perception of policy support toward ride-hailing also plays a vital role in traveler's decision behavior. Moreover, the policy support discussed in this study is the measure taken by the government that intends to improve the development of ride-hailing industry. For example, in 2016, the Chinese government has promoted several policies to build healthier ride-hailing market and provide better services for travelers. Therefore, it is necessary to consider factors of social influence and perceived policy support into the study of ride-hailing.

This research aims to examine travelers' behavioral intention of ride-hailing services. (1) What is the effect of perceived value on the travelers' behavioral intention? (2) What are the factors included in perceived benefit or perceived sacrifice and their relationship with perceived value? (3) What is the relationship between social factors and perceived value, travelers' behavioral intention? (4) What is the effect of perceived policy support on travelers' behavioral intention?

The paper is organized as follows. The literature review is presented in the second section. In Section 3, the research model is constructed and hypotheses are proposed. Then data and research methods are described in Section 4. In Section 5, the empirical results are presented. Then, the discussion is put forward in Section 6. Finally, conclusion and future research directions are discussed in Section 7.

## 2. Literature Review

The literature related to this paper mainly consists of two parts, i.e., (1) behavior of ride-hailing travelers and (2) perceived value and behavioral intention.

*2.1. Behavioral Intention of Ride-Hailing Services.* With the expansion of ride-hailing services, the travel behavior of urban residents has changed. Currently, issues of ride-hailing services have been discussed in kinds of literature. Among them, travelers' behavioral intention of ride-hailing services was studied.

The effect of sociodemographic characteristic and attitude of ride-hailing users were explored. By referring to current research, the users tend to be younger, well-educated, and do not own a vehicle [3, 10–12]. Since ride-hailing is a new emerging service, some travelers may still not familiar and even not ever used them. Based on a survey of 15 metropolitan statistical areas in the United States, Dawes [10] showed that 28% of the respondents have never used Uber and the attitude toward ride-hailing services varies a lot among different groups. Nielsen [20] investigated users' negative and positive perceptions of ridesharing. Among them, availability, safety, and social awkwardness are negative perceptions, and positive perceptions include cost saving, flexibility, and social demand fulfillment. What is more, existing literature shows that both sociodemographic factors and attitudinal factors are also essential in the adoption of ride-hailing services.

The reasons for the adoption of ride-hailing services can further be illustrated from different sides. From the side of travel itself, less cost, shorter waiting time, parking problem, and car ownership are account for the adoption behavior [3, 12, 21]. From the side of nontravel reasons, avoid driving under the influence of alcohol may be one of the top reasons for ride-hailing adoption [3, 12]. Moreover, factors of environmental protection, energy consumption, and habit also contribute to the adoption of ride-hailing services [15, 16]. For example, travelers' acceptance of ride-hailing services is positively related to their habit [16].

The effect of latent variables was examined. Typically, it has shown that perceived ease of use and perceived usefulness related to behavioral intention or adoption of ride-hailing services positively [14, 17, 22]. But the effect of subjective norm varies in different research. In most research, the impact of subjective norm or social factors on consumers' behavioral intention is positive, which means usage behavior or positive opinion of friends, colleagues, and family members may increase consumers' behavioral intention [14, 16]. However, Septiani et al. [17] found that subjective norm plays a negative role in behavioral intention. Nevertheless, both results showed that people's behavior is influenced by social factors significantly and has been a critical factor of the study on consumer behavior.

As for the research methods in the current study, the model was built based on the combination of different theories to examine the relationship between behavioral intention of ride-hailing services and particular variables

[14, 16, 17, 21, 22]. For example, technology acceptance model, theory of planned behavior, diffusion of innovation theory, and unified theory of acceptance and use of technology 2. In these studies, the structural equation model and regression models were constructed and several latent variables were considered. In Table 1, the theory and variables in current studies are summarized.

In more detailed level, the research theories are introduced to reflect features of ride-hailing services from specific aspect. Ride-hailing is a new travel service based on advanced mobile Internet technology, which means the technology acceptance model or unified theory of acceptance and use of technology 2 can be considered to study travelers' adoption behavior. And it has shown that TAM and UTAUT2 are effective tools to explain ride-hailing adoption behavior [14, 17, 23, 24]. Further, travelers' adoption behavior of ride-hailing services may change as there are many other transportation modes, and hence the theory of planned behavior could be introduced [17]. Comparing with traditional travel modes, ride-hailing services are innovative modes, for example, advanced match technology and new economic style. Then, travelers' adoption behavior can be explained by diffusion of innovation theory as well. In summary, the theories considered in extant research are different and each of them focused on specific aspect of ride-hailing service adoption behavior.

Based on several theories of consumer behavior, travelers' behavioral intention on the adoption of ride-hailing services was studied. Then, the effect of factors related to travelers' behavior can be further investigated. Also, most of the factors considered in existing literature are the positive side of ride-hailing usage. To avoid this shortage, Wang et al. [23] extended technology acceptance model by introducing perceived risk to represent the negative aspect of ride-hailing services. However, in most studies, the negative effect of ride-hailing services was neglected.

**2.2. Perceived Value and Behavioral Intention.** It has added value to study travelers' behavioral intention of ride-hailing services with view of perceived value. The concept of perceived value has been introduced into plenty of research to reveal the mechanism of consumers' decision behavior. As mentioned above, a widely cited and more general definition was given by Zeithaml [19] from gain and loss. Generally, the study of perceived value is intended to explain the idea behind these factors and form a theoretical viewpoint.

The model construction of perceived value is the foundation for further research. In the current study, it can be concluded that perceived value contains various factors. And such factors can mainly be classified into the instrumental function, self-emotional function, and social function [25–27]. Based on the classification of perceived value, hypotheses on the relationship between perceived value and behavioral intention are carried out. And the utilitarian effect, hedonic effect, and social effect of perceived value are further examined.

In summary, consideration of dimensions in extant research can embody perceived value in a more detailed

TABLE 1: Summary of theories.

Theory	Key variables	Literature
TAM, TPB, DOI	Perceived ease of use Perceived usefulness Perceived enjoyment Subjective norm Trust	Septiani et al. [17]
TAM, TPB	Perceived usefulness Perceived ease of use Subjective norm Attitude	Giang et al. [14]
TAM	Perceived behavior control Perceived safety Perceived price Perceived convenience Perceived accessibility Perceived expectancy Effort expectancy Social influence	Mohamad et al. [22]
UTAUT2	Facilitating conditions Hedonic motivation Price value Habit	Chen et al. [16]
Extended TAM	Perceived ease of use Perceived usefulness Perceived risk Personal innovativeness Environmental awareness	Wang et al. [23]

level, but the perceived value was mainly studied from positive side through this method. This may lead to the problem that some features of perceived value remain unexplored, and then factors which consumer cares and the process of decision-making may not be described well enough. To avoid this drawback, perceived value can further be studied from view of perceived benefit and perceived sacrifice. Then, the positive effect and negative effect of perceived value are introduced and their relationship with behavioral intention is further assumed [28–30].

Based on the construction of perceived value, the effect of perceived value on behavioral intention can be examined. Generally, perceived value has positive effect on behavioral intention, and this conclusion has been verified in different industries, for example, wearable device [29], mobile Internet technology [26, 28], tourism [25], shopping mall [27], and green products [30]. As for perceived benefit and perceived sacrifice, it can be concluded from extant studies that perceived benefit is positively related to perceived value and perceived sacrifice is negatively related to perceived value [28–30].

### 3. Research Model and Hypotheses

Based on the literature mentioned and characteristics of ride-hailing services, the research model is built as is shown in Figure 1. This concept model is built to investigate the effect of related factors on travelers' behavioral intention of ride-hailing services adoption. In particular, the perceived value consists of two parts, i.e., perceived benefit and

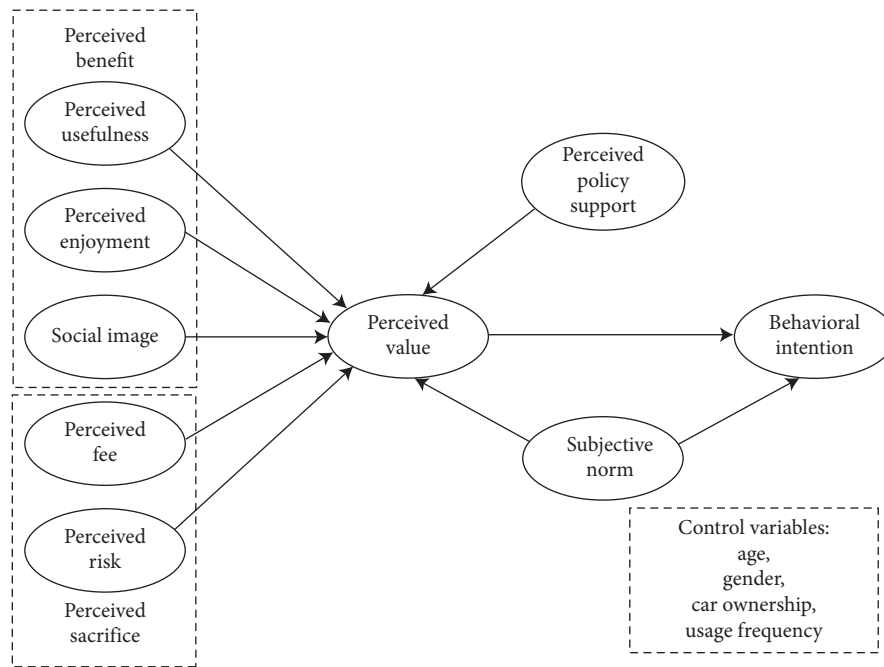


FIGURE 1: Research model.

perceived sacrifice. Moreover, perceived policy support and social norm are considered in this model as well. Besides, four control variables are further introduced, i.e., age, gender, car ownership, and usage frequency of ride-hailing services.

**3.1. Perceived Value and Behavioral Intention.** According to the definition of perceived value, travelers will evaluate both sides to form their behavioral intention to adopt ride-hailing services. Their perceived value is positive when evaluation value of the benefit is more excellent than sacrifice, and then the behavioral intention may form. As a result, travelers will choose whether to use ride-hailing services. Extant research has shown perceived value has a positive effect on behavioral intention [28, 29]. Therefore, the hypothesis can be depicted as follows.

*H1.* The perceived value of ride-hailing services will positively affect travelers' behavioral intention.

**3.2. Perceived Benefit.** According to extant research, the factors related to a customer's behavioral intention mainly consist of utilitarian, hedonic, and social effects. Utilitarian effect is the basic function the product or service provides. Also, hedonic effect is an internal effect which can reflect a customer's self-emotion or enjoyment. What is more, external factors may stem from the social network that customers belong, i.e., social effect. In this paper, perceived benefit is constituted by perceived usefulness, perceived enjoyment, and social image.

**3.2.1. Perceived Usefulness.** Perceived usefulness is defined as "the extent to which a person believes that using one specific product or service will enhance his or her job

performance" [31]. Perceived usefulness has been introduced into many research studies that focus on IT or new product adoption. Venkatesh and Bala [32] found that perceived usefulness has a strong and positive effect. However, in most research, it implies that perceived usefulness has an indirect and positive impact on behavioral intention [28, 29, 33].

The usefulness or utilitarian effect is the primary function of ride-hailing services, and travelers' original purpose of adopting ride-hailing services is to fulfill their travel demands. If travelers can get better travel experience from ride-hailing services, they may tend to have a better perception of such services [14]. In this paper, perceived usefulness is defined as the extent to which an individual believes using ride-hailing services will enhance his or her travel quality or even job performance. The usefulness can be specified as shorter waiting time, faster way to the destination, and lower cost [3]. Then, the hypothesis is proposed.

*H2.* The perceived usefulness of ride-hailing services will positively affect travelers' perceived value.

**3.2.2. Perceived Enjoyment.** Besides fundamental functions, the feeling or enjoyment consumers experienced also plays a vital role in the evaluation of product or service. Perceived enjoyment is defined as suggested by Venkatesh and Davis [34]. And the effect of this factor has been examined, which indicates that perceived enjoyment has a positive effect on perceived value [28, 29, 35].

This paper defines perceived enjoyment as the extent to which the adoption of ride-hailing services is enjoyable aside any other performance. Ride-hailing can be more comfortable and independent besides of utilitarian functions [20, 36]. What is more, Septiani et al. [17] found that



perceived enjoyment is one of the main factors that influence travelers' behavior. Therefore, the hypothesis can be described as follows.

*H3.* The perceived enjoyment of ride-hailing services will positively affect travelers' perceived value.

*3.2.3. Social Image.* Social image is defined as "the degree to which an individual perceives that use of innovation will enhance his or her status in his or her system" [37]. From many related pieces of research studies, it has shown that social image is a vital factor to consumers' decision behavior [38–42]. Nowadays, individuals tend to have more social interactions with their social network members. Moreover, the role of social image is further strengthened, especially on the behavioral intention of new emerged services.

In this paper, social image is the extent to which an individual thinks the adoption of ride-hailing services will enhance his or her social status. Social image has also been considered as one of the most important reasons for ride-hailing service adoption [10]. Sweeney and Soutar [43] identified the effect of social value (enhancement of social self-concept) on consumers' perceived value. Yang et al. [29] found that social image related to perceived value positively. Therefore, the hypothesis can be proposed as follows.

*H4.* The social image of ride-hailing services will positively affect travelers' perceived value.

*3.3. Perceived Sacrifice.* Perceived sacrifice includes not only monetary factors but also nonmonetary factors. On the monetary aspect, travelers need to pay a fee to have access to ride-hailing services, and their perception of the fee may vary with preference heterogeneity. On the nonmonetary aspect, there may be some potential risk of using ride-hailing services, such as accessibility risk, performance risk, and safety risk.

*3.3.1. Perceived Fee.* Travelers need to pay money to use ride-hailing services. The price charged by ride-hailing platforms includes two main forms, i.e., transaction fee and registration fee. On the context of ride-hailing services, perceived fee can be defined as the extent to which individual perceived on the fee he or she needs to pay for ride-hailing services. Besides, perceived fee can be studied as the monetary aspect of perceived sacrifice.

In many surveys, price or cost has been one of the most frequently mentioned factors [3, 12, 44]. It showed that travelers tend to make more travels using ride-hailing services if the price or cost is lower. Moreover, the relationship between perceived fee and perceived value has been examined in many research studies. It has been proposed that perceived fee has a negative effect on perceived value [28, 35, 45]. Therefore, the hypothesis can be proposed as follows.

*H5.* The perceived fee of ride-hailing services will affect travelers' perceived value negatively.

*3.3.2. Perceived Risk.* Accompany with adoption of ride-hailing services, travelers may experience risk related to such new transportation modes. Dowling and Staelin [46] defined perceived risk as customers' perception of uncertainty and adverse outcome of using the product or service. Moreover, perceived risk can be represented by various factors, such as risk being cheated, safety risk, social risk, and privacy risk [29, 35, 47, 48].

In the survey by Dawes [10], safety risk and performance risk (inconvenience, slow) are the main reasons against choosing ride-hailing services. Similarly, safety and performance were included in the research of Rayle et al. [3]. Moreover, availability, awkwardness, and social exclusion were considered as the negative reasons for nonadoption of ride-hailing services [20]. In this paper, the perceived risk of ride-hailing services consists of accessibility risk, performance risk, and safety risk. Therefore, the hypothesis can be given as follows.

*H6.* The perceived risk of ride-hailing services will negatively affect travelers' perceived value.

*3.4. Subjective Norm.* According to social influence theory, the process of people's attitude or behavioral change can be classified into three parts, i.e., compliance, identification, and internalization [38]. In the process of compliance, people's behavior will be affected by other members who belong to his or her social network. Usually, people have a demand to achieve a favorable reaction from others and suffer the pressure from his or her social network. This effect is also called subjective norm. Subjective norm is defined from the aspects of an individual's social network [34, 49].

The factor of subjective norm was considered in many research studies of consumer behavior. However, indirect effect of subjective norm has been rarely examined. This paper defines subjective norm as the extent to which a traveler perceived that most people who are important to him or her think he or she should or should not use ride-hailing services. Further, one of the reasons for ride-hailing service adoption is "my friends do it" [10]. On the one hand, the members of social network can influence the traveler's behavioral intention directly [32, 50, 51]. On another hand, the traveler's behavioral intention may be affected by subjective norm through perceived value indirectly. Therefore, two hypotheses can be given as follows.

*H7.* The subjective norm of ride-hailing services will positively affect travelers' perceived value.

*H8.* The subjective norm of ride-hailing services will positively affect travelers' behavioral intention.

*3.5. Perceived Policy Support.* As a new emerged transportation service, ride-hailing platforms have provided several cheaper and more convenient travel options to urban residents. But it has also generated some new problems worldwide, and then some political measures were put forward by governments [52–54]. However, little literature has studied the influence of perceived policy support on travelers' behavioral intention to adopt ride-hailing services.

According to a survey in the United States, it indicates that a significant proportion of urban residents hold the opinion that the government should regulate and form a partnership with Uber or Lyft [10]. If the government put forward policies to regulate the current ride-hailing market, then the price level may be more stable and fairer. In addition, more qualified drivers can provide better services if policies are taken. Finally, more travelers tend to adopt ride-hailing services. Therefore, the hypothesis can be described as follows.

*H9.* The perceived policy support of ride-hailing services will positively affect travelers' perceived value.

## 4. Data and Method

*4.1. Data Collection.* A survey was held from October to November 2017 in Nanjing City, China. Nanjing is a city located in the east of China and also the capital of Jiangsu Province. As one of the main cities in China, Nanjing has a square area of 6,587 km<sup>2</sup> and 8.27 million residents. The methods of stated preference surveys were applied into this study, which has shown an effective tool on study of emerging services [55]. The targeted respondents in this survey are the residents who live in Nanjing. Then, an online survey was designed for data collection. Moreover, a fraction of the data was collected offline to attract more respondents. With the development of Internet technology, online survey approach has become a popular method for data collection primarily when the product or service is operated based on Internet. In addition, current research has shown that the quality of online survey is similar to the offline survey [35, 56].

The survey includes sociodemographic information, daily travel information, and behavioral intention to adopt ride-hailing services. The items of the questionnaire were designed in English first and then be translated into the Chinese version. The questionnaires written in English and Chinese were compared and revised by authors and qualified translators. After then, the online survey was put forward and distributed through online forum and social media, for instance, WeChat, Weibo, QQ, etc. To attract more respondents, a bonus of 10 yuan with a probability of 20 percent was offered. Although most of the data were collected through an online method, part of data was also collected offline in the university campus and railway stations. Overall, a total of 503 samples are retained. Among them, 414 samples are valid for further analysis.

The detail information of items is presented in Table 2. The data were collected with a Likert 5-point scale that ranges from fully disagree (1) to fully agree (5).

*4.2. Descriptive Analysis.* Detailed information of descriptive statistics for sociodemographic characteristics of 414 valid respondents is listed in Table 3. Among the valid samples, 50.5% are men and 49.5% are women. Also, the slight skew toward male reflects the actual gender distribution in Nanjing. As for age distribution, the dominant part is 25–30 years old and the proportion is 53.4%. As regard to

education, more than 57.7% have higher education experience. Approximately 63% of the respondents do not have a car, but the proportion of the group that plans to buy a car is 16.7%. Notably, 56.5% of the sample is unmarried. On the view of income, the sample is divided into five groups, viz. 1500 yuan and below (21.0%), 1501–3500 yuan (13.8%), 3501–5000 yuan (15.2%), 5001–8000 yuan (25.1%), and 8001 and above (24.9%).

## 5. Empirical Results

*5.1. Reliability and Validity of Measurements.* According to results, items of PE4, PF1, PF2, and PR1 were deleted. Then, the means, factor loading, reliability, and validity of all items are summarized in Table 4. To test reliability, Cronbach's  $\alpha$  was conducted for given data. Then, the Kaiser-Meyer-Olkin (KMO) test and Bartlett's test were conducted to test the validity of related measurements. Moreover, factor loading and mean of each item were also examined.

In Table 4, the scales of Cronbach's  $\alpha$  range from 0.806 to 0.927, and the total scale is 0.920, which significantly exceeds the threshold of 0.7 that is set for further analysis [58]. The KMO value of all items surpasses 0.5, which indicates that the sample data have a good validity [59]. In addition, combining with the factor loading value and significant results of Bartlett's test, it also established the convergent validity of the sample data [60].

*5.2. Hypothesis Test.* To examine the effect of control variables, age, gender, car ownership, and usage frequency of ride-hailing services are introduced and coded as dummy variables, as shown in Table 5.

The confirmatory factor analysis was performed based on the Amos 23 software, and results are presented in Table 6 and Figure 2. Before results analysis, the goodness of model fit should be examined first. The fit indices include absolute indices (chi-square, GFI, AGFI, RMSEA, and NCP), incremental indices (NFI, RFI, IFI, TLI and CFI), and parsimonious fit indices (PGFI, PNFI, and Chisq/df). According to the most frequently reported indices that summarized by Zainudin [61], the indices of Chisq/df, RMSEA, GFI, PGFI, IFI, and CFI are introduced. The indices' value of theoretical framework indicates that fitness of basic model is acceptable, and the results in Table 6 and Figure 2 can further be analyzed (Chisq/df = 2.696, GFI = 0.822, PGFI = 0.693, IFI = 0.905, CFI = 0.905, PCFI = 0.806, RMSEA = 0.064).

Regarding the empirical results, most of the relationships hypothesized are supported except for perceived risk and perceived value (−0.017 NS). As shown in Table 6 and Figure 2, perceived value has a positive effect on behavioral intention significantly (0.487\*\*\*). Perceived usefulness, perceived enjoyment, and social image all show a positive effect on perceived value. In addition, the effect of perceived usefulness (0.272\*\*\*) and social image (0.202\*\*\*) on perceived value is slightly stronger than perceived enjoyment (0.120\*). As for perceived sacrifice, perceived fee has a significant and negative effect on perceived value (−0.143\*\*),

TABLE 2: Appendix: list of items.

Construct	Item	Code
Perceived usefulness [31, 32]	Ride-hailing is very useful to my daily travel in general	PU1
	Ride-hailing can enhance the effectiveness of my travel	PU2
	Ride-hailing can improve the quality of my daily travel	PU3
	Ride-hailing can save my time and efforts during travel	PU4
	Ride-hailing can save my money during travel	PU5
Perceived enjoyment [28, 32]	I find using ride-hailing service can be enjoyable	PE1
	The actual process of using ride-hailing service is pleasant	PE2
	I have fun using ride-hailing service	PE3
	Using ride-hailing bores me	PE4
Behavioral intention [31, 32]	I intend to take ride-hailing as my usual travel mode in the future	BI1
	I intend to use ride-hailing more in the future	BI2
	I predict I would use ride-hailing in the future	BI3
	I am willing to recommend ride-hailing service to my family members/friends/colleagues	BI4
	Compared with traditional taxi, I would prefer to use ride-hailing service	BI5
Subjective norm [32]	My family members/friends/colleagues think that I should use ride-hailing service	SN1
	People who are important to me think that I should use ride-hailing service	SN2
	My family members/friends/colleagues who has the experience of using ride-hailing service think that I should use ride-hailing service	SN3
Social image [29, 32]	In general, my social network has supported me to use ride-hailing service	SN4
	People in my organization who use ride-hailing service have more prestige than those who do not	SI1
	Using ride-hailing service will makes me special in my organization	SI2
	Using ride-hailing improves my image within the organization	SI3
Perceived value [19]	Compared to the fee that I need to pay, the use of ride-hailing offers value for money	PV1
	Compared to the effort to put, using ride-hailing is beneficial to me	PV2
	Compared to the time to spend, using ride-hailing is worthwhile to me	PV3
	Overall, using ride-hailing delivers me good value	PV4
Perceived policy support [57]	If government encourage the development of ride-hailing industry, I would like to use ride-hailing service	PO1
	If government regulates the pricing mechanism of ride-hailing industry, I would like to use ride-hailing service	PO2
	If government regulates drivers' entry condition of ride-hailing industry, I would like to use ride-hailing service	PO3
Perceived fee [28]	The fee that I have to pay for the use of ride-hailing is too high	PF1
	The average fee level in ride-hailing market is unstable	PF2
	The fee that I have to pay for the use of ride-hailing is reasonable	PF3
	I am pleased with the fee that I have to pay for the use of ride-hailing	PF4
Performance risk [28, 29, 32]	Without the resources to use ride-hailing, it would not be easy for me to use ride-hailing service	PR1
	Using ride-hailing service makes me feel nervous	PR2
	It is uncertain that ride-hailing will work satisfactorily	PR3
	It is uncertain that ride-hailing will provide the level of benefits I expect	PR4
	It is uncertain that ride-hailing will work safely due to the reason from driver or car	PR5

while perceived risk has no significant effect ( $-0.017$  NS). As one of the most critical factors, perceived policy support of ride-hailing is positively related to perceived value ( $0.545^{***}$ ). Further, it is clear that subjective norm has a positive effect on both perceived value ( $0.184^{**}$ ) and behavioral intention ( $0.599^{***}$ ) significantly. Overall, from the results of SEM analysis, H1, H2, H3, H4, H5, H7, H8, and H9 are supported, while H6 is not supported.

To further investigate the moderate effect of control variables, the effect of age, gender, car ownership, and usage frequency of ride-hailing services was examined. However, most of the relationship between control variables and perceived value, and behavioral intention, is insignificant except for the effect of usage frequency of ride-hailing services on behavioral intention ( $0.098^{**}$ ). This result implies that travelers' perceived value and behavioral intention will not be influenced by age or gender significantly. As regard of car ownership, its impact on perceived value and behavioral intention is insignificant. Further, although the relationship between usage frequency and perceived value is

insignificant, but the significant effect of usage frequency of ride-hailing services on behavioral intention indicates that the usage frequency has an influence on travelers' behavioral intention significantly.

The indirect, direct, and cumulative effects are further examined, as presented in Table 7.

First, it is clear that both perceived benefit and perceived sacrifice can affect travelers' behavioral intention to adopt ride-hailing services indirectly. Among factors of perceived value, the strength of perceived usefulness, social image, and perceived fee are relatively stronger. Second, based on perceived benefit and perceived sacrifice, perceived value has a strong and direct effect on behavioral intention. Further, perceived policy support of ride-hailing has an indirect effect on behavioral intention. As for subjective norm, it affects travelers' behavioral intention of ride-hailing services both indirectly and directly. By the comparison between indirect and direct effect of subjective norm, it indicates that direct effect is much stronger than indirect effect.

TABLE 3: Descriptive analysis of sociodemographic information.

Value	Frequency	Percent
Gender		
Male	209	50.5
Female	205	49.5
Age (years)		
18 and below	8	1.9
19–24	90	21.7
25–30	221	53.4
31–35	58	14.0
35 and above	37	8.9
Education		
High school and below	8	1.9
Junior college	35	8.5
Bachelor	132	31.9
Master	184	44.4
PhD	55	13.3
Income (yuan)		
1500 and below	87	21.0
1501–3500	57	13.8
3501–5000	63	15.2
5001–8000	104	25.1
8001 and above	103	24.9
Car ownership		
No	198	47.8
No (but plan to buy a car)	69	16.7
Yes (only one car)	126	30.4
Yes (more than one car)	21	5.1
License		
Yes	316	76.3
No	98	23.7
Occupation		
Student	137	33.1
Corporation (state-owned)	48	11.6
Corporation (private)	111	26.8
Education	72	17.4
Government	30	7.2
Self-employed	13	3.1
Unemployed	3	0.7
Marital status		
Unmarried	234	56.5
Married (no child)	60	14.5
Married (have child)	116	28.0
Other	4	1.0

## 6. Discussion

This research found that perceived value has a positive and direct effect on travelers' behavioral intention to adopt ride-hailing services. This result also supports the conclusions in previous studies that focus on customer behavior [28, 29]. Based on consideration of perceived value, the formation of travelers' behavioral intention can be explained as a sequential process from a theoretical point. Travelers tend to evaluate and relate factors first and then form the behavioral intention. After then, their decision to adopt or not adopt ride-hailing services is made.

**6.1. Perceived Benefit.** Perceived benefit consists of perceived usefulness, perceived enjoyment, and social image. From

empirical results, it indicates that all of them have a significant and positive effect on perceived value. Also, these factors affect travelers' behavioral intention to adopt ride-hailing services indirectly through perceived value. Moreover, these three factors can reflect perceived benefit from functional, hedonic, and social effects. As a new transportation service, ride-hailing not only provide cheaper and more convenient travel options but also with features of higher service level, more flexible, and customized travel time and route [62], which can reflect the functional and hedonic effects of ride-hailing services. To some extent, since ride-hailing is a new service and the behavior of early users may be special, travelers' social image may also be enhanced. Further, the difference between the effects of perceived benefit implies that travelers of ride-hailing services care more about functional effect and social effect than hedonic effect.

**6.2. Perceived Sacrifice.** Perceived fee and perceived risk were considered from views of monetary and nonmonetary. Based on the empirical results, perceived fee has a negative effect on perceived value. Similar to perceived benefit, perceived fee and perceived risk have an indirect influence on behavioral intention. However, the effect of perceived risk on perceived value is not significant and the effect of perceived fee is much stronger than the effect of perceived risk. This finding indicates that travelers care more on monetary cost than nonmonetary risk, and this result has been verified by Liu et al. [35]. As a result, perceived sacrifice will lead to a lower or even negative evaluation of ride-hailing services.

**6.3. Social Effect.** In this paper, subjective norm was introduced into the concept model. The empirical results indicate that subjective norm has a positive effect on both perceived value and behavioral intention significantly. The result of the direct effect verified many researches of consumer behavior that have considered social factors [17, 34, 63]. Moreover, the indirect effect of subjective norm was further examined in this paper. Usually, travelers' behavioral intention is affected by the social network to which he or she belongs. As defined above, subjective norm is the extent to which a traveler perceived that most people in his or her social network think he or she should or should not use ride-hailing services. Among travelers' group, when most members in his or her social network think he or she should or should not use ride-hailing services, the behavioral intention of him or her may change directly. On the other hand, the formation of behavioral intention to adopt ride-hailing services may be affected by others indirectly. On this context, subjective norm can influence travelers' behavioral intention to adopt ride-hailing services indirectly through perceived value, which means travelers would evaluate the opinion from his or her social network first and then form behavioral intention of ride-hailing services. According to the empirical results in this paper, the direct effect of subjective norm is much stronger than the indirect effect.



TABLE 4: Reliability and validity test.

Value	Item	KMO	Bartlett's test			Load	Cronbach's $\alpha$	Mean
			Approx. chi-square	df	Sig.			
Perceived usefulness	PU1	0.846	1251.673	10	0.000	0.852	0.876	3.74
	PU2					0.897		3.90
	PU3					0.891		3.78
	PU4					0.869		3.89
	PU5					0.598		3.22
Perceived enjoyment	PE1	0.729	693.783	3	0.000	0.917	0.881	3.50
	PE2					0.914		3.67
	PE3					0.868		3.42
Behavioral intention	BI1	0.830	1034.513	10	0.000	0.794	0.869	2.90
	BI2					0.873		3.10
	BI3					0.817		3.57
	BI4					0.840		3.52
	BI5					0.741		3.63
Subjective norm	SN1	0.857	1314.681	6	0.000	0.901	0.927	3.18
	SN2					0.918		3.20
	SN3					0.928		3.30
	SN4					0.877		3.44
Social image	SI1	0.691	684.058	3	0.000	0.836	0.869	2.94
	SI2					0.903		2.67
	SI3					0.932		2.65
Perceived value	PV1	0.831	941.443	6	0.000	0.783	0.882	3.32
	PV2					0.900		3.57
	PV3					0.896		3.61
	PV4					0.869		3.63
Perceived policy support	PO1	0.728	750.069	3	0.000	0.875	0.891	3.71
	PO2					0.930		3.79
	PO3					0.914		3.84
Perceived fee	PF3	0.500	335.332	3	0.000	0.934	0.855	2.65
	PF4					0.934		2.66
Perceived risk	PR2	0.733	690.295	6	0.000	0.623	0.806	2.58
	PR3					0.880		3.00
	PR4					0.906		3.00
	PR5					0.767		3.19
Total							0.920	

TABLE 5: Control variables.

Variables	Definition
Gen	Male = 1
	Female = 0
Age	18 years and below = 1
	19–24 years = 2
	25–30 years = 3
	31–35 years = 4
	36 years and more = 5
Car	Do not have a car = 1
	Do not have a car, but plan to buy one = 2
	Have only one car = 3
	Have more than one car = 4
RHFre	I never do this = 1
	I do this, but not in the past 30 days = 2
	I did this 1–3 times in the past 30 days = 3
	I did this 1 day per week = 4
	I did this 2 or more times per week = 5

TABLE 6: Results of SEM analysis.

Path	Standardized regression weights	C.R.
PV < ---PU	0.272***	4.057
PV < ---PE	0.120*	1.774
PV < ---SI	0.202***	4.513
PV < ---PF	-0.143**	-3.086
PV < ---PR	-0.017	-0.471
PV < ---SN	0.184**	3.273
PV < ---PO	0.545***	8.591
BI < ---PV	0.487***	8.263
BI < ---SN	0.599***	8.922
PV < ---Gen	0.021	0.635
PV < ---Age	-0.008	-0.222
PV < ---Car	0.029	0.775
PV < ---RHFre	-0.002	-0.062
BI < ---Gen	0.021	0.630
BI < ---Age	0.034	0.875
BI < ---Car	-0.015	-0.381
BI < ---RHFre	0.098**	2.592

\*  $p < 0.1$ ; \*\*  $p < 0.05$ ; and \*\*\*  $p < 0.001$ .

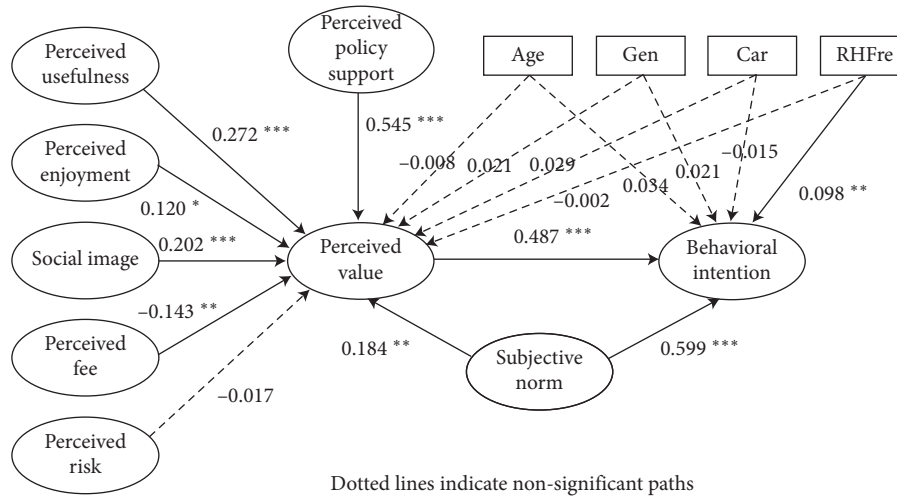


FIGURE 2: Results of SEM analysis. Note: \* $p < 0.1$ ; \*\* $p < 0.05$ ; and \*\*\* $p < 0.001$ .

TABLE 7: Indirect effect, direct effect, and total effect.

Path	Indirect effect	Direct effect	Total effect
PO→BI	0.265	—	0.265
SN→BI	0.090	0.599	0.689
PR→BI	-0.008	—	-0.008
PF→BI	-0.069	—	-0.069
SI→BI	0.098	—	0.098
PE→BI	0.059	—	0.059
PU→BI	0.133	—	0.133
PV→BI	—	0.487	0.487

6.4. *Policy Support.* The policy of ride-hailing services has been widely discussed, and the effect of perceived policy support was examined in this paper. From the empirical study, it indicates that perceived policy support related to perceived value positively and has an indirect effect on behavioral intention. This further verified the pivotal role of perceived policy support in travelers' acceptance of ride-hailing services. In early stage, ride-hailing is a transportation service for travelers and most of them may not be familiar with such new travel modes. On the other hand, the legal status is ambiguous in some areas. Then, the price level and quality of drivers or cars vary a lot as a result of a lack of effective policy support. However, if some available measures and policies that intend to construct a better ride-hailing market put forward by the government, then more travelers will adopt such services.

6.5. *Sociodemographic Factors.* According to the results of sociodemographic factors and usage frequency related to ride-hailing services, age and gender will not affect perceived value and behavioral intention significantly. The insignificance of age and gender also exists in some studies of new emerged services or products [35, 64–66]. As for car ownership, the relationship is not significant. In a survey put forward by Clewlow [12], the adopters of ride-hailing services tend to have lower vehicle ownership rates than nonadopters of such services. Moreover, Dias et al. [11]

demonstrate that car ownership plays a negative effect on travelers' underlying propensity of ride-sourcing. Further, previous studies showed that the usage frequency of Uber and Lyft is positively related to travelers' attitude toward Uber and Lyft [10]. In this study, the significant and positive relationship between usage frequency of ride-hailing services and behavioral intention verifies this result and indicates that if travelers use ride-hailing more frequently, then his or her behavioral intention to adopt ride-hailing services may further be strengthened with a satisfied performance of ride-hailing services.

## 7. Conclusions

7.1. *Main Results.* Ride-hailing service is becoming one of the most essential components of urban transportation. Some research studies were accomplished to reveal the regular pattern of consumer behavior related to ride-hailing services. However, little of them have considered both positive and negative aspects of ride-hailing services and the process of travelers' decision-making. Based on the research on perceived value, this paper analyzed the factors travelers concerned in order to construct a conceptual model. The factors can be classified into perceived benefit and perceived sacrifice. Moreover, factors of social influence and perceived policy support were introduced into this model as well. Based on a survey in Nanjing, China, an empirical analysis was put forward to investigate the relationships between

related factors and travelers' behavioral intention to adopt ride-hailing services.

**7.2. Limitations and Future Directions.** There are still some limitations that should be noted. First, more factors that can reflect the characteristic of perceived value need to be considered. Hence, a more accurate and objective model should be established to reflect the actual behavior of ride-hailing service adoption better. Second, the size of sample data in this paper is still limited, and more surveys in different cities could be carried out to investigate the differences in travelers' adoption behavior of ride-hailing services in different cities or cultural background. Moreover, the differences in car ownership and public transport may be one of the reasons for the adoption of ride-hailing services, and then several surveys with a difference of car ownership and public transport could be put forward. Third, the consideration of policy purposes is still a limitation. In future, research on behavior of ride-hailing travelers can be studied by considering policy purposes.

## Data Availability

The data used to support the findings of this study have not been made available because the data also form part of an ongoing study.

## Conflicts of Interest

The authors declare no conflicts of interest.

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