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ORIGINAL RESEARCH

A comparative analysis of factors influencing millennial travellers' intentions to use ride-hailing

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Abstract

Ride-hailing services (e.g., Uber, Lyft) have drawn attention as a disruptive innovation in the tourism industry as they provide a new option for transport while on vacation or a business trip. Few studies have examined how travellers perceive the value of this new mode of transportation and modelled their intent to use ride-hailing services. Millennial consumers are known for their early adoption of smart technologies with different supply chains and portable internet devices (e.g., cell phones). This research examines the impact of perceived value on millennial travellers' intentions to use ride-hailing services in two rapidly changing tourism economies embracing smart phone access to transport services. Primary data were collected with millennials located in urban universities in the US and China. Data were analysed using ordinary least squares estimates. The results revealed that price and relational value positively influenced millennial travellers' intentions to use ride-hailing services in both samples. These influences remained significant after controlling for previous experiences with mobile technology, perceived safety, and regulations for ride-hailing services. The two millennial samples, however, exhibited different consumer factor influences. While quality and perceived regulations for ride-hailing services predicted millennial travellers' use intentions in the US sample, previous experience of using mobile technology influenced travellers' use intentions in the Chinese sample. As companies like Uber and Lyft expand and new providers enter the market, consumer behaviour research on perceived value can inform how business models might differ across countries and services should be tailored for each destination.

Keywords Sharing economy · Collaborative consumption · Mobile technology · Peer-to-peer market · Perceived value

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1 Introduction

Ride-hailing services (e.g., Uber, Lyft) have drawn attention as a disruptive innovation in the tourism industry. They have risen as an appealing alternative ground transportation mode among travellers (Amirkiaee and Evangelopoulos 2018), notably college students and young professionals (Lanset 2018). Ride-hailing has many significant impacts on the tourism industry (UNWTO 2017). One impact is that ride-hailing businesses are increasing the market share in the ground transportation mode. Among the business trips that involved ground transportation, 49% used ride-hailing services in the second quarter of 2016, according to expense management company Certify (Jones 2016). In 2016, the number of taxi rides has continued to plummet, down to 14% of leisure and business trips, compared with 37% market share in 2015 (Jones 2016). Considered a disruptive innovation, ride-hailing services pose a serious threat to existing traditional transports.

Ride-hailing is an international phenomenon. The ride-hailing market is more developed in countries in the United States and Western Europe, where platforms have been operating for a number of years. Ride-hailing is rapidly expanding around the world, notably in Asia and the Pacific region (OECD 2016). In today's global marketplace, ride-hailing is not confined to the United States or Western Europe, and providers need research to show that managerial practices do not naturally transfer across countries. For example, the American business model struggles to be successful in China. Recently, Uber China sold itself to Didi Chuxing, despite intense local competition (Mozur 2016). The merger calls into question whether the success factors found in Western contexts are similarly important to the Chinese and are equally effective with Chinese consumers, specifically travellers. A broader question is raised as to whether or not factors that influence intentions to use ride-hailing services are specific to one or a few contexts may not be relevant in other contexts.

To respond to the global rise of disruptive innovation, efforts by academic researchers have focused on the study of intent to use sharing economy products and services. Prior studies have stressed that ride-hailing businesses provide a distinct set of benefits, typically focused on lower cost, greater convenience, or simplicity (Hamari et al. 2016; Möhlmann 2015). While these studies have significantly improved our understanding of ride-hailing services, a literature gap can be identified. Considering that most of the existing studies have focused on the United States or Western Europe, the theories and practices developed from advanced economies need to be re-examined in the context of emerging countries, since these countries may have different economic, technology, and regulatory environments (Zhu and Kraemer 2005). A comparative study can examine whether consumers' choices and behavioural intentions are applicable to different economic environments.

Thus, the primary aim of this survey study is: (1) to identify consumer factors that predict continuous intentions to use ride-hailing services in the travel context, and (2) to examine how these factors influence intent to use with a delimited

sample of college-attending millennials in two countries using the same methodology to gather primary data. The United States and China were selected to compare the differences in factors influencing travellers' intentions to use ride-hailing, since they are growing consumer markets. The current study considers millennials as an important segment, given that prior research has evidenced that a young age group is more likely to use ride-hailing (Möhlmann 2015; Lee et al. 2020) and tests the multi-dimensional perceived value theory for the first time in ride-hailing product segment. More specifically, the study demonstrates how perceived value including price, quality, and relational value can enhance intentions to use ride-hailing services, controlling for the effects of other variables. The control variables in the estimated model include previous experiences with mobile technology, perceived safety in ride-hailing services, and a regulatory environment for innovative businesses in emerging and developed countries.

Overall, the current study contributes to tourism research in that the study is an original attempt to measure and model intentions for using ride-hailing services with two samples from different countries. The study highlights a comparative analysis on the consumer factors that determine intentions to use ride-hailing services. A two-sample analysis allows for common and unique consumer factors to emerge. Empirical research can lead to more theoretical rigour and inclusion of product innovations in consumer behaviour models.

2 Background

Our research highlights factors that influence millennial travellers' intentions to use ride-hailing services. First, literature on the importance of comparative analysis for understanding ride-hailing services is reviewed. Second, literature on millennial travel, as a targeted consumer segment of ride-hailing services in both emerging and developed countries, is reviewed.

2.1 Importance of comparative evidence of ride-hailing services

Ride-hailing, or ride-sharing, is defined as participating in an arrangement in which a passenger travels in a private vehicle driven by its owner, for free or for a fee, which is booked and paid for using a mobile device (Amirkiaee and Evangelopoulos 2018; Hamari et al. 2016; Möhlmann 2015). Ride-hailing is being adopted by consumers in the United States and China, but decision making may differ across consumers in these countries because of the use of mobile technology. For example, smartphones, rather than personal computers, are the primary e-commerce device in China for shopping and payment (Lu et al. 2017). About half of e-commerce sales are made with mobile devices in China, compared to one-quarter of sales in the United States (Gustke 2016). The difference in mobile technology use across the United States and China and its influence on the purchase of travel services is critical at this time of rapid technology application innovation, development and

diffusion. Academic research on factors that drive intentions to use ride-hailing services in China is particularly limited.

Previous research has shown that developed and emerging countries differ in terms of the factors affecting intentions and behaviours to use technology-mediated services (Dewan and Kraemer 2000). Researchers (Caselli and Coleman 2001; Rogers 2003; Tornatzky and Fleischer 1990; Yang and Jolly 2009) have questioned the assumption of the uniform influence of the consumer value framework across countries, highlighting the danger of the overgeneralization of the findings. In addition to this central test of perceived value and intent to use, research has shown other factors are likely to be influential—these include: the extent of the technology diffusion depends on previous experience related to the advance of the technology (Meuter et al. 2005), business practices to secure safety (Caselli and Coleman 2001), and regulatory environments for innovative businesses (Dasgupta et al. 1999).

2.2 Millennial travellers as a segment of ride-hailing services

Millennials are an important group of travellers. Millennial travellers are becoming an increasingly important market segment for destinations around the world (Gurău 2012). Travellers aged 15–29 years are estimated to account for 23% of all international travellers in 2015 (UNWTO 2016). Most young travellers come from the generation born between the early 1980s and 2000s. Millennial travellers comprise 65% of the total leisure travellers in China, while American millennial travellers comprise 40% (Phocuswright 2016).

Furthermore, millennials are the leading adopters of ride-hailing apps (e.g., Uber and Lyft) in both developing and developed countries. Ride-hailing services provide an alternative transportation mode for many college students and young professionals, particularly in dense urban areas where such mobile apps are popular (Bomey 2016). Millennials are well-versed in mobile technology uses, by requesting a car on the app, calling a taxi to their doorstep, getting picked up and paying with the tap of a button. Millennials leverage smartphone technology, which make them more convenient to organizes their travel experiences (Phocuswright 2016). As a result, the increasing availability of mobile transportation apps leads millennials to drive less. The transportation apps (e.g., ride-sharing, taxi apps, public transportation information) on mobile technology have a greater impact on millennials' driving decision (Bomey 2016). According to the University of Michigan's Transportation Research Institute (2016), ride-hailing is compatible with millennials' indifferent attitude towards car ownership and decreased licensing. Young people aged 20–24 years are forgoing driver's licenses at a quickening pace, as they grapple with the emergence of ride-hailing services. Ride-hailing apps appeal to millennials, in that it allows for temporary access to a vehicle rather than ownership (University of Michigan Transportation Research Institute 2016).

Despite the growing importance of millennial travellers in both emerging and developed countries, little research has been conducted about their ride-hailing decision making and use while on vacation or for business travel. As smart technology applications grow, there is a pressing need for academic research using a theoretical

framework to study consumer behaviour in many contexts to further understand global products and their adoption.

3 Theoretical framework and hypotheses development

Previous research has provided important insights regarding travel behaviours and perceptions of ride-hailing services Table 1 shows that early studies predominantly explored the determinants of intentions to use ride-hailing over other transportation modes, without identifying theoretical foundations (Amirkiaee and Evangelopoulos 2018; Hamari et al. 2016; Lavieri and Bhat 2019; Möhlmann 2015; Nguyen-Phuoc et al. 2020). Common variables in these studies were customer satisfaction and behavioural intentions. Relationships emerged, for example, the lower cost, the ease of payment, high service quality, smartphone capability, and enjoyment, were found to be associated with ride-hailing (Amirkiaee and Evangelopoulos 2018; Lavieri and Bhat 2019; Nguyen-Phuoc et al. 2020). Recent research emphasizes the characteristics of technology and innovation affecting consumer's actual or intended usage with specific theories to explain these relationships (Malik and Rao 2019; Min et al. 2019). Technological Acceptance Model (Benbasat and Barki 2007; Kim et al. 2008; Venkatesh et al. 2003) and the Diffusion of Innovation Theory (Rogers 2003) have been tested and supported with empirical evidence from ride-hailing studies.

3.1 Theoretical framework

The most recent studies on ride-hailing (see Table 1) signal deeper consideration of customer perceived value (e.g. Malik and Rao 2019; Min et al. 2019). Min et al. (2019) showed that the strongest antecedent to predict future usage intention is relative advantage, which is conceptualized as providing more benefits than its predecessor. Relative advantage is congruous with perceived value, in that relative advantage is frequently described as economic benefits such as saving cost and time. Furthermore, Malik and Rao (2019) found that the direct effect of perceived value on continued usage is highly significant. Their finding indicates that perceived value, conceptualized as benefits from saving cost and time, has a significant impact on continued usage of rid-hailing services. Arguably, the scope of perceived value in the domain of technology-based services needs to be much larger and beyond one single dimension. The factors that consumers deem as useful should be delineated more comprehensively.

Amongst service quality and value models, PERVAL includes multi-dimensional perceptual measures, such as economic value, quality, and social value (Choi et al. 2018; Sánchez et al. 2006). Multiple dimensions of perceived value open the door to the underlying reasons why travellers adopt new and innovative services. The PERVAL scale can be used to elucidate the underlying dimensions of perceived value: functional and affective (Sánchez et al. 2006). The functional dimension refers to the economic evaluations made by individuals. The price or quality would a part of this dimension. The affective dimension indicates either

Table 1 Empirical research on the factors influencing intentions to use ride-hailing

Study	Research focus	Theoretical foundation	Antecedents	Study site
Möhlmann (2015)	Satisfaction, likelihood of repeat use of sharing economy option	–	Community belonging, cost savings, familiarity, service quality, smartphone capability, trust, utility	A large public university in Europe
Hamari et al. (2016)	Intention to use ride-hailing	–	Economic benefit, enjoyment, attitude	Urban locations in Europe
Amirkiaee and Evangelopoulos (2018)	Intention to use ride-hailing	–	Economic benefit, time benefit, transportation anxiety, reciprocity, trust, attitude towards ride-hailing	A large public university in US
Min et al. (2019)	Future usage intention	Technology acceptance model, diffusion of innovation theory	Perceived usefulness, perceived ease of use, relative advantage, compatibility, complexity, observability, social influence, attitude	Urban locations in US
Malik and Rao (2019)	Continued usage through mobile applications	Technology acceptance model, expectancy-confirmation model	Perceived usefulness, perceived ease of use, confirmation, self-efficacy, perceived value	Urban locations in India
Lavieri and Bhat (2019)	Ride-hailing experience and usage	–	Privacy sensitivity, tech-savviness, variety seeking lifestyle propensity, green style propensity	Urban locations in US
Nguyen-Phuoc et al. (2020)	Customer satisfaction and loyalty with ride-hailing	–	Perceived sales promotion, perceived service quality, perceive benefits of booking app	Urban locations in Vietnam
Current study	Intention to use ride-hailing, comparative analysis	Multi-dimensional perceived value framework	Economic value, quality value, social value	Large public universities in US and China

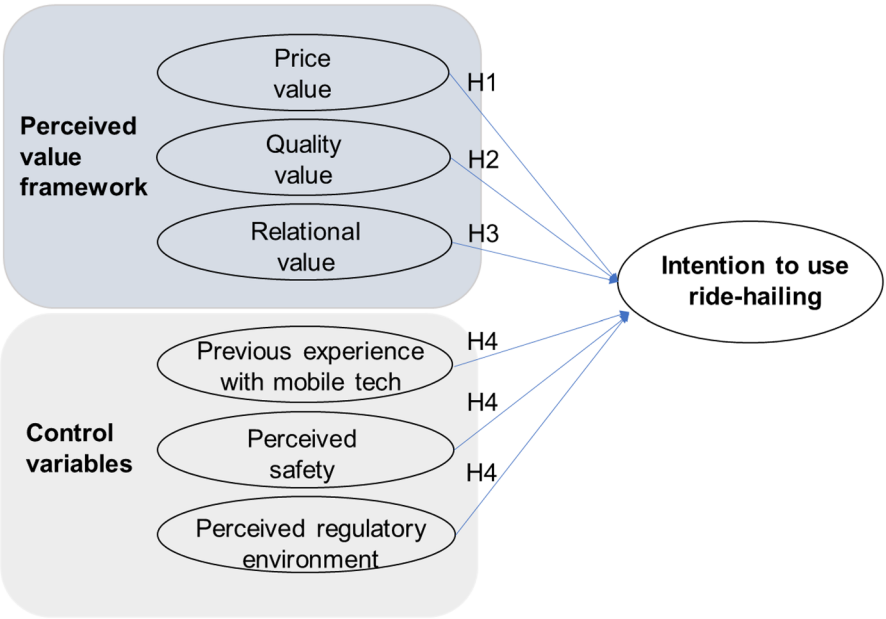

Fig. 1 Conceptual framework for millennial travellers' intentions to use ride-hailing

emotional or relational feelings generated by the rapport that travellers develop with service providers (i.e. ride-hailing drivers). These underlying dimensions capture how travellers create their own multi-dimensional value at later periods of technology adoption.

The consumer value framework has been supported by empirical evidence from the tourism domains, such as adventure tourism (Williams and Soutar 2009), shopping tourism (Choi et al. 2018), wine tourism (Gill et al. 2007), water parks (Jin et al. 2015), and tourism packages (Sáchez et al. 1991). These studies offer vital documentation of the beneficial aspects of perceived value in various tourism domains. Application of perceived value to a cross-country context provides new approach to consumer research in travel and transport innovations.

Figure 1 illustrates the conceptual model testing the influence of multi-dimensional perceived value on travellers' intentions to use ride-hailing services. The value components, in terms of their importance, include: value for price, value for quality, and relational value. The conceptual model controls for the influences of other factors identified in the ride-hailing literature: previous experience with mobile technology, perceived safety, and perceived regulatory environments.

3.2 Hypotheses development

Based on the conceptual framework, hypotheses for analysis are proposed and supported by past empirical studies.

3.2.1 Value for price

Price value refers to the utility derived from products due to the perception about reduced costs (Sweeney and Soutar 2001). Price value includes psychological costs, as well as transaction costs (prices), that customers attempt to minimize. Psychological costs also include the personal investment of customers (e.g., time, effort, and energy), which customers devote to the purchase, and consumption process (Smith and Colgate 2007). Empirical studies on the sharing economy's products and services illustrate that customers seek more value for less cost (Hamari et al. 2016; Tussyadiah 2016). Tussyadiah (2016) argues that economic value is the main driving factor of satisfaction and future intentions to use peer-to-peer accommodations. Based on literature, the following hypothesis is proposed:

Hypothesis 1: *Value for price positively influences travellers' intentions to use a ride-hailing services.*

3.2.2 Value for quality

Quality value represents the utility resulting from the perceived quality and expected performance of products (Sweeney and Soutar 2001). Sharing economy products and services have adopted different approaches to ensure quality standards, which possibly make consumers remain uncertain about the consequences of service delivery. Ride-hailing services (e.g., Uber, Lyft, Didi Chuxing) allow car owners to become cab drivers. There is the high degree of heterogeneity in terms of driving skills, car insurance, or vehicle quality. Arguably, the lack of a provider's ability to perform the task properly may influence the perceived quality. In addition, the quality standards of ride-hailing services depend heavily on rating systems and travellers' feedback. Heavy reliance on feedback scores raises the concern that anyone can manipulate scores (Mayzlin et al. 2014). The following hypothesis is shaped by existing studies:

Hypothesis 2: *Value for quality positively influences travellers' intentions to use ride-hailing services.*

3.2.3 Relational value

Relational value is derived from building relationships and exchanging information between providers and customers (Kellogg et al. 1997). The mobile ride-hailing applications connect travellers to service providers (e.g., ride-hailing drivers) in a network of local communities. Relational value is relevant to confidence benefits (Gwinner et al. 1998), which represent benefits from a feeling of confidence in a service provider. Travellers engage in seeking information since they want to make sure that a driver is reliable. They may also want to reduce their perceived anxiety and risk. Relational value is also associated with the social benefits (Gwinner et al. 1998) that travellers may receive by offering words of kindness or understanding to the drivers. Based on literature, the following hypothesis is proposed:

Hypothesis 3: *Relational value positively influences travellers' intentions to use ride-hailing services.*

In addition to the three hypotheses testing perceived value, past research on the perceived value framework tests other factors as controls in product intent models. The literature on tourism and technology (Blut et al. 2016; Hackbarth et al. 2003; Tornatzky and Fleischer 1990) and ride-hailing (Hartl et al. 2016; Lobel 2016) includes previous experiences with mobile technology, perceptions about safety, and perceptions about regulation of the service as influencing factors to product usage.

3.2.4 Previous experiences with mobile technology

Previous experiences with mobile technology refer to the extent to which individual uses the related technology in dealing with businesses (Meuter et al. 2005). Prior research suggests that use intentions might be affected by individual differences in prior experience with the related technology (Blut et al. 2016; Meuter et al. 2005; Parasuraman and Colby 2015). The rationale is that the previous use of the related technology may enhance one's ability to try new services, particularly in technology-related innovations (Hackbarth et al. 2003). This suggests an experienced traveller of mobile technology is more likely to use ride-hailing services than an inexperienced one. Past research (Blut et al. 2016; Rogers 2003) has shown that previous experience with mobile apps influences individual's product adoption behaviours.

3.2.5 Perceived safety

Perceived safety of ride-hailing services indicates consumers' perception that ride-hailing services comply with passenger safety regulations and deliver reliable services. One of the controversies over the sharing economy is whether or not ride-hailing businesses ensure safety standards that are similar to other transportation modes. In a 2015 PwC survey, the majority of respondents reported that they would not fully trust the sharing economy businesses until the safety compliance questions were settled. The safety issues encompass liability policies, driver background checks, and car inspections (Lobel 2016).

3.2.6 Perceived regulatory environments

Regulatory environments are the arena in which ride-hailing businesses deal with government regulations (Tornatzky and Fleischer 1990). Regulatory environments are particularly applicable to ride-hailing services, as the lack of the regulations on online transactions tends to be a common concern (Hartl et al. 2016). The regulatory questions raised by the rapid rise in ride-hailing services are expansive. They include permitting, licensing, liability for accidents, quality and safety controls, and employment law (Lobel 2016). In response to the regulatory questions, the Public Utility Commission in California offered legal status for ride-hailing companies and allowed them to operate legally (Geron 2013). The legal status involves requiring criminal background checks on drivers and mandatory insurance coverage that

is more stringent than that required of taxi companies. In China, ride-hailing services became legal in November of 2016 (Mozur 2016). Drivers in China must have 3 years of experience, be licensed by a local taxi regulator, and have no criminal record (Mozur 2016).

Based on prior research and particular linkages to the nature of ride-hailing businesses, the following individual differences and environmental contexts are included in a fourth hypothesis:

Hypothesis 4: *By controlling for the influences of previous experiences with mobile technology, perceived safety, and regulatory environments, travellers' perceived value positively influences intentions to use ride-hailing services.*

4 Methodologies

4.1 Survey and sampling methods

Survey research is well suited as a methodology for collecting data that enables modelling of relationships between variables for sample estimates (Orcher 2014). Given the research problem and interest in adopters of new innovations, the desired sample was millennials who used ride-hailing services on vacations within the past 6 months. We used college students because they are millennials and the most active participants of the sharing economy (Gupta et al. 2019). According to Pew Research Centre survey, in the United States, 55% of college students have used ride-hailing services (Marshall 2019), similarly, a survey conducted by a Tencent Poll in China indicated that 49% of respondents who had used ride-hailing apps were college students (Li 2016). Millennials have been found to be more likely to adopt ride-sharing services and use these services more frequently since this type of services could respond to the young generations' desired sustainable consumption practice (Alemi et al. 2017; Lee et al. 2020). It was also confirmed by the previous research that most of ride hailing service users are young adults, urbanities and college students (Jiang 2019; Mousavi et al. 2020; Smith 2016; Synder 2020). For the current study, two universities were selected for collecting data to test the model and hypotheses. The universities are located in urban areas with a large student population in the age group of 18–25 years old, which represented millennial ride hailing service users. This sampling approach was taken because a population list of ride-hailing consumers in either country would be difficult to obtain from private industry or simply does not exist.

4.2 Pre-testing, pilot testing, and measurement

A cross-cultural study requires additional work to ensure a questionnaire and the survey protocol are similar. Pre-testing started with two graduate students and three undergraduate students enrolled in a tourism program of an American university tested the English version of the questionnaire. Next, the English version was

Table 2 Latent correlation, convergent and discriminant validity analysis

	1	2	3	4	5	6	7
US millennial sample ($n_1 = 247$)							
1. Use intention	–						
2. Price value	0.53	–					
3. Quality value	0.46	0.49	–				
4. Relational value	0.44	0.26	0.25	–			
5. Previous	0.17	0.10	0.05	0.23	–		
6. Perceived safety	0.49	0.43	0.51	0.30	0.18	–	
7. Perceived regulatory environments	0.29	0.19	0.04	0.26	0.16	0.19	–
Mean	5.56	5.26	5.18	4.71	5.91	5.31	5.67
Standard error	1.15	1.31	1.19	1.21	0.98	1.13	1.04
Cronbach's alpha	0.90	0.93	0.86	0.67	0.77	0.89	0.87
Composite reliability	0.86	0.94	0.93	0.57	0.78	0.90	0.40
Average variance extracted	0.67	0.80	0.77	0.44	0.60	0.72	0.52
Chinese millennial sample ($n_2 = 251$)							
1. Use intention	–						
2. Price value	0.57	–					
3. Quality value	0.50	0.66	–				
4. Relational value	0.54	0.44	0.50	–			
5. Previous	0.38	0.25	0.25	0.14	–		
6. Perceived safety	0.50	0.43	0.50	0.50	0.33	–	
7. Perceived regulatory environments	0.11	0.13	0.18	0.11	0.23	0.08	–
Mean	5.24	5.16	5.07	5.00	5.46	5.12	5.82
Standard error	0.93	1.03	1.06	1.09	1.06	1.01	0.98
Cronbach's alpha	0.85	0.90	0.86	0.77	0.81	0.85	0.53
Composite reliability	0.77	0.92	0.93	0.71	0.78	0.85	0.48
Average variance extracted	0.59	0.74	0.77	0.53	0.59	0.66	0.59

Respondents reported agreement with the statements on a Likert-type scale ranging from 1 (strongly disagree) to 7 (strongly agree)

translated to into Chinese. Then the translated questionnaires were compared by five undergraduate students who are bilingual in both English and Chinese. They examined the questionnaires to ensure that the English meaning of the instructions, constructs, phrases, and wordings were equivalent. The linguistic equivalence of the measures was established using standard back translation (Brislin 1970). Once an agreement was achieved, the Chinese questionnaire was translated back into English to ensure that the meanings of the questionnaire stayed the same through the translation process. The instructions and the sequence of the questions were standardized for the two samples. The preliminary version of the instrument was piloted with a separate sample of ten students respectively in the United States and China, then refined based on analyses of the resulting data. There was no overlap between respondents in the pre-test, pilot or main study.

The measurement items mostly came from aforementioned research with minor wording modifications to the context of using ride-hailing services while traveling. All questions were developed to measure respondent's reported agreement with the statements on a 7-point Likert-type scale ranging from 1 (strongly disagree) to 7 (strongly agree). Researchers assessed whether the original validity may hold for new instrument to ensure divergent studies are connected in measuring the variables studied in this paper. As recommended by Creswell (2014), the present study has established two traditional forms of validity: content validity and construct validity. During pilot testing, preliminary version of measurement scales was assessed to make sure that the items measure the content they were intended to measure. Then, researchers incorporated respondents' comments into final instrument revisions and made modifications. Construct validity was examined during data analysis. Tables 2 and 3 show that the items measure the hypothetical concepts of perceived value (e.g., price value, quality value, relational value) in the measurement scales.

To measure the dependent variable, intentions to use ride-hailing services while traveling, with a leading service behavioural scale E-S-QUAL scale (Parasuraman et al. 2005) was employed. The main study variable, perceived value, was measured with eight items adapted from previous research (Gwinner et al. 1998; Kellogg et al. 1997; Sweeney and Soutar 2001) that capture subjective perceptions of price, quality, and relational value within the context of intentions to use ride-hailing services. To test the robustness of our proposed relationships and control for extraneous influences, three control variables were included: previous experiences with mobile technology, perceived safety, and perceived regulatory environments in their respective countries. Because a single source self-report survey was used in data collection for this study, there was the potential for common method bias to influence the findings. To determine whether common method bias was present, survey items were interspersed to avoid response sets and underwent pre-tests to assess clarity and ambiguity (Podsakoff et al. 2003). From a statistical standpoint, a Harmon one-factor test was conducted (Malhotra et al. 2006). The statistical test revealed a single factor did not adequately represent the items in the study which means the data passed the test.

4.3 Data collection

The survey was conducted in two metropolitan areas: one university located in the southwestern region of the United States and one university placed on the Northeast region of China. College courses were deemed to be most convenient to reach the targeted sample. The researchers went to three undergraduate classes at each university and two dormitories for the undergraduate students with prior permission from instructors/administrators. At the beginning of the survey, the researchers outlined the purpose of the research indicating that it aimed to investigate their use of ride-hailing services when traveling domestically. If they had taken a vacation in the past 6 months, students were asked to take part in answering a paper-and-pencil questionnaire. Actual data collection took place over 1-month period.

In total, 620 questionnaires were collected (from 308 respondents from the United States and 312 respondents from China) from the targeted sample of millennials

Table 3 Confirmatory factor analysis

	Items and item description	US sample (n_1 = 247)		Chinese sample (n_2 = 251)	
		Mean (SD)	Factor loading	Mean (SD)	Factor loading
	Price value (3 items adapted from PERVAL scale of Sweeney and Soutar 2001)				
PV1	Ride-hailing brings me reasonably priced services	5.25 (1.45)	0.91	5.19 (1.12)	0.85
PV2	Ride-hailing brings me value for money	5.16 (1.43)	0.91	5.20 (1.13)	0.87
PV3	Ride-hailing brings me a good service for the price	5.38 (1.32)	0.87	5.09 (1.16)	0.86
	Quality value (2 items adapted from PERVAL scale Sweeney and Soutar 2001)				
QV1	Ride-hailing provides consistent quality	5.02 (1.38)	0.85	5.03 (1.18)	0.86
QV2	Ride-hailing provides an acceptable standard of quality	5.35 (1.15)	0.90	5.11 (1.01)	0.89
	Relational value (3 items adapted from Gwinner et al. 1998; Kellogg et al. 1997)				
RV1	I am involved in getting to know ride-hailing drivers	4.51 (1.55)	0.57	4.96 (1.22)	0.71
RV2	I provide ratings or feedback to ride-hailing services	5.26 (1.57)	0.60	5.27 (1.22)	0.68
RV3	I share information about my needs with drivers	4.34 (1.51)	0.79	4.78 (1.51)	0.79
	Previous experiences with mobile technology (3 items created for the context of interest)				
PE1	I use a lot of mobile apps when dealing with other businesses	5.30 (1.41)	0.53	5.56 (1.27)	0.79
PE2	I have a lot of experiences using mobile apps	6.27 (1.03)	0.90	5.64 (1.17)	0.74
PE3	I use a lot of technology-based products and services	6.16 (1.11)	0.84	5.19 (1.12)	0.77
	Perceived safety (3 items created for the context of interest)				
SF1	I believe ride-hailing services follow passenger safety regulations	5.16 (1.26)	0.80	5.06 (1.11)	0.80
SF2	I expect drivers are trustworthy about delivering ride-hailing services	5.43 (1.26)	0.86	5.21 (1.19)	0.84
SF3	I believe ride-hailing services perform as safely as other transportation modes	5.34 (1.24)	0.89	5.08 (1.15)	0.79
	Perceived regulatory environments (2 items created for the context of interest)				
RE1	Ride-hailing businesses should provide consumer protections (e.g., insurance, safety, security)	5.62 (1.26)	0.79	5.94	0.53
RE2	Formal agreements should be made between platform companies and drivers	5.72 (1.13)	0.65	5.70	0.68
	Intention to use ride-hailing services (4 items adapted from Parasuraman et al. 2005)				
INT1	I would like to say positive things about ride-hailing to other people	5.63 (1.08)	0.94	5.26 (0.98)	0.87

Table 3 (continued)

	Items and item description	US sample (n_1 = 247)		Chinese sample (n_2 = 251)	
		Mean (SD)	Factor loading	Mean (SD)	Factor loading
INT2	I would recommend friends and others to use ride-hailing services	5.84 (1.10)	0.90	5.44 (0.99)	0.83
INT3	I would consider ride-hailing to be my first choice for future rides	5.31 (1.49)	0.70	4.96 (1.25)	0.66
INT4	I would use more ride-hailing services in the coming months	5.47 (1.55)	0.71	5.29 (1.20)	0.68

with recent travel experience with ride-hailing. To address randomly missing data, listwise deletion was used. Cases with more than three missing values were removed from analysis (13 respondents for US millennial sample and 18 respondents for Chinese millennial sample). Respondents who indicated that they had never used ride-hailing services were eliminated from the dataset. Of US millennial sample, 16% (48 respondents) reported that they had never used ride-hailing services, while 15% (43 respondents) of Chinese millennial sample indicated the non-use of ride-hailing services ever. In total, 498 responses from the United States ($n_1 = 247$) and China ($n_2 = 251$) remained in the dataset for analysis to represent recent ride-hailing consumers who had used the service a range of 1–90 times in the past 6 months.

4.4 Data analysis

Confirmatory factor analysis (CFA) was employed to identify factors underlying the items in the questionnaire and to test measurement invariance (Brown 2015). CFA was selected in that it is useful for testing the consumer value framework of the PERVAL scale (Sweeney and Soutar 2001) and evaluate whether factors in the specified model can explain the relationships among the measures. Mplus 7.2 (Muthén and Muthén 2015) was used to analyse data. CFA was conducted using maximum likelihood estimation approach (ML estimation). Goodness of fit for a priori dimensions of the model was evaluated according to the following indices: the model chi-square statistic, RMSEA < 0.07, CFI > 0.90, and SRMR < 0.08 (Hu and Bentler 1999; MacCallum et al. 1996). The posited seven-factor model was found to be acceptable in both groups. The measurement invariance was also tested to examine whether the measures established in a Western context are applicable to the non-Western context (Supplementary Appendix).

To examine the hypotheses to test the influence of independent and control variables on a single dependent variable, a multiple regression was deemed as the appropriate statistical test (Hair et al. 2010). Data were analysed with the OLS (Ordinary Least Squares) estimates with control variables, using the two samples of the United States and China. After screening data to detect outliers and check normality, the OLS estimates were used to estimate the two main models considered in this study. In the first model, intentions to use ride-hailing while traveling was regressed on three dimensions of perceived value (e.g., price, quality, and relational value); in the second model, the three potential factors as controls that were identified in the extant studies were added to the first model.

5 Results

5.1 Sample profile

The final sample consisted of 498 responses from the US millennials (247 respondents) and Chinese millennials (251 respondents) who were recent users of ride-hailing services for a vacation purpose. For both samples, approximately two-thirds were female, while one-third were male. Of US millennial respondents, 66% (164 respondents) are female, and 32% (78 respondents) are male. Chinese millennial respondents indicated that 64% (161 respondents) are female, and 35% (88 respondents) are male. With respect to usage frequency, the US millennial respondents indicated that 41% (102 respondents) had used ride-hailing services between 1 and 5 times in the past 6 months, while 19% (47 respondents) had used ride-hailing services over 20 times in the same period. The Chinese millennial respondents reported that over 31% (78 respondents) had used ride-hailing services between 1 and 5 times in the past 6 months, while 8% (20 respondents) had participated in ride-hailing services over 20 times in the same period.[1]

5.2 Measurement validation

Raw data were screened to detect outliers, address issues of missing data, and meet underlying assumptions of normality required for conducting CFA (Brown 2015). Test of univariate normality were conducted prior to model estimation. The cut-off values for 2.0 for skewness and 7.0 for kurtosis were used respectively (Curran et al. 1996). All variables used in the analysis met skewness and kurtosis requirements.

The construct validity of the variables was assessed, including convergent and discriminant validity. For convergent validity, Table 2 summarizes the psychometric properties of the measures. Cronbach's alphas, composite reliabilities, and average variance explained (AVE) for all measurement scales indicate acceptable reliability and convergent validity of our operationalization. In addition, discriminant validity was tested, using the criterion proposed by Fornell and Larcker (1981), which suggests that discriminant validity is established if the average variance extracted exceeds the squared correlations between all pairs of constructs. All constructs met this criterion, thereby providing empirical evidence in support for discriminant validity among the constructs.

A series of CFA was performed to assess reliability and validity of study construct and to assess model fit (Table 3). This procedure determines the extent to which all items properly represent their respective latent construct (Brown 2015). The initial CFA was conducted on the US millennial sample. Modification indices and Wald tests were examined to identify poorly performing items. The goodness-of-fit indices of the hypothesized model indicated a reasonable fit to the data, χ^2

[1] We tested the inclusion of "levels of previous experience with ride-hailing" as a ratio control variable. The results indicate this variable to be insignificant for both U.S. and Chinese samples that were self-reported ride-hailing users.

Table 4 Regression model results (US millennial sample)

	Model 1		Model 2	
	Estimates	SE	Estimates	SE
Main variables				
Price value	0.30**	(0.05)	0.24**	(0.05)
Quality value	0.22**	(0.06)	0.18**	(0.06)
Relational value	0.28**	(0.06)	0.22**	(0.05)
Control variables				
Previous experience with mobile tech			0.03	(0.06)
Perceived safety			0.19**	(0.06)
Perceived regulatory environments			0.15**	(0.06)
Intercepts	1.53**	(0.32)	0.38	(0.47)
Adjusted R^2	0.41		0.45	

Dependent variable = *Intention to Use Ride-hailing Services*. Estimates show unstandardized coefficients. *$p < 0.05$, **$p < 0.01$

(148) = 225.47, $p < 0.001$, RMSEA = 0.04 with 90% CI [0.03, 0.06], CFI = 0.97, SRMR = 0.05. A second CFA was conducted on the Chinese millennial sample, allowing for cross-validation of the model. The global fit indices demonstrated a reasonable degree of the adequacy of the measurement model, χ^2 (148) = 340.23, $p < 0.001$, RMSEA = 0.072 with 90% CI [0.06, 0.08], CFI = 0.93, SRMR = 0.05. All factor loadings were statistically significant and relatively strong in both samples. The standardized parameter estimates for the two samples are shown in Table 3.

5.3 Hypotheses testing

The crux of the regression analysis in this study is to estimate the influences of perceived value on intentions to use ride-hailing services and to determine whether there is a significant difference between the US and Chinese millennial samples. To do so, two sets of regression models were employed for each sample. The first model estimates the three factors of perceived value as the main covariates of interest. The second estimation model includes the control variables.

Table 4 illustrates the results of the regression model for the US millennial sample. The explained variance of Model 1 was 0.41 (Table 4). The results of Model 1 indicate that for the US millennial sample, perceived price, quality, and relational value were found to be positively related to intentions to use ride-hailing services while traveling. The coefficients of these variables were positive and highly significant at the one percent level. Based on our sample estimate, US millennials were likely to use mobile ride-hailing services continuously, as long as they perceived that the services were of a reasonable price, a high quality, and was attentive to their needs.

Table 5 Regression model results (Chinese millennial sample)

	Model 3		Model 4	
	Estimates	SE	Estimates	SE
Main variables				
Price value	0.29**	(0.06)	0.25**	(0.06)
Quality value	0.08	(0.06)	0.03	(0.06)
Relational value	0.34**	(0.05)	0.29**	(0.05)
Control variables				
Previous experience with mobile tech			0.18**	(0.04)
Perceived safety			0.13*	(0.05)
Perceived regulatory environments			−0.03	(0.04)
Intercepts	1.66**	(0.25)	0.90*	(0.35)
Adjusted R^2	0.46		0.51	

Dependent variable = *Intention to Use Ride-hailing Services*. Estimates show unstandardized coefficients. *$p < 0.05$, **$p < 0.01$

Model 2 in Table 4 includes three control variables: previous experiences with mobile technology, perceived safety of ride-hailing, and regulatory environments. The results show a strongly positive association between perceived value and behavioural intentions, which remained largely intact, even after controlling for these potential factors. The influences of price, quality and relational value on use intentions were positive and still highly significant. The estimates of perceived safety on ride-hailing and regulatory environments were positive and statistically significant at the one percent level. This suggests that safety considerations and regulations are important components of ride-hailing services. The estimate of another control variable was statistically insignificant, so it should be inferred that previous experiences with mobile technology were not likely to generate intentions to use ride-hailing services in the US sample.

Table 5 shows the results for the Chinese millennial respondents. According to the results of Model 3 in Table 5, use intentions of the Chinese millennial respondents were likely to be higher, as they perceived price and relational value more positively. This suggests that the quality value that the Chinese millennial sample perceived was not an important determinant of using ride-hailing services. This result differed from that of the US millennial sample. Model 4 in Table 5 includes three control variables. The results show that the main effects of Model 4 remained the same. The Chinese millennial sample was more likely to use ride-hailing services when they had more previous experiences with mobile technology.

The price and the relational value were key variables found to account for intentions to use ride-hailing services in a travel context. The coefficients of price and relational value were positive and highly significant at the one percent level across the samples. In addition, consumer safety perceptions about ride-hailing services were critical in determining intentions to use ride-hailing services in both samples. The influence of the quality value on use intentions was significant, but only for the US millennial sample. Finally, previous experience with mobile technology was

positively related to use intentions, but only among the Chinese millennial sample. The regulatory environment was positively associated with use intentions, but only among the US millennial sample.

6 Discussion, conclusions, and future research

This study sought to examine the predictors of intentions to use ride-hailing services while traveling using a delimited sample of US and Chinese college students as a proxy for millennial consumers. Overall, the research framework revealed that the perceived value, composed of the price, quality, and relational value, was positively related to intentions to use ride-hailing services. The findings indicated that price and relational values determine intention to use ride-hailing services, supporting Hypotheses 1 and 3. These results are consistent with other sharing economy findings (Guttentag et al. 2017; Tussyadiah and Pesonen 2018), which show that economic (price value) and social appeals (relational value) are important benefits. Our findings are also aligned with the results of other studies with a focus on millennials (Bernardi 2018; Schiopu et al. 2016; Veiga et al. 2017), in that millennial travellers are susceptible to economic value and social influences.

On the third component of perceived value, quality value was found to be different across the two samples. For the US millennial sample, quality value is an important determinant to intentions to use ride-hailing services, supporting Hypothesis 2. For the Chinese millennial sample, quality value did not influence their intentions to use ride-hailing services, thus Hypothesis is partially supported. Overall, perceived value is a strong determinant in predicting intentions to use ride-hailing services after controlling for influences of technology use, perceived safety, and perceived regulatory environments. The results support Hypothesis 4.

6.1 Theoretical implications

Theoretically, the research extended the body of literature on the perceived value framework for innovative, disruptive products by incorporating significant consumer behaviour variables. First, relational value was added to the conceptual framework, given that the sharing economy delivers service experiences that other conventional businesses do not readily offer (Tussyadiah and Pesonen 2018). By examining the relationship between drivers and travellers, the research results discovered that the relational value had a significant positive association with travellers' intentions to use ride-hailing services at destination. The findings demonstrated that perceived value of the social interaction between drivers and passengers, through the effective peer-to-peer communication, influenced decision making to use intentions to use ride-hailing services in a travel context. This finding is new and significant to defining sharing economy and mobile technology applications, particularly with millennials.

A second theoretical implication is this study found that price value significantly influenced intentions to use ride-hailing services, a finding that further supports past research that has shown that saving money was one of the most common benefits of the sharing economy products and services among millennials (Amaro et al. 2018; Godelink 2017). Another interpretation of this finding might be that behavioural intentions are facilitated by two types of price value: one is the monetary value such as the affordable price and free parking in the metropolitan city area, and the other is the functional value, which includes easy payment and short wait times.

A third theoretical implication is that this is the first study within tourism research that has measured intentions to use ride-hailing services across two countries. Given that ride-hailing is a global phenomenon and used at home and with travel in-country and globally, further research is needed that is cross-cultural. By comparing perceived value framework between developed and emerging countries, the current study presented that predictors of intentions to use ride-hailing were different across these selected countries. The research findings uncovered that the perceived value framework remained robust after controlling for the influences of other variables. Both extensions of the perceived value framework provided valuable knowledge that would otherwise be unknown. The results illustrated that predicting intentions to use a new alternative transportation mode was a complicated task.

6.2 Managerial implications

Practically, this study holds several important implications for ride-hailing companies and drivers. The current study demonstrated that millennials wanted more value with less cost. Millennials were likely to build relational value with drivers and provided ratings or feedback to ensure service expectations and performance. The positive association between price and relational value remained largely intact after controlling for other variables, that is, previous experiences with mobile apps, perceived safety of ride-hailing services, and regulatory environment of each country. Safety was perceived to be critical in both countries. These results implied that the success of ride-hailing services relies heavily on the provision for consumer protection and safety. Failure to ensure safety standards may negatively affect the use intentions of ride-hailing. In response to concerns over safety controls, ride-hailing companies could set more stringent requirements, including pre-screening drivers, checking driving records, and inspecting vehicles. Ride-hailing companies might need to improve efforts in providing reliable, consistent, and safer ride sharing services for tourists.

The current study also disclosed that the relationships between perceived value and use intentions were viewed to be different between the United States and China. More specifically, quality predicted use intention of US millennials in our sample, but not Chinese millennials. The US millennials studied perceived value when there was a balance between quality and price. By contrast, the Chinese millennials studied who used ride-hailing services focused on price value when they decide to use it

for travel. Sharing economy firms must recognize that a management model in one-country may not translate to another country.

The findings of this study provided additional managerial implications for the marketing and management of ride hailing service companies. The US millennials studied exhibited that the regulatory environment was a critical factor in determining their intentions to use ride-hailing services, whereas their Chinese counterparts studied did not. Recently, ride-hailing companies like Uber or Lyft have been criticized for violating regulations for transportation services regarding a lack of training of drivers, invalid licenses, unsafe driver behaviours, or poor vehicle maintenance in the United States. Unregulated businesses could negatively impact travellers' intentions to use of the ride hailing services while traveling. Consequently, ride-hailing businesses in the United States should improve service quality and make a commitment to the public safety through continuous monitoring.

Furthermore, this study identified that, among Chinese millennials studied, previous experiences with mobile technology were positively associated with intentions to use ride-hailing services while traveling. Any incentives to trigger the use of mobile technology could appeal to the Chinese market, given that the Chinese millennials studied were likely to use ride-hailing services as they get familiar with using mobile devices. For example, many ride-hailing apps in China provide subsidies to both passengers and drivers to increase market share. The subsidies have increased the number of ride-hailing users (Wang et al. 2016). As aforementioned, millennials are well-versed in mobile technology uses and leverage smartphone technology (Phocuswright 2016). Besides survey data on consumer decision making, consumer behaviours can also be studied with data mining of app generated data. In short, the current study implied that ride-hailing businesses could develop additional promotional strategies through the mobile app to target millennial travellers more effectively.

Our findings would be also useful to the incumbents in the tourism and transportation industry. As ride-haling becomes an alternative transportation mode for travellers, it poses threats the incumbents in the tourism and transportation industry. Our findings show that ride-hailing offers reasonable prices and provides the opportunities to develop rapports with drivers. The existing industry players have a high pressure to improve their service offerings and provide travellers with efficient transports to deal with service innovation of ride-sharing services.

6.3 Limitations and future research

Findings from the present research should be interpreted in the context of its limitations. Millennial passengers in the US and China were the target samples, however, the samples were non-probabilistic of the population. Thus, the results are exploratory in nature, and care should be taken in generalizing findings to market segments beyond the group studied in the paper.

Future research can address additional factors beyond perceived value that influence intentions to use of the ride-hailing services. The present study relies on data mainly obtained from active ride-hailing users—millennials. Prior research revealed

that there was no significant difference in terms of age between users or non-user in the sharing economy (Möhlmann 2015; Tussyadiah and Pesonen 2018), but future studies should investigate what factors influence travellers' intentions to use ride-hailing differ in other age groups. In addition, future research should examine the potential hypotheses outlined in this study in different settings, such as different countries and other sharing economy services further to test and validate the theoretical concepts.

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