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Traffic risk perception and behavioral intentions of paratransit users in Phnom Penh

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A B S T R A C T

Paratransit in Asian developing cities operates under high risk of traffic accidents because of dangerous driving behavior and use of old, poorly maintained, overloaded, and non-standardized vehicles. We explore the effects of traffic risk perception on satisfaction and behavioral intentions of paratransit users. Behavioral intentions comprised user loyalty and intention towards a new (safer and more comfortable) public transport mode. The effects were investigated using structural equation modeling based on data collected from 484 motorcycle taxi and 272 auto-rickshaw users in Phnom Penh, Cambodia, between May 13 and 20, 2016. For motorcycle taxi users, the results showed that traffic risk perception had a direct negative effect on satisfaction and positive effects on user loyalty and perception of new public transport. Users were dissatisfied with the risk of traffic accidents involving motorcycle taxi services, but tolerated the risk and would continue using the service. They were further likely to shift to the new public transport mode when that mode became available. All effects were nonsignificant for auto-rickshaw users. Feasible policy implications of our results are discussed, along with recommendations to improve paratransit safety and users' traffic risk perception.

1. Introduction

The flexibility, availability, and affordability of paratransit services are keys to their survival in Asian developing cities (Phun & Yai, 2016a). Current modes of paratransit include motorcycle taxis, auto-rickshaws, microbuses, and minibuses (Shimazaki & Rahman, 1995). However, dangerous driving behaviors and old, poorly maintained, overloaded, and non-standardized paratransit vehicles are blamed as causes of urban traffic issues such as traffic congestion, accidents, and air pollution. Furthermore, paratransit operations are mostly unregulated and profit-motived. Often, paratransit drivers—who are typically poor and low-skilled individuals—receive insufficient training, and to maximize their profits, seek out customers in a risky manner (e.g., reckless driving, speeding) and save on operating costs through minimal vehicle maintenance (e.g., re-use of bald tires). Additionally, drivers work longer hours per day under various weather conditions, which in turn intensify the risk of traffic accidents due to tiredness and weather factors. With these strategies, paratransit drivers can offer a certain level of service quality with an affordable fare to customers, while also maintaining sufficient daily demand to support their own living. However, what paratransit users fear most is the risk of traffic accidents (Cervero, 2000).

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Traffic accidents are serious social problems that have detrimental impacts on human health as well as lead to high medical expenses, production loss, and property damage (Wegman, 2017). They often pose a greater problem in Asian developing countries because of the rapid rate of motorization and other factors. Road fatalities are more likely to occur among riders of motorized 2-/3-wheelers than among any other road users—in particular, 71.0% of road user fatalities in Cambodia, 67.0% in Laos, 73.0% in Thailand, and 53.0% in the Philippines occur among users of these vehicles (WHO, 2015). This is possibly because paratransit with 2-/3-wheelers (e.g., motorcycle taxis and auto-rickshaws) are the most dangerous modes of paratransit. While these small-sized vehicles seem to satisfy many users because of their ability to penetrate traffic congestion and narrow urban streets at a considerable speed, they also have a higher risk of traffic accidents because their drivers tend to exhibit more dangerous driving behaviors, including driving errors and frequent lane changes (Olawole, Ajala, & Aloba, 2010). Furthermore, compared to auto-rickshaws, motorcycle taxis are more dangerous because they move along city streets without a so-called "protective shell" (WHO, 2009).

Users' choice of paratransit mode for safely arriving at a destination is closely linked with the level of traffic risk that they perceive. For instance, individuals who feel unsafe with motorcycle taxi service might choose a safer alternative, could simply cancel the whole trip, or might accept the traffic risk when necessary. Following implementation of modern mass transit systems (e.g., bus rapid transit, urban railways), however, the future of paratransit services is uncertain, and largely relies on users' behavioral intentions. Behavioral intentions are defined as signals that indicate whether a paratransit user will repeat patronage or shift to a different mode (Zeithaml, Berry, & Parasuraman, 1996). Users who perceive that paratransit services are of good quality are likely to be highly satisfied with these services, and thus would continue to use them (Lai & Chen, 2011). Conversely, those who perceive paratransit to be associated with greater risk of traffic accidents would likely be dissatisfied with the services, and would therefore shift to a safer public transport mode. To this end, the traffic risk perceived by users (hereafter known as "traffic risk perception") is a key factor influencing user satisfaction and behavioral intentions.

Traffic risk perception refers to a subjective assessment of the risk associated with a traffic situation (Deery, 1999). Researchers regard traffic risk perception as an important concept in road traffic safety studies aiming to devise countermeasures for reducing the number of traffic accidents (Nordfjærn & Rundmo, 2009). Traffic risk perception is also considered as one of the most critical aspects of public transport operations because of how it helps sustain ridership (Joewono & Kubota, 2006). Numerous studies have been conducted on traffic risk perception and traffic safety among general road users (e.g., Dejoy, 1989; Hongsranagon, Khompratya, Hongpukdee, Havanond, & Deelertyuenyong, 2011; Hughes, Anund, & Falkmer, 2016; Vanlaar & Yannis, 2006), but rather few have examined these among public transport operators/passengers, especially in Asian developing countries (Phun & Yai, 2016a). For example, Joewono and Kubota (2006) formulated the safety and security improvement agenda (i.e., technology, management, and institution) based on subjective data from microbus (i.e., *Angkot*) drivers and users in Indonesia. In Thailand, Tangphaisankun, Okamura, and Nakamura (2009) explored how users' satisfaction with the safety and security of motorcycle taxi and microbus (i.e., *Songtaew*) services influenced their use of these modes as feeders to the mass transit system as well as on their use of the mass transit services in general. They found that greater satisfaction with the safety and security of motorcycle taxis and Songtaews increased individuals' use of them as feeder services as well as their use of mass transit. However, there appear to be no studies examining the effects of traffic risk perception on the satisfaction and behavioral intentions of paratransit users.

This paper explores the potential effects of traffic risk perception on paratransit users' satisfaction and behavioral intentions in an Asian developing city. We assumed that behavioral intentions comprise "user loyalty" and "intention to shift to a new public transport mode when that mode becomes available." The effects were investigated using structural equation modeling based on data collected from paratransit users in Phnom Penh, Cambodia. This study contributes to the limited literature on this topic by adding knowledge of how users would react to the perceived risk of traffic accidents involving paratransit services, and how users would view a new public transport mode in terms of traffic risk. From these results, we offer feasible policy implications and recommendations on how to improve paratransit safety and users' traffic risk perception.

2. Theoretical background and hypotheses

2.1. Behavioral intentions

Behavioral intentions refer to the possibility that an individual will engage in a certain behavior. According to the theory of planned behavior, behavioral intentions are important indicators of customers' future behaviors (Ajzen, 1991). Numerous researchers have regarded favorable behavioral intentions as measures of customer loyalty because it is difficult to directly define and measure customer loyalty (Yang & Peterson, 2004). Marketing researchers have typically viewed customer loyalty as the intention to carry on a liaison with a service provider or repurchase a service or product with that provider. It further refers to an intention to recommend or promote a service to other people (Lai & Chen, 2011). However, this line of thinking has been criticized because intention does not always lead to action, and repeated purchasing behavior does not always reflect the intention. Indeed, transport research has shown that repeatedly using a transit service cannot alone be indicative of customer loyalty (TRB, 1999). In fact, users might repeatedly use a transit service because of necessity, convenience, or habit. When a new transport mode becomes available, they might quickly shift to using that mode. For these reasons, customer loyalty must be reflected by a combination of attitudes and behaviors, which includes an intention to use the service again, a willingness to recommend the service to other people, and a disinterest in or a general resistance to alternative modes of transport when such modes are available (TRB, 1999). In this study, we incorporate two separate measures of behavioral intentions: user loyalty, which refers to users' intentions to continue using the current paratransit services and to recommend the services to other people, and perception of new public transport, which refers to a user's intention to shift from the current paratransit modes to a new mode with better services (e.g., safer and more comfortable) when it becomes available.

2.2. Satisfaction

Satisfaction has a diverse range of definitions. For instance, it can be defined as "a cumulative construct that is affected by market expectations and performance perceptions in any given period and is affected by past satisfaction from period to period" (Jonhson, Anderson, & Fornell, 1995), as "an overall positive or negative feeling about the net value of services received from a supplier" (Yang & Peterson, 2004), or as "an overall affective response to a perceived discrepancy between prior expectations and perceived performance after consumption" (Lai & Chen, 2011). Nevertheless, there are two popular conceptualizations of satisfaction (Jonhson et al., 1995): transaction-specific satisfaction (i.e., on the individual-level) and cumulative satisfaction (i.e., consumers' total consumption experience). Since service quality and satisfaction can be used interchangeably (Lai & Chen, 2011), we refer to service quality as cumulative satisfaction, or users' overall impression of paratransit service performance. Cumulative satisfaction is also believed to be a better predictor of user loyalty (Yang & Peterson, 2004) than is transaction-specific satisfaction. Satisfaction typically reflects short-term assessments, while loyalty reflects users' long-term attitude and commitment towards the service (Shiftan, Barlach, & Shefer, 2015). Previous studies have continuously found that satisfaction has significant positive effects on user loyalty (e.g., Joewono & Kubota, 2007). Furthermore, satisfied users are more likely to repeat service usage and recommend the service to other people. Accordingly, it is important for transit operators to monitor customers' satisfaction and implement satisfactory countermeasures to maintain ridership.

2.3. Traffic risk perception

Following notable increases in traffic accidents, traffic risk perception among general road users has become a topic of interest. In particular, traffic risk perception is an important aspect of road safety campaigns because it can help to identify risk factors that can be used to improve risky driving behaviors (Nordfjærn & Rundmo, 2009). Driving behaviors are a major cause of traffic accidents (Ulleberg & Rundmo, 2003), and it is believed that one can modify such behaviors through alteration of the drivers' traffic risk perception (Rundmo, 1999). For example, drivers who perceived a higher risk of traffic accidents might take preventive measures (e.g., speed adjustment, seatbelt or helmet strap usage) to minimize the traffic risk (Deery, 1999; Hongsranagon et al., 2011).

For public transport services, providers face the challenge of maintaining passenger demand while also trying to attract more passengers (Joewono & Kubota, 2006). Promoting the perception that riding on public transport mode is safer might be a good service feature for attracting passengers to that mode. In developed countries, transit operators are required both to ensure the safety of their passengers and to maintain passengers' perception of the mode as safe (TRB, 2001). This is because traffic risk perception is regarded as having a negative influence on passengers' satisfaction and future ridership (Tangphaisankun et al., 2009). However, passengers might have rather different thresholds of traffic risk. They are likely to continue to use a transit service (user loyalty) when the levels of their perceived traffic risk remain below these thresholds (i.e., risk acceptance); however, they might give up their patronage or shift to a safer public transport mode (i.e., risk aversion) when the levels of risk exceed the thresholds (Kahneman & Tversky, 1979). Generally, paratransit users perceive greater traffic risk than do mass transit passengers, likely because the safety of both paratransit users and drivers has been compromised for operators' benefits (Kumar, Singh, Ghate, Pal, & Wilson, 2016). To this end, an assessment of passengers' traffic risk perception would be essential because it could allow transit/paratransit operators to introduce more appropriate safety countermeasures in order to sustain the demand for transit/paratransit services.

2.4. Hypotheses

By combining the findings from past studies, we propose a conceptual structural equation model (illustrated in Fig. 1) within the context of paratransit in developing cities. We explore the causal relationships among traffic risk perception, satisfaction, and behavioral intentions (i.e., "user loyalty" and perception of "new public transport") of paratransit users. The hypothesized causal relationships are as follows.

H1. Satisfaction has a positive effect on user loyalty. This is because satisfied users are expected to have a higher usage level of paratransit services than are dissatisfied users.

H2. Traffic risk perception has a negative effect on satisfaction. This is because users would have lower satisfaction when they perceived a higher risk of traffic accidents involving paratransit services.

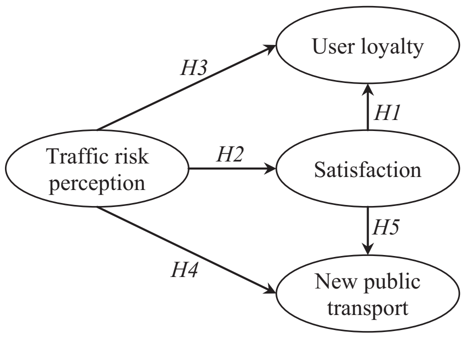

Fig. 1. Conceptual model of traffic risk perception, satisfaction, and behavioral intentions.

H3. Traffic risk perception has a negative effect on user loyalty. This is because perceiving a paratransit mode as unsafe would reduce users' intention to continue using that mode.

H4. Traffic risk perception has a positive effect on perception of new public transport. This is because users who perceive a high risk of traffic accidents for their current paratransit services would shift to using a new service when that service became available.

H5. Satisfaction has a negative effect on perception of new public transport. This is because users who were satisfied with the current paratransit services would have less intention to shift to the use of a new public transport.

2.5. Structural equation modeling

Structural equation modeling (SEM) is a multivariate regression technic that allows us to examine the theoretical model by testing hypotheses, in order to better understand the causal relationships among interested variables. SEM contains both observed (i.e., indicator) and unobserved (i.e., latent) variables. The subjective response to a Likert-scaled item, ranging from "1: very unlikely" to "5: very likely" is an example of an observed variable. In research methodology, the observed variables are used to measure unobserved variables—that is, researchers can reduce the number of observed variables into a fewer number of latent variables by examining the covariation among the observed variables (Schreiber, Nora, Stage, Barlow, & King, 2006). Graphically, researchers use a rectangle to designate the observed variable and an oval to designate the latent variable in SEM. In addition, the direct effect of one variable on another is denoted by an arrow, explaining the causal relationship between the two variables.

In this study, we develop four latent variables (i.e., traffic risk perception, satisfaction, user loyalty, and new public transport) and explore the causal relationships among them (i.e., *H1–H5*). Questionnaire survey is designed to get sufficient indicators for measuring these latent variables. We use the covariance analysis method (i.e., method of moments) to estimate the conceptual SEM in Fig. 1. We also use four common indices to assess the model fit: the ratio of chi-square to the degrees of freedom (χ^2/d.f.), the root mean square error of approximation (RMSEA), goodness-of-fit index (GFI), and adjusted GFI (AGFI). The model fit refers to the degree to which the sample variance-covariance data fit the model. A good model fit is indicated by the following standards: χ^2/d.f. < 5, RMSEA < 0.08, GFI > 0.9, and AGFI > 0.9 (Hair, Anderson, Tatham, & Black, 1998; Hooper, Coughlan, & Mullen, 2008). It should be noted that the minimum sample size of 200 is reported to be adequate and satisfactory in the SEM analyses (Golob, 2003; Hooper et al., 2008).

3. Case study

3.1. Survey

Phnom Penh, the capital city of Cambodia, has 678.5 km^2 of land area and a total road length of 1379 km. It was estimated to have 2.1 million inhabitants in 2016, and the GPD per capita was 981 USD in 2009 (JICA-PPUTMP, 2014). The current urban public transport modes are public bus, *Motodop*, *Remork*, long-tailed Remork, taxi, and *Cyclo* (Phun & Yai, 2016b). In 2014, the public bus was introduced on several major roads (covering a total length of 54 km; Fig. 2). As such, the bus service is rather new and makes up just a fraction of the existing road network. Since the bus operates in mixed traffic and moves at a relatively slow speed (approximately 10 km/h), the expected wait time at a bus stop is unknown. Since September 2017, the bus service has been expanded to ten routes, covering several parts of the city (total length of 148 km). However, the bus is likely to have little appeal to general citizens because many still prefer door-to-door trips (Phun, Pheng, & Yai, 2015).

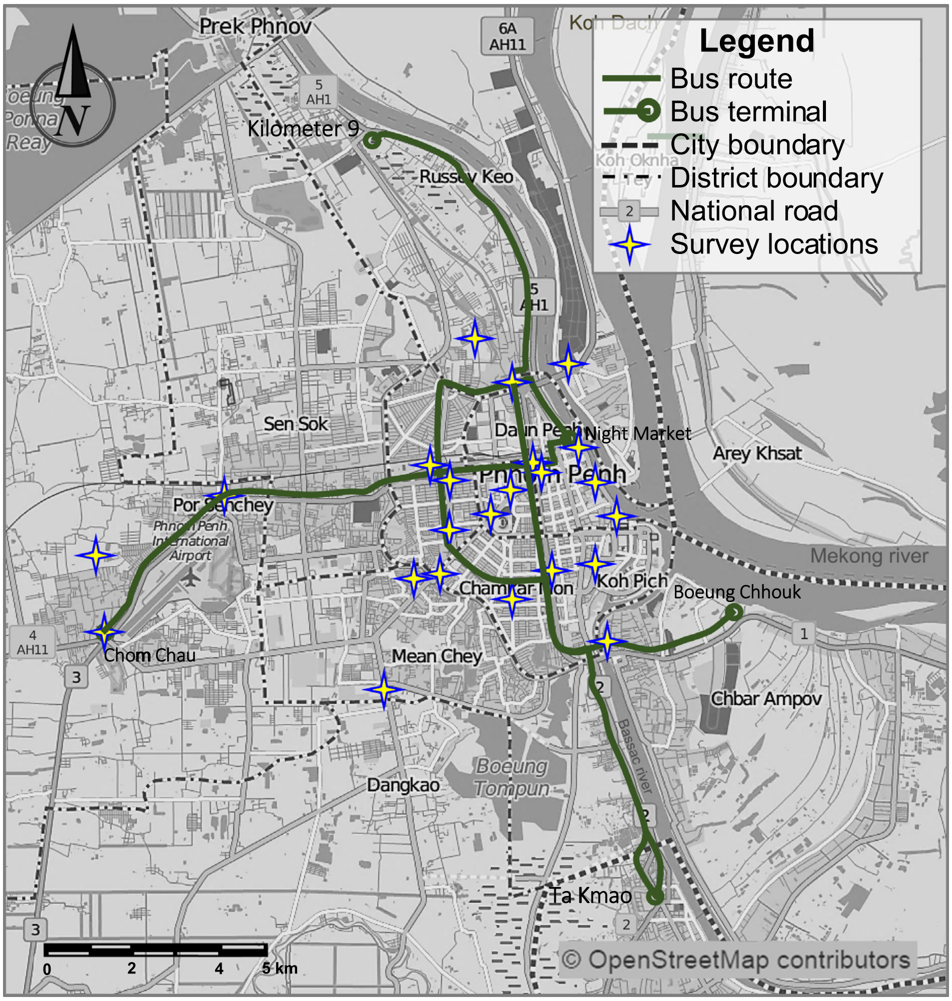

Fig. 2. The survey locations in Phnom Penh.

The Motodop, or motorcycle taxi, can typically carry a maximum of two adults and one child. The Remork is an auto-rickshaw type of vehicle (holding between 2 and 6 passengers), which is sometimes called a three-wheeler or *Tuktuk,* despite being a four-wheeled vehicle. We focused on Motodop and Remork users, as these are the most popular and active transport modes in Phnom Penh. These modes provide flexible, informal, and door-to-door transport services to general citizens up to 12 h per day with non-fixed routes and timetables, non-shared rides, and unregulated fares. Further details on the operational characteristics of the Motodop and Remork services can be found in Phun, Lim, and Yai (2015).

A questionnaire survey was conducted with actual users of Motodops and Remorks in Phnom Penh, May 13–20, 2016; questionnaires were administered via interviews by 11 surveyors trained to fully understand and administer the questionnaire. We initially wrote the questionnaire in English and later translated it into Khmer, after which we performed a pilot test to ensure consistency between the English and Khmer versions. The questionnaire contained six parts. Part 1 asked users about their general experiences with the Motodop/Remork services. Part 2 asked them to provide subjective experiences of the transport services provided by Motodops/Remorks and their overall satisfaction with the services. Part 3 inquired about users' experiences with violating traffic rules and traffic accidents while riding Motodops/Remorks as well as their perceptions of the traffic safety of the services. Behavioral intentions towards the future use of Motodops/Remorks and a new public transport mode were inquired in Part 4 and 5, respectively. Finally, Part 6 asked them to provide personal information. All items asking about their subjective experiences were based on a 5-point scale (1: very unlikely, 2: unlikely; 3: neither, 4: likely, and 5: very likely) (Dawes, 2008).

Fig. 2 shows the survey locations in Phnom Penh. The surveyors visited common destinations such as markets, intercity bus terminals, and sightseeing places to collect the data. The sample size was not pre-determined—it depended on the number of respondents recruited during the survey timeframe. Simple random sampling was adopted: surveyors did not request every person they met to join the survey. They initially observed and then verbally confirmed whether a targeted person travelled by Motodop or Remork on a given day. Although the surveyors asked approximately 1000 people, only 791 users voluntarily participated in the survey. The actual interview took place along the streets at suitable locations for interviewing, such as in front of markets or under trees. Respondents were recruited with an incentive gift (i.e., a scarf). On average, it took 20–25 min to complete the questionnaire.

3.2. Data

After screening the data, we found that only data from 756 respondents were usable for analyses. The general characteristics of respondents are reported in Table 1. Respondents were aged 16–73, and were an average of 31.4 years old. The majority were female (72.8%), married (53.4%), and had monthly income of 400 USD or less (91.0%).

Respondents were requested to freely provide up to five major reasons that they had chosen to travel by Motodops/Remorks on the day of the interview. We obtained 1077 mixed responses from the 751 respondents, which were then classified into the categories shown in Fig. 3. More specifically, Motodops were chosen because of no choice (70.1%), convenience/availability (11.5%), fast speed (10.1%), and cheap fare (3.8%), among other factors. In contrast, Remorks were selected because of no choice (42.2%), transport capacity (21.1%), comfort (12.1%), convenience/availability (9.2%), and safety (9.0%), among other factors. The "no choice" category comprises the categories of "no other public transport modes available," "do not own a vehicle," and "no one to drive them."

The frequency of riding Motodops and Remorks per week was as high as 70 (average of 7.83) and 28 (average of 4.40) times, respectively. Among all respondents, 8.6% had 1–8 experiences of a Motodop driver being fined by traffic police (equivalent to 13.4% of Motodop users), and another 2.1% had 1–3 experiences of Remork drivers being fined (equivalent to 5.9% of Remork users). These fines were given when Motodop/Remork drivers violated the traffic rules; in other words, the drivers deviated from the accepted procedures and standards, which are possible causes of traffic accidents. Relatedly, 8.3% of Motodop users reported having experienced 1–10 traffic accidents. Among Remork users, 4.8% reported experiencing 1–3 traffic accidents, and another 0.4% had experienced up to 8 accidents.

Respondents were further asked to evaluate eight factors that could possibly lead to traffic accidents using a 5-point scale (1: very unlikely, 2: unlikely, 3: neither, 4: likely, and 5: very likely). The factors were then ranked according to mean scores, as follows: dangerous driving behavior of Motodop/Remork drivers (4.08), big trucks in the city (4.06), low awareness of other road users (3.96), poor traffic law enforcement by authorities (3.88), poor infrastructure for general traffic flow (3.54), poor environmental conditions along the roads (3.46), low quality of Motodop/Remork vehicles (2.95), and low awareness of Motodop/Remork users (2.53). The first four factors were of greatest concern to Motodop/Remork users in terms of traffic risk. Thus, minimal safety policies/regulations related to these factors should be considered to reduce the risk of traffic accidents involving Motodop/Remork operations.

3.3. Measurement models

Table 2 reports the summary statistics of the potential latent and contextual variables of the model shown earlier. Each latent variable was operationalized using at least four indicators, and each indicator represents a questionnaire item

Table 1
Descriptive statistics of respondents.

Items	All users (*N* = 756)	Motodop (*N* = 484)	Remork (*N* = 272)
Male	27.2%	28.7%	24.6%
Married	53.4%	58.3%	44.9%
Rental house	50.0%	55.8%	39.7%
Own a car/motorcycle	50.3%	58.8%	52.9%
Occupation			
Student	21.0%	16.7%	28.7%
Self-employed	35.1%	42.1%	22.4%
Employee/staff	13.2%	11.8%	15.8%
Worker	17.6%	18.4%	16.2%
Housewife	9.1%	7.4%	12.1%
Others	3.7%	3.4%	4.4%
Missing	0.3%	0.2%	0.4%
Monthly income (USD)			
No income	23.9%	17.4%	35.3%
1–100	13.3%	13.2%	13.2%
101–200	25.1%	28.5%	19.1%
201–400	28.7%	32.4%	22.1%
401–600	5.0%	4.5%	5.9%
$\geq$601	1.8%	1.9%	1.8%
Missing	2.2%	2.1%	2.6%

1.0 USD = approximately 4000 KHR.

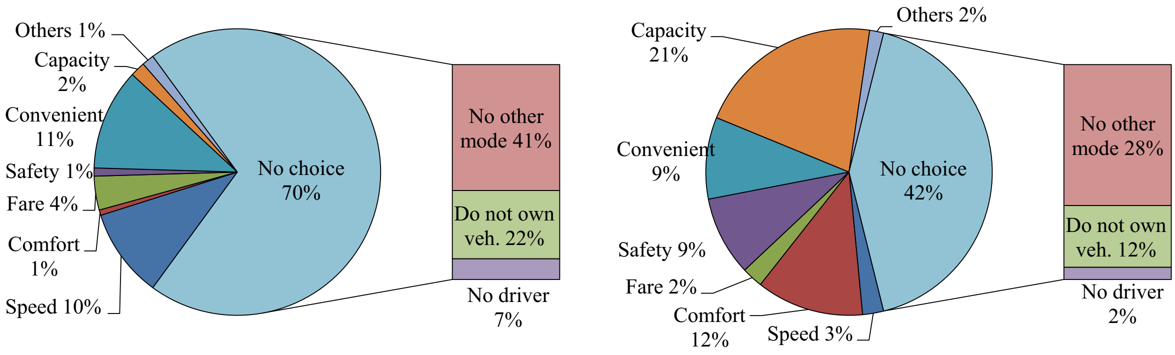

Fig. 3. The reasons that respondents chose to travel by Motodop (left) and Remork (right).

answered by Motodop/Remork users on a 5-point scale (1: very unlikely, 2: unlikely, 3: neither, 4: likely, and 5: very likely). In particular, we newly proposed four indicators to measure traffic risk perception, and we used existing indicators found in literatures to measure other latent variables.

User loyalty was measured using four subjectively rated questionnaire items. Respondents were first provided with two cases (Joewono & Kubota, 2007; Lai & Chen, 2011): in the first case, the paratransit service was running as usual, and in the second case, there was an improvement to the service. The respondents were then asked whether they would use the Motodop/Remork services in the future and whether they would recommend the services to others for these two cases. For example, respondents answered based on the 5-point scale to the questionnaire items "I will use Motodop/Remork when its service runs as usual (Loyalty1)" for the first case and "I will recommend Motodop/Remork to others when improvements are made to its service (Loyalty4)" for the second case.

Satisfaction was measured using six items. The first three items (Satisfy1 to Satisfy3) concerned user satisfaction with the overall performance of the Motodop/Remork services, drivers, and vehicles. The remaining items (Satisfy4 to Satisfy6) assessed satisfaction with the fare, speed and reliability, and freight transport of the Motodop/Remork services. According to the results of a Welch's *t*-test, Remork users had significantly higher satisfaction scores (except Satisfy4) than did Motodop users ($p < 0.01$). This suggests that users were more satisfied with the Remork service.

There are no standardized questionnaire items for measuring traffic risk perception for general road users (e.g., Dejoy, 1989; Nordfjærn & Rundmo, 2009; Olufikayo & Grace, 2014; Vanlaar & Yannis, 2006). Therefore, we developed four items to measure the traffic risk perception of Motodop/Remork users. The first item (Risk1) related to users' perception of the high risk of traffic accidents when using Motodop/Remork services—that is, "I feel that there is a high risk of traffic accident when riding Motodop/Remork". The second item (Risk2) concerned risk communication between users and drivers—that is, "I often warn Motodop/Remork drivers to driver more carefully". When users perceived a high risk of a traffic accident for a given traffic situation, they might directly warn the drivers (e.g., "Please slow down" or "Drive more carefully"). This communication helps to minimize users' perception of traffic risk. The third item (Risk3) addressed users' direct and indirect experiences with traffic accidents when riding Motodops/Remorks. A direct experience refers to traffic accidents experienced by users themselves in the past, while an indirect experience refers to traffic accidents that users had heard from other users or the news. The question for this item is "Motodop/Remork operations often cause traffic accidents". The fourth item (Risk4) concerned the assessment of the overall perceived safety of Motodops/Remorks (Olawole et al., 2010). More specifically, Risk4 measures the perceived safety (the opposite of perceived risk) of a given service, and thus it is expected to have a negative effect on traffic risk perception (the opposite of other risk items). The questionnaire item for Risk4 is "Overall, Motodops/Remorks are safe from traffic accidents". The results of Welch's *t*-tests indicated that Motodop users perceived higher traffic risk than did Remork users ($p < 0.01$), implying that riding the Remork is perceived as safer than is riding the Motodop.

Finally, perception of the new public transport was measured using four items (NewPT1–NewPT4). The first item (NewPT1) was presented to respondents at the end of Part 4 of the questionnaire. This item was designed to measure respondents' general tendency to use a new public transport mode that is safer than Motodops/Remorks and more flexible than the current public bus in terms of scheduling and stops. However, no specific transport mode was mentioned. Approximately 80.0% of respondents thought that the citizens of Phnom Penh would need a new mode of public transport (i.e., they rated the item with a 4 or 5). Then, in Part 5 of the questionnaire, respondents were requested to imagine the new public transport with a statement of "Suppose that there is a new public transport service in Phnom Penh called the passenger van (11–16 passengers), which is safer and more comfortable than Motodops/Remorks. This passenger van operates on a fixed route from nearby your home to this location, and you can get on/off anywhere along the service route." Rather than relying on respondents' imagination, we presented interior and exterior images of the passenger van to respondents. After that, they were asked to answer items NewPT2 to NewPT4 in Table 2. The average scores for these items were relatively high (4.04 or more), which suggests that respondents had a strong intention to use the new passenger van service.

Table 2
Summary statistics of potential model variables.

Questionnaire items (Abbreviation)	Mean SD	All users	Motodop	Remork	Welch's *t*-test[b]
Latent variables[a]:					
User loyalty					
I will use Motodop/Remork when its service runs as usual (Loyalty1)	Mean	3.63	3.62	3.64	−0.45
	SD	0.83	0.84	0.80	
I will recommend Motodop/Remork to others when its service runs as usual (Loyalty2)	Mean	3.29	3.24	3.39	−2.04[*]
	SD	1.02	1.04	0.99	
I will use Motodop/remork when improvements are made to its service (Loyalty3)	Mean	4.39	4.38	4.42	−0.65
	SD	0.67	0.66	0.69	
I will recommend Motodop/Remork to others when improvements are made to its service (Loyalty4)	Mean	4.06	4.04	4.11	−1.21
	SD	0.77	0.76	0.79	
Satisfaction					
I am satisfied with the overall transport services of Motodop/Remork (Satisfy1)	Mean	3.67	3.52	3.95	−7.70[**]
	SD	0.79	0.79	0.70	
I am satisfied with the behaviors of Motodop/Remork drivers (Satisfy2)	Mean	3.59	3.50	3.74	−3.86[**]
	SD	0.83	0.84	0.80	
I am satisfied with the general characteristics of Motodop/Remork vehicles (Satisfy3)	Mean	3.63	3.52	3.81	−4.83[**]
	SD	0.80	0.81	0.75	
Motodop/Remork fares are cheap (Satisfy4)	Mean	3.18	3.14	3.25	−1.39
	SD	1.05	1.07	1.02	
Motodops/Remorks are fast and reliable (Satify5)	Mean	3.58	3.50	3.72	−3.29[**]
	SD	0.91	0.93	0.86	
Motodops/Remorks can help me carry my belongings (Satify6)	Mean	4.05	3.87	4.38	−8.92[**]
	SD	0.84	0.86	0.70	
Traffic risk perception					
I feel that there is a high risk of traffic accidents when riding Motodop/Remork (Risk1)	Mean	3.53	3.75	3.14	6.50[**]
	SD	1.22	1.12	1.30	
I often warn Motodop/Remork drivers to drive more carefully (Risk2)	Mean	3.62	3.82	3.27	6.11[**]
	SD	1.18	1.11	1.23	
Motodop/Remork operations often cause traffic accidents (Risk3)	Mean	3.15	3.26	2.96	4.58[**]
	SD	0.85	0.79	0.92	
Overall, Motodops/Remorks are safe from traffic accidents (Risk4)	Mean	3.11	2.89	3.50	−9.97[**]
	SD	0.91	0.92	0.73	
New public transport					
Citizens require a new public transport mode, which is flexible, safe, and comfortable (NewPT1)	Mean	4.04	4.05	4.04	0.02
	SD	0.86	0.84	0.91	
It is good to have a passenger van offering a new public transport service in the city (NewPT2)	Mean	4.39	4.39	4.38	0.23
	SD	0.78	0.76	0.81	
I intend to travel via the passenger van (NewPT3)	Mean	4.34	4.38	4.28	1.55
	SD	0.79	0.75	0.86	
I will recommend others to use the passenger van (NewPT4)	Mean	4.18	4.18	4.17	0.20
	SD	0.82	0.81	0.83	
Contextual variables:					
Experienced fines by the traffic police while riding Motodops/Remorks (ExpFine)	Mean	0.21	0.26	0.11	3.15[**]
	SD	0.72	0.81	0.50	
Experienced traffic accidents while riding Motodops/Remorks (ExpAccid)	Mean	0.17	0.21	0.10	2.07[*]
	SD	0.85	0.97	0.59	
Frequency of riding Motodops/Remorks per week (FreqWeek)	Mean	6.60	7.83	4.40	6.87[**]
	SD	7.84	8.87	4.84	

[a] Indicators of latent variables are based on the 5-point scale, with most ranging from 1 to 5.
[b] For comparing differences in mean scores between Motodop and Remork users.
[*] $p < 0.05$.
[**] $p < 0.01$.

The potential contextual variables were the weekly frequency of riding Motodops/Remorks (FreqWeek), experience of fines by traffic police (ExpFine), and experience of traffic accidents (ExpAccid) while riding Motodops/Remorks. FreqWeek was expected to have a positive effect on satisfaction because more satisfied users would have a higher usage level. ExpFine and ExpAccid were expected to have positive influences on traffic risk perception. The results of Welch's *t*-tests showed that Motodops were used more frequently than were Remorks [t (755.353) = 6.87, $p < 0.001$], and Motodop users also experienced more traffic accidents and fines ($p < 0.05$).

3.4. Results

3.4.1. Goodness-of-fit

Three separate models were estimated using the data of all respondents, Motodop users, and Remork users. The corresponding estimation results are summarized in Table 3. An illustrative example of the path diagram of full SEM results for all respondents is provided in Fig. 4. The χ^2/d.f. values for all models were 2.371–4.892, making them lower than the cut-off for a good fit (χ^2/d.f. < 5). The RMSEA is an absolute fit index, and had values of 0.071–0.072; thus, they were lower than the 0.08 cutoff. The other fit indices (GFI = 0.868–0.897; AGFI = 0.834–0.870) were both slightly lower than the 0.9 cutoff. We can conclude that the overall fit of the models to the data is sufficient for examining the effects of traffic risk perception on the satisfaction and behavioral intentions of current Motodop/Remork users.

All indicators were significantly related to their latent constructs ($p < 0.01$). Further, except for the ExpFine of Remork users, the contextual variables were all significant ($p < 0.05$) with expected sign.

3.4.2. Causal effects

We tested five hypotheses (*H1*–*H5*). All of the hypothesized causal relationships (i.e., direct effects) were significant ($p < 0.05$), except for those related to *H2*–*H4* for Remork users (Table 3). The first hypothesis (*H1*), which concerned the effect of satisfaction on user loyalty, was supported by the positive and significant path between these constructs for all models ($p < 0.01$). This result indicates that the higher the satisfaction with the Motodop/Remork services, the more loyal is the user to these transport modes.

For Motodop users, we confirmed the second hypothesis (*H2*) by showing a significant negative effect of traffic risk perception on satisfaction (−0.218, $p = 0.002$). This result suggests that the higher the perceived risk of traffic accidents, the less satisfied the user would be with the Motodop service. This is plausible because traffic accidents have a negative effect on

Table 3
Estimation results of the SEMs with standardized effects.

Path			All users	Motodop	Remork
Causal relationships					
User loyalty	←	Satisfaction	0.484**	0.496**	0.466**
Satisfaction	←	Traffic risk perception	−0.304**	−0.218**	−0.096
User loyalty	←	Traffic risk perception	0.148**	0.156*	−0.015
New public transport	←	Traffic risk perception	0.211**	0.207**	0.155
New public transport	←	Satisfaction	0.184**	0.131*	0.265**
Latent constructs					
Loyalty1	←	User loyalty	*0.785*	*0.824*	*0.364*
Loyalty2	←	User loyalty	0.699**	0.685**	0.286**
Loyalty3	←	User loyalty	0.275**	0.247**	0.738**
Loyalty4	←	User loyalty	0.324**	0.268**	0.762**
Satisfy1	←	Satisfaction	*0.678*	*0.688*	*0.557*
Satisfy2	←	Satisfaction	0.578**	0.511**	0.704**
Satisfy3	←	Satisfaction	0.567**	0.552**	0.562**
Satisfy4	←	Satisfaction	0.530**	0.547**	0.503**
Satisfy5	←	Satisfaction	0.568**	0.579**	0.481**
Satisfy6	←	Satisfaction	0.342**	0.250**	0.390**
Risk1	←	Traffic risk perception	*0.717*	*0.724*	*0.748*
Risk2	←	Traffic risk perception	0.470**	0.421**	0.414**
Risk3	←	Traffic risk perception	0.426**	0.429**	0.353**
Risk4	←	Traffic risk perception	−0.404**	−0.323**	−0.244**
NewPT1	←	New public transport	0.324**	0.289**	0.375**
NewPT2	←	New public transport	*0.818*	*0.800*	*0.844*
NewPT3	←	New public transport	0.912**	0.901**	0.930**
NewPT4	←	New public transport	0.832**	0.818**	0.855**
Contextual variables					
Traffic risk perception	←	ExpFine	0.140**	0.140*	0.021
Traffic risk perception	←	ExpAccid	0.151**	0.140*	0.208**
Satisfaction	←	FreqWeek	0.196**	0.278**	0.144*
N	=		756	484	272
χ^2	=		900.074	646.162	436.327
d.f.	=		184	184	184
χ^2/d.f.	=		4.892	3.512	2.371
GFI	=		0.897	0.887	0.868
AGFI	=		0.870	0.858	0.834
RMSEA	=		0.072	0.072	0.071

Numbers in italics were constrained to one.
* $p < 0.05$.
** $p < 0.01$.

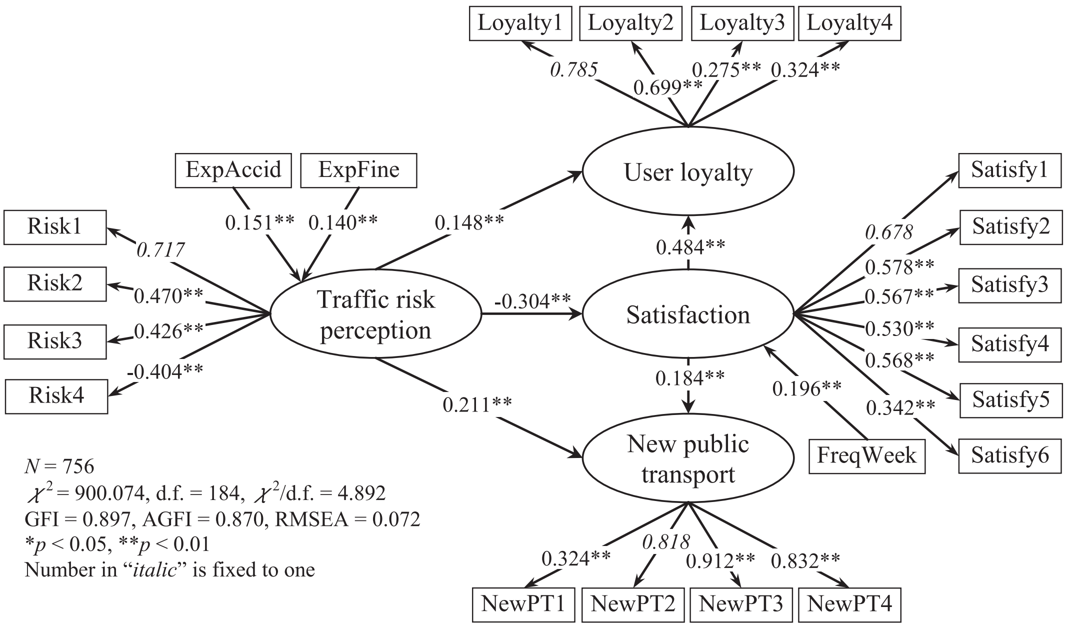

Fig. 4. Estimate results of full SEM for all respondents, with standardized effects.

subjective well-being, including satisfaction. The relationship between traffic risk perception and user loyalty (i.e., *H3*) was positive and significant (0.156, $p = 0.020$), which was opposite to what was expected. This result indicates that users were likely to continue using the Motodop service even when the perceived risk of traffic accidents was high for that service. One possible reason for this is that Motodop users who perceived higher traffic risk might have had fewer choices of transport modes. This was supported by the results of an additional analysis. First, we summed the scores of the four indicators of user loyalty (i.e., Loyalty1 – Loyalty4), and then divided the total scores into two levels: low (scores 4–11) and high (scores 12–20). The same procedure was performed for traffic risk perception (although we used the reverse score of Risk4). Next, we identified the proportions of users who chose to travel by Motodop because they had no choice. We found that a large proportion of users (63.4%) who chose to travel by Motodop because they had no other choice also had high traffic risk perception and high user loyalty scores. In Phnom Penh, the Motodop service can be found almost everywhere, whereas Remorks tend to only be available at specific places, such as major roads, major intersections, markets, and intercity bus terminals. In places where there is low availability of other public transport modes, the Motodop service tends to be riskier as Motodop drivers have less competitive service to drivers of other modes. Another possible reason is that the majority of Motodop users (51.9%) are risk-takers. Users were divided into two groups: younger (aged $\leq$ 30 years; 51.9%) and older (a ged > 30 years; 48.1%). A Welch's *t*-test showed that younger users tended to have relatively lower total scores for traffic risk perception (13.7) than did older users (14.2) [$t\,(478.309) = -2.1$, $p = 0.038$]. Thus, younger users might have underestimated the risk of traffic accidents involving the Motodop service. In particular, younger users might interpret the traffic risk less efficiently than older and more experienced users (Nordfjærn & Rundmo, 2009). To this end, users might have been more likely to continue using the Motodop service, despite their fear of traffic accidents, not because they were loyal to the service, but rather because they had limited choice of modes and were risk-takers. When a safer mode becomes available, they might quickly shift to that mode. This is supported by our results concerning the fourth hypothesis (*H4*)—namely, that the effect of traffic risk perception on perception of new public transport was positive and significant (0.207, $p = 0.002$).

For Remork users, traffic risk perception had non-significant effects on user satisfaction, user loyalty, and perception of new public transport ($p > 0.05$). This might be because users already know that Remorks are safer than are Motodops, and thus chose to use Remorks for that reason. Accordingly, they might feel less concerned about traffic risks when riding Remorks.

The fifth hypothesis (*H5*), which relates to the relationship between satisfaction and perception of new public transport, was not supported—namely, we found a positive and significant relationship between these variables for both Motodop and Remork users ($p < 0.05$). This indicates that users who were more satisfied with Motodop/Remork services also had a stronger intention to shift to the new passenger van service, which is opposite to what we expected. One possible reason for this is a need to reduce cognitive dissonance. Specifically, individuals with few available transport modes might believe that the current mode should satisfy them, even when it does not, thus generating substantial psychological stress. These individuals might thus have reported being highly satisfied with the Motodops/Remorks even when that was not true, and when offered the option of a new public transport mode, readily considered shifting to reduce the psychological stress. Another possible reason is that individuals who are strongly dissatisfied with the Motodops/Remorks might have an overall negative impression or distrust of current urban transport policy. Thus, such people might not support or accept a newly proposed public transport service. Meanwhile, individuals who are satisfied with the Motodops/Remorks might have positive attitude towards new public transport services. It should be noted that the magnitudes of the effects of satisfaction on user loyalty (Motodop: 0.496, Remork: 0.466) were rather larger than were the effects of satisfaction on perception of new public transport (Motodop: 0.131, Remork: 0.265). This could suggest that higher satisfaction with Motodops/Remorks was more strongly related to an intention to continue using Motodop/Remork services than to shift to the new passenger van service.

3.4.3. Direct, indirect, and total effects on behavioral intentions

Table 4 shows the direct, indirect, and total effects of the two determinants (traffic risk perception and satisfaction) on behavioral intentions (user loyalty and perception of new public transport) among Motodop and Remork users. The effects were estimated by using the bootstrapping technique in SPSS AMOS 22 with 2000 replications. The total effect is the sum of the direct and indirect effects. Our results show that the total effects tended to be smaller than the direct effects because the opposing signs of the direct and indirect effects tended to cancel each other out. This is known as inconsistent mediation, but nevertheless indicates that mediation is still present (Kenny, 2016). Satisfaction had only direct effects on behavioral intentions, whereas traffic risk perception had both direct and indirect effects. For Remork users, traffic risk perception had nonsignificant direct, indirect, and total effects on user loyalty and perception of new public transport ($p > 0.05$).

For Motodop users, the indirect effect of traffic risk perception on user loyalty via satisfaction is negative and significant (−0.109, $p = 0.045$). This suggests that the perceived traffic risk indirectly lessened users' intention to continue using the Motodop service by decreasing satisfaction with the service. Additionally, the indirect effect of traffic risk perception on perception of new public transport via satisfaction was significant and negative, although the effect size was small (−0.028, $p = 0.033$). This implies that users who are concerned about traffic accidents when using Motodop services are also partially concerned with traffic risk involving the new passenger van service, which leads to a reduced intention to use the van service. Moreover, traffic risk perception had a positive total effect on perception of new public transport (0.179, $p = 0.010$), but its total effect on user loyalty was nonsignificant (0.048, $p = 0.617$). This suggests that users who perceived higher traffic risk with Motodops were more likely to shift to the new passenger van service when it became available.

3.5. Discussion

For Remork users, the results showed that traffic risk perception had nonsignificant effects on satisfaction and behavioral intentions (i.e., user loyalty and new public transport). This implies that Remork operations should be left as are.

For Motodop users, the results showed that traffic risk perception had a negative effect on satisfaction and positive effects on behavioral intentions. The users who perceived higher traffic risk tended to have fewer choices of modes, which made them tolerate the traffic risk and continue to use the Motodops. This implies that minimal safety policies/regulations are required to improve the safety of Motodop operations and user satisfaction. Based on users' evaluations of the possible causes of paratransit accidents in Section 3.2, the following feasible policies/regulations might be suggested. First, additional training programs should be provided to current Motodop drivers to enhance their knowledge of general traffic rules, safe driving behaviors, etc. Second, traffic rules should be strictly enforced by authorities for all road users. Such enforcements would include increasing percentage of driving license holders, limiting operation of big trucks in the city, and employing stricter penalties for traffic violations. In particular, enforcements for Motodop operations might include the need for a professional driving license, vehicle safety inspections, and safety equipment (e.g., helmets, handles, gloves). Third, traffic safety campaigns might be regularly launched to improve the awareness of general road users of traffic risks. Such campaigns might be more active in numerous Asian developing cities, including Phnom Penh, following the global decade of action for road safety 2011–2020 (WHO, 2009). Finally, formalization of Motodop services might also help to improve users' traffic

Table 4
Direct, indirect, and total effects on behavioral intentions.

	Path		Effect	All users	Motodop	Remork
Traffic risk perception	→	User loyalty	Direct	0.148**	0.156*	−0.015
			Indirect	−0.147**	−0.108*	−0.045
			Total	0.001	0.048	−0.060
Satisfaction	→	User loyalty	Direct	0.484**	0.496**	0.466**
			Indirect	–	–	–
			Total	0.484**	0.496**	0.466**
Traffic risk perception	→	New public transport	Direct	0.211**	0.207**	0.155
			Indirect	−0.056**	−0.028*	−0.025
			Total	0.155**	0.179*	0.130
Satisfaction	→	New public transport	Direct	0.184**	0.131*	0.265**
			Indirect	–	–	–
			Total	0.184**	0.131*	0.265**

* $p < 0.05$.
** $p < 0.01$.

risk perception by ensuring more professional transport services and better driving behaviors. In 2005, Thailand became the first country in the world to regulate motorcycle taxis (Oshima, Fukuda, Fukuda, & Satiennam, 2007). The Thai regulations require license plates, fare rates, driver uniforms, pick-up stations, and sufficient control over driver behavior. Such regulations could be good practice to help minimize the risk of traffic accidents involving motorcycle taxi operations.

Furthermore, the magnitude of the effect of traffic risk perception on perception of new public transport (0.207) was larger than was that on user loyalty (0.156), implying that users had stronger intentions to use the new passenger van service. Accordingly, another possible policy/regulation to improve users' traffic risk perception would be to introduce a safer public transport mode, much like the passenger van proposed herein. Passenger vans have become a major part of many urban public transport systems (Leopairojna & Hanaoka, 2005). Passenger van services in Thailand, for example, cover the main roads between suburban areas and city centers, the routes between suburban areas, and expressways. Additionally, the passenger van can be operated as both a point-to-point service and a feeder service to a mass transit system. Because the operation of passenger vans requires relatively low capital investment, these vans might be suitable for many Asian developing cities, including Phnom Penh (Chalermpong, Ratanawaraha, & Sucharitkul, 2016). However, any attempts to introduce a new public transport service (e.g., passenger van) must be carefully considered because such a service would likely have a negative influence on existing paratransit operators (e.g., motorcycle taxi) in terms of passenger demand.

4. Conclusion

We examined the effects of traffic risk perception on satisfaction and behavioral intentions (i.e., user loyalty and perception of new public transport) of the current paratransit users in Asian developing cities. The effects were investigated using structural equation modeling and data from an interview survey of motorcycle taxi (Motodop) and auto-rickshaw (Remork) users in Phnom Penh. We found that, among Motodop users, traffic risk perception had a negative effect on satisfaction and positive effects on user loyalty and perception of a new public transport mode. All effects were nonsignificant for Remork users.

The findings indicated that users chose to travel by Remork because of their safety, among other factors—as such, they had no concerns regarding the risk of traffic accidents involving Remorks. However, users were dissatisfied with the risk of traffic accidents of Motodop services, but tolerated this risk and were likely to continue using the services because the majority of those who perceived high traffic risk tended to have limited choice of modes and be risk-takers. They were also more likely to shift to the new passenger van service when it became available. The van service was likely to be safer and more comfort than the Motodops and more flexible than the public bus.

Because of limited financial ability, many governments in Asian developing countries are unable to supply their urban areas with adequate mass transit systems in the near future. Accordingly, citizens continue to depend on paratransit as their main public transport modes. Current modes of paratransit are designed to meet local conditions and transport needs, and most appear to be operated informally and with minimal safety considerations. Nevertheless, citizens cannot simply wish away these modes because of their associated negative perceptions (e.g., risk of traffic accidents), as these modes might be the only choices available to them. When a safer, more comfortable, and comparatively more convenient mode becomes available, it is likely that citizens will shift to that mode. Accordingly, at present, minimal safety regulations should be implemented immediately to ensure the safety of current paratransit users. A better public transport mode (e.g., passenger van) should also be considered, with care being taken to discuss its impacts on existing paratransit operations.

The study of traffic risk perception for paratransit users remains in its infancy. More studies, including whether the suggested safety policies/regulations in this study actually improve traffic risk perception for both drivers and users are required to better understand traffic risks involving paratransit operations and to generalize the current research findings. Finally, a feasibility study of introducing the new passenger van service in Asian developing cities (e.g., Phnom Penh), where there are many paratransit operators, might be an interesting avenue for future research.

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Appendix A. Supplementary material

Supplementary data associated with this article can be found, in the online version, at https://doi.org/10.1016/j.trf.2018.03.008.

References

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*, 179–211.
Cervero, R. (2000). *Informal transport in the developing world*. United Nations Centre for Human Settlements (Habita): Nairobi.

Chalermpong, S., Ratanawaraha, A., & Sucharitkul, S. (2016). Market and institutional characteristics of passenger van services in Bangkok. *Transportation Research Record: Journal of the Transportation Research Board, 2581*, 88–94.
Dawes, J. (2008). Do data characteristics change according to the number of scale points used? *International Journal of Market Research, 50*(1), 61–77.
Deery, H. A. (1999). Hazard and risk perception among young novice drivers. *Journal of Safety Research, 30*(4), 225–236.
Dejoy, D. M. (1989). The optimism bias and traffic accident risk perception. *Accident Analysis and Prevention, 21*(4), 333–340.
Golob, T. F. (2003). Structural equation modeling for travel behavior research. *Transportation Research Part B, 37*, 1–25.
Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. (1998). *Multivariate data analysis*. New Jersey: Prentice-Hall.
Hongsranagon, P., Khompratya, T., Hongpukdee, S., Havanond, P., & Deelertyuenyong, N. (2011). Traffic risk behavior and perceptions of Thai motorcycle: A case study. *IATSS Research, 35*, 30–33.
Hooper, D., Coughlan, J., & Mullen, M. R. (2008). Structural equation modelling: Guidelines for determining model fit. *Electronic Journal of Business Research Methods, 6*(1), 53–60.
Hughes, B. P., Anund, A., & Falkmer, T. (2016). A comprehensive conceptual framework for road safety strategies. *Accident Analysis and Prevention, 10*, 13–28.
JICA-PPUTMP, 2014. *Project for comprehensive urban transport plan in Phnom Penh capital city (PPUTMP)*. Japan International Cooperation Agency.
Joewono, T. B., & Kubota, H. (2006). Safety and security improvement in public transportation based on public perception in developing countries. *IATSS Research, 30*, 86–100.
Joewono, T. B., & Kubota, H. (2007). User satisfaction with paratransit in competition with motorization in Indonesia: Anticipation of future implications. *Transportation, 34*, 337–354.
Jonhson, M. D., Anderson, E. W., & Fornell, C. (1995). Rational and adaptive performance expectation in a customer satisfaction framework. *Journal of Consumer Research, 21*, 695–707.
Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica, 47*, 263–284.
Kenny, D.A. Mediation. <http://davidakenny.net/cm/mediate.htm>. (Last accessed August 2016).
Kumar, M., Singh, S., Ghate, A. T., Pal, S., & Wilson, S. A. (2016). Informal public transport modes in India: A case study of five city regions. *IATSS Research, 39*, 102–109.
Lai, W.-T., & Chen, C.-F. (2011). Behavioral intentions of public transit passengers—The role of service quality, perceived value, satisfaction and involvement. *Transport Policy, 18*, 318–325.
Leopairojna, S. K., & Hanaoka, S. (2005). Market structure of passenger vans in Bangkok. *Journal of the Eastern Asia Society for Transportation Studies, 6*, 4192–4207.
Nordfjærn, T., & Rundmo, T. (2009). Perceptions of traffic risk in an industrialized and a developing country. *Transportation Research Part F: Traffic Psychology and Behaviour, 12*(1), 91–98.
Olawole, M. O., Ajala, O. A., & Aloba, O. (2010). Risk perceptions among users of commercial motorcycles in cities of southwestern Nigeria. *IFE PsychologIA, 18*(2), 253–269.
Olufikayo, A., & Grace, A. (2014). Risk perception factors and their influence on road transportation. *Journal of Transport Literature, 8*(2), 100–112.
Oshima, R., Fukuda, A., Fukuda, T., & Satiennam, T. (2007). Study on regulation of motorcycle taxi service in Bangkok. *Journal of the Eastern Asia Society for Transportation Studies, 7*, 1828–1843.
Phun, V. K., & Yai, T. (2016a). State of the art of paratransit literatures in Asian developing countries. *Asian Transport Studies* 4. 57–77.
Phun, V. K., & Yai, T. (2016b). Intention of paratransit drivers to operate as feeder service of public bus in Phnom Penh. Transport Policy Studies' Review 19, pp. 2–14.
Phun, V. K., Lim, I., & Yai, T. (2015). The characteristics of paratransit operation and fare in Phnom Penh. *Journal of the Eastern Asia Society for Transportation Studies, 11*, 1307–1327.
Phun, V. K., Pheng, P., & Yai, T. (2015). Using ordered probit modeling to assess perceived bus performance in Phnom Penh. *Journal of the Eastern Asia Society for Transportation Studies, 11*, 1155–1172.
Rundmo, T. (1999). Perceived risk, health and consumer behaviour. *Journal of Risk Research, 2*, 187–200.
Schreiber, J. B., Nora, A., Stage, F. K., Barlow, E. A., & King, J. (2006). Reporting structural equation modeling and confirmatory factor analysis results: A review. *The Journal of Education Research, 99*(6), 323–337.
Shiftan, Y., Barlach, Y., & Shefer, D. (2015). Measuring passenger loyalty to public transport modes. *Journal of Public Transportation, 18*(1), 1–16.
Shimazaki, T., & Rahman, M. M. (1995). Operational characteristics of paratransit in developing countries of Asia. *Transportation Research Record, 1503*, 49–56.
Tangphaisankun, A., Okamura, T., & Nakamura, F. (2009). Influences of paratransit as a feeder of mass transit system in developing countries based on commuter satisfaction. *Journal of the Eastern Asia Society for Transportation Studies, 8*.
TRB: Transport Research Board (1999). *A handbook for measuring customer satisfaction and service quality*. Washington, D.C.: National Academy Press.
TRB: Transport Research Board (2001). Making transit work: Insights form Western Europe, Canada, and the United States. Special Report 257, Washington, D.C.
Ulleberg, P., & Rundmo, T. (2003). Attitudes and risk perception as predictors of risky driving behaviour among young drivers. *Safety Science, 41*, 427–443.
Vanlaar, W., & Yannis, G. (2006). Perception of road accident causes. *Accident Analysis and Prevention, 38*, 155–161.
Wegman, F. (2017). The future of road safety: A worldwide perspective. *IATSS Research, 40*, 66–71.
WHO: World Health Organization (2009). Global status report on road safety: Time for action. Geneva.
WHO: World Health Organization (2015). Global status report on road safety. Geneva.
Yang, Z., & Peterson, R. T. (2004). Customer perceived value, satisfaction, and loyalty: The role of switching costs. *Psychology & Marketing, 21*, 799–822.
Zeithaml, V. A., Berry, L. L., & Parasuraman, A. (1996). The behavioral consequences of service quality. *Journal of Marketing, 60*(2), 31–46.