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Bashar S. Mohammed · Nasir Shafiq · Shamsul Rahman M. Kutty · Hisham Mohamad · Abdul-Lateef Balogun *Editors*

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Preface

This book contains papers presented in the 6th International Conference on Civil, Offshore and Environmental Engineering (ICCOEE2020) under the banner of World Engineering, Science and Technology Congress (ESTCON2020) held on 13–15 July 2021 at Borneo Convention Centre, Kuching, Malaysia. The ICCOEE series of conferences started in Kuala Lumpur, Malaysia, in 2012.

The main objective of the ICCOEE is to provide a platform for academia and industry to showcase their latest advancements and findings in the broad disciplines of civil, offshore and environmental engineering with an emphasis on the looming Industrial Revolution 4.0. The conference also provides great opportunities for participants to exchange new ideas and experience as well as to forge research and business relations with global partners for future collaborations.

The articles in this book were accepted after a rigorous review process. All accepted papers are categorized based on the following themes and areas of research:

- Green Environment and Smart Water Resource Management Systems
- Advanced Coastal and Offshore Engineering
- Resilient Structures and Smart Materials
- Advanced Construction and Building Information Modelling
- Smart and Sustainable Infrastructure

We would like to express our gratitude to the Technical Programme Committee and Advisory Committee who undertook the biggest responsibility in the paper reviewing process. We are also grateful to the additional reviewers who helped the authors deliver better papers by providing them with constructive comments. We hope that this process contributed to a consistently good level of the papers that are included in the book.

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Contents

Exploring the ride-hailing drivers' characteristics and their order rejection behavior in Bandung City

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Abstract. With the sharing economy characteristics, ride-hailing services have created a substantial number of jobs. While the number of ride-hailing drivers reached more than one million drivers in Indonesia, there still limited insight on who is the ride-hailing drivers and how their behavior in the receipt of an order from the potential passengers. This paper describes the characteristics of ride-hailing drivers as well as their travel behavior, particularly in the factors for refuse an order from the potential passengers. The study collected data using a questionnaire survey in Bandung City in 2019 that distributed to drivers of ride-hailing. The descriptive analysis shows that several segments of drivers also have other jobs among their jobs as ride-hailing drivers. MBRH drivers tend to have a lower distance to pick-up users than the CBRH. Furthermore, security reason is the highest reason to refuse the order for both of the group. At the same time, the payment method and personal characteristics of the passenger is not influenced to refusing the order.

Keywords: ICT, ride-hailing drivers, refuse order, developing countries.

1 Introduction

Indonesia has experienced significant growth in ride-hailing usage from past decades. The rise of mobility-on-demand platforms has created opportunities for cities' economy by providing new jobs for its resident. Therefore, along with the number of users, the number of drivers also rose significantly. This has created several problems for cities' mobility and the environment due to the congestion that occurs. The ride-hailing differs with taxi services only by the use of mobile applications [1]. The potential users could order a ride (car, motorcycle, etc.) through a mobile app that is given various pieces of information about drivers and trips, and the driver can respond to the order through [2, 3].

Ride-hailing has characteristics of sharing economy [4] with the drivers sharing their assets (i.e., car and motorcycle) for the services and no obligations for operators to maintain the drivers' assets. Therefore, the drivers should waive their income for assets' maintenance. There are more than one million drivers that served ride-hailing services in more than 50 Indonesian cities [5]. With the significant number of ride-hailing users and drivers, there are questions on how its implication to the city mobility and environment [1, 6, 7].

Several studies focus on investigating the implication of ride-hailing to mode-choice [6, 8], a sustainability environment [7], and to increasing vehicle kilometers travel [9]. Most of these studies were conducted from the perspective of users. However, we rarely find studies conducted from the perspective of drivers. Drivers have a substantial role in the chain decision of travel as they also could choose to accept or refuse the order, even when they will get disincentive from the operators. In the issue of the increasing empty miles travel (EMT) [9], the drivers' spatial characteristics and choice also contribute to minimizing the EMT, which consequently lowering the emission. Furthermore, the studies of ride-hailing services have mostly been conducted in developed countries, and much less attention has been given to developing countries, which have more growth of ride-hailing services and various services offered than developed. The effect of ride-hailing on increasing mobility differs between developing countries and developed countries because the former usually have poor-quality public transport and/or paratransit services as well as a lower standard of living [4].

Understanding the characteristics of the ride-hailing drivers has a vital role in managing the ride-hailing service to minimize the EMT and to improve its service for the customers. Furthermore, the investigation on the factor that influence drivers to decline the order may provide substantial insights into understanding the behavior of ride-hailing drivers and its service quality based on drivers' preference. Therefore, our objectives in this study were twofold: first, to describe the characteristics of the ride-hailing driver, and second, to describe the factors that influence drivers to refuse the order.

The remainder of the paper is structured as follows. The following section presents the research method, where the collection of data and the respondents' characteristics are described. The model estimation is shown in the next section, and this is followed by the discussion and conclusion sections.

2 Method

This study distributed questionnaires to the ride-hailing drivers in Bandung City, Indonesia. The sample size of 500 was determined from Yamane's equation [10], given that the population of Bandung was 2,481,469 [11] and assuming a 5% significance level. The sample size was upgraded to 520 to overcome the possibility of errors during the survey. The questionnaire was divided into three parts. The first part contained questions about the respondents' characteristics. The second part was related to the characteristics of their travel, covering their travel behavior, such as

travel time, length, and frequency per day. The third part is about their preference to refuse the order. In this part, the respondents were asked to identify their travel preferences when they received the order. They also had to indicate their reasons for rejecting the order from a customer (e.g., destination too far, many criminal issues in the destination, pick up place is too far, etc.). The responses were on a five-point Likert scale, where one representing "strongly disagree," and five representing "strongly agree". The questionnaire form was distributed from 26 July to 24 August 2019 after a series of reviews and revisions from a pilot survey. The final questionnaire was distributed in six administrative areas in Bandung City using face-to-face interviews in various locations (stations, offices, malls, schools, etc.). Before asking the questions, the surveyor asked, as a filtering question, whether the respondent was a ride-hailing driver or not. To proceed to the next section, only those who are a ride-hailing driver can answer the remainder of the questionnaire. The data were then evaluated based on completeness, and it was found that 492 sets (94.7%) of the questionnaire could be used for further analysis.

3 Analysis and Result

3.1 The Ride-hailing Drivers

Table 1 describes the respondents' characteristics based on ride-hailing mode use which are motorcycle-based ride-hailing (MBRH) mode (n= 394) and car-based ride-hailing (CBRH) mode (n=98). The majority of respondents are in the productive age (26-40 years old), either MBRH or CBRH drivers.

Table 1. Respondents Personal Characteristics

Variables	MBRH (%)	CBRH (%)	Chi-Square	Variables	MBRH (%)	CBRH (%)	Chi-Square
Age				**Total Income‡**			
18-25 years old	20.6	16.3	4.854	< IDR 1 mill.	3.6	4.1	100.47
26-40 years old	60.4	62.2	**	IDR 1 - 3 mill.	43.4	14.3	2
41-60 years old	19.0	20.4		IDR 3 - 6 mill.	43.9	36.7	**
> 60 years old	0.0	1.0		IDR 6 - 9 mill.	7.9	21.4	
Gender				IDR 9 - 12 mill.	1.0	20.4	
Male	98.5	94.9	4.600	> IDR 12 mill.	0.3	3.1	
Female	1.5	5.1	**	**Marital Status**			
Occupation				Married	67.5	63.3	2.127
Ride-hailing driver	74.4	61.2	21.542	Single	28.4	34.7	*
W/ student	6.6	8.2	**	Divorce/widow	4.1	2.0	
W/ entrepreneur	6.1	18.4		**Household-Structure**			
W/ civil servant	0.0	1.0		Single	28.4	34.7	9.170
W/ private employee	6.6	4.1		HW	6.1	10.2	**
W/ lecturer	0.5	1.0		HW -1 child	30.5	19.4	
W/ housewife	0.5	1.0		HW -2 child	22.6	26.5	
W/ others	5.3	5.1		HW -3 child	12.4	9.2	

W/=with also a; HW= husband-wife; ‡ IDR 14,250 equal to USD 1 (2019); *Significant at 10%, ** Significant at 5%

While most of the drivers (around 60-75%) are only have ride-hailing as their occupation, several segments of the group also have other jobs. For the MBRH drivers, 6.6% is categorized as students, similarly with private employees who have 6.6% share. On the other hand, 16% respondents who CBRH drivers are also working as an entrepreneur. Most of the total income of MBRH respondents is around IDR 3-6 million (around US$ 220-450) per month. While for CBRH drivers, 41.8% are having income per month of IDR 6-12 million (US$ 450-1000).

Furthermore, most of the drivers are married, and CBRH drivers have two children, while MBRH drivers mostly have one child. Table 1 also shows the comparative analysis between CBRH and MBRH by using chi-square statistics. Most of the personal characteristics of respondents are differ based on the type of mode. The most difference is shows by the income and household structure variables. Table 2 describes the respondents' travel characteristics consists of the respondents' home location, travel length and time, waiting time, and pick-up distance. The majority of respondents have travel distance from 5-10 km. The travel time variable of respondents shows the average at 15-30 minutes. However, for CBRH, the proportion who have travel time 30-60 minutes 34.7% while only 19.3% for MBRH.

The average pick-up distance by MBRH is lower than CBRH. 44.9% of CBRH drivers who pick up the customers from 1-2 km distance while for MBRH drivers only 29.4% for the same distance. Most drivers wait for the customer for 5-10 minutes to come. In terms of the average daily trip, CBRH drivers show a lower daily trip than MBRH. While MBRH drivers majority have daily trips more than 15 times (40.6%), majority CBRH drivers have 10-15 times daily trips (43.9%).

Table 2. Respondents Travel Characteristics

Variables	MBRH (%)	CBRH (%)	Chi-Square
Average Trip Distance			
< 5 km	19.8	29.6	10.768**
5-10 km	55.3	46.9	
11-15 km	10.9	8.2	
15-20 km	6.3	2	
20-30 km	3	6.1	
> 30 km	4.6	7.1	
Average Travel Time			
< 15 minutes	10.7	2	17.071**
15-30 minutes	69	61.2	
30-60 minutes	19.3	34.7	
60-90 minutes	1	2	
> 90 minutes	0.3	0	
Average Daily Trip			
<6 times/day	4.6	7.1	12.718**
6-10 times/day	25.9	25.5	
11-15 times/day	28.9	43.9	
>15 times/day	40.6	23.5	
Average Waiting for Passenger Come			
<5 minutes	41.1	28.6	11.400**
5-10 minutes	46.4	61.2	
10-15 minutes	6.6	9.2	
15-30 minutes	3	0	
>30 minutes	2.8	1	
Average Pick up Distance			
<1 km	61.2	49	8.741**
1-2 km	29.4	44.9	
2-3 km	8.1	5.1	
3-4 km	1.3	1	
>4 km	0	0	

*Significant at 10%, ** Significant at 5%

We performed the chi-squared test of comparison and found that the variables of occupation are significantly different between the type of ride-hailing services. In terms of travel characteristics, waiting and travel time, is also found to be significantly different across the type of service.

3.2 Reason Not Accept Order

The reason for ride-hailing drivers not accept the order is shown in Table 3. From five-point likert scale in questionnaire, we convert the scale to eight-point likert scale with 0 represent strongly disagree and 8 represent strongly agree.

Table 3. Description of Reason for Not Pick the Order

I am not accepting the order because…	Mean	Std. Dev.	T Stat [a]	I am not accepting the order because…	Mean	Std. Dev.	T Stat [a]
Too far to pick up	3.309	2.005	-0.505	Not experienced in destination areas	2.943	1.723	-0.683
Too difficult to pick up	3.516	2.063	-2.376**	Users not communicate	3.955	2.028	1.652
Destination too far from my house	3.057	1.97	0.663	Female users	1.744	1.586	0.775
Destination too far from my basecamp	2.98	1.912	-0.117	Users not using e-payment	2.549	1.708	2.237**
Destination too far	3.455	2.089	0.141	Users not polite	3.683	2.061	0.817
Destination not align with my activities	2.947	1.738	1.354	Destination has security issue	4.817	2.153	1.158
In destination no passengers	3.524	2.22	1.394	Pick up place has security issue	5.093	2.162	-0.044
Destination too difficult to access	3.447	2.019	-1.690*	Destination/pickup has high accident rate	5.138	2.16	0.081
Destination too congested	3.541	1.992	-1.161	Already achieve frequency target	3.789	1.851	-1.509
The road is broken on the way to destination	3.179	1.817	-1.344	Already achieve rating target	3.431	1.741	0.922

[a]= MBRH vs CBRH * Significant at 10%, ** Significant at 5%

From the description, it could be seen that the highest reason to decline the order is security and safety issues such as crime and accident in the destination/pick up place. However, the personal characteristics of the customers, such as gender and payment method, show the lowest scale. In terms of destination characteristics, the lowest reason to decline the order is distance from the basecamp (2.98) and home (3.05) and not align with my activities (2.94).

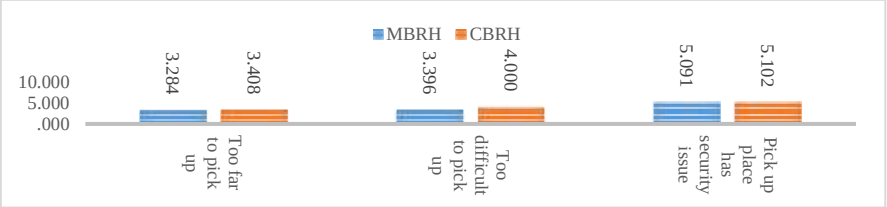

Figure 1. Preference to Not Pick Up the Order Based on Pick Up Location

The reason to decline the order also described based on ride-hailing mode (i.e. MBRH and CBRH. The description is illustrated in Figure 1 to 3. Figure 1 shows the reason not to pick up the order based on the pick-up location. It indicates that

CBRH and MBRH tend to have a similar number between all of the reasons such as too far to pick up, too difficult to pick up, and security issues in pick up place. Furthermore, figure 2 shows the comparison of reason to decline the order due to its destination characteristics between MBRH and CBRH. From the figure, it could be seen that relatively there are only slight difference between MBRH and CBRH di various reasons. However, we also found quite a different scale for several reasons. The reason that the destination difficult to access differs between MBRH and CBRH. It shows that CBRH is more influential than MBRH. In contrast, the reason no passenger in destination is found larger in MBRH than CBRH. The reason to decline the order due to low road quality to destination is found to influence more to CBRH than MBRH.

Figure 2. Preference to Not Pick Up the Order Based on Destination Location

Figure 3 shows the reason not to pick up the order based on personal characteristics. Found that when customers cannot be contacted have a larger scale to MBRH than CBRH. Similar findings for customers do not use electronic payment that found have a larger scale for MBRH than CBRH. In contrast, the reason already achieves target tend to have a larger scale for CBRH than MBRH.

Figure 3. Preference to Not Pick Up the Order Based on Other Characteristics

4 Discussion and Conclusion

The increasing usage of ride-hailing has provided opportunities for economic growth as well as a challenge for the city mobility and environment. This article tried to shed a light on comprehending the behavior of the ride-hailing drivers and their socio-demography characteristics. Several previous studies have gathered knowledge on the implication of ride-hailing to the users' travel behavior, however much less attention given to the perspective of drivers. This study examines the travel behavior from the perspective of the drivers using data from Bandung, Indonesia.

Based on the personal characteristics, the study reports that several segments of ride-hailing drivers are a part-timer and have other jobs other than being an online driver. They also tend in the productive age period with CBRH drivers tend to have a higher income than MBRH drivers. In terms of travel distance from the respondents' characteristics, CBRH and MBRH have different travel distance distribution with CBRH have a higher percentage for short-distance travel than MBRH. It most likely related to the purpose of the trip as short distance travel might be related to the specific purpose than commuting activities [4]. In addition, it is probably influenced by the number of people who travelled with as particular purposes (i.e., leisure, meeting, etc.) are performed together. Therefore, it needs a higher vehicle capacity. The issue of EMT, from the respondent characteristics, shows that MBRH has lower EMT than CBRH. As it is related to the flexibilities of place for waiting for the order that MBRH has than CBRH. The MBRH driver in Indonesia tends to wait for the order on the roadside, give more side-friction for the road capacity, and consequently lead to higher congestion. In terms of the daily trip, more trips are performed by MBRH as its demand higher than CBRH. Motorcycle has been the most popular mode with its superiority they offered, especially in Indonesia cities that have higher traffic congestion. Furthermore, it is found that the highest reason to decline the order is security and safety issues such as crime and accident in the destination/pick up place. The security issues are also related to the competition with other modes and the conventional motorcycle-taxi (CMT/ojek). In many Indonesian Cities, MBRH service does not permit to pick up/drop off the passengers in several areas due to the competition. In addition, the personal characteristics of the customers, such as gender and payment method, show the lowest scale. In terms of destination characteristics, the most inferior reason to decline the order is the distance from the basecamp and home and not align with my activities; therefore, it is least considered by the drivers.

The study indicates drivers consider many variables when accepting the order, and that shapes their behavior. In order to make efficient mobility, lower EMT, and not adding more congestion, ensuring the drivers and users' location near is important and the same as important as providing the place for the ride-hailing driver to wait as well as managing the place for users for boarding. Furthermore, in the effort to ensure safe mobility, the government also has to manage the competition among transport modes and promoting safe mobility for every mode. With the unclear regulation and ride-hailing characteristics, consolidating the ride-hailing service and other modes is crucial not only to provide safe mobility but also the integrated service and seamless transportation.

Despite the findings, this study has some limitations that could be a basis for the next research agenda. The measure of aggregate trips used in this study could not perfectly capture how drivers decide the order. An extension of choice modeling that integrated travel characteristics, attitude, negative experience would extend our knowledge on the behavior of ride-hailing users.

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