

PAPER • OPEN ACCESS

## Online Transportation Demand Model in Residential and Education area in Semarang City

To cite this article: A R Rakhmatulloh *et al* 2019 *IOP Conf. Ser.: Earth Environ. Sci.* **248** 012014

View the [article online](#) for updates and enhancements.

# Online Transportation Demand Model in Residential and Education area in Semarang City

A R Rakhmatulloh<sup>1</sup>, R S Pulungan<sup>1</sup> and D I Kusmo Dewi<sup>1</sup>

<sup>1</sup>Department of Urban and Regional Planning, Diponegoro University, Jl. Prof. Sudharto, Kampus Undip Tembalang, Semarang - 50275, Jawa Tengah, Indonesia.

anita.ratnasari.r@gmail.com

onapulungan@gmail.com

diah.intan@pwk.undip.ac.id

**Abstract** Movement of people in Semarang city have been serving by the public transport, but the service it less efficient in terms of cost and time. This condition makes people prefer to use private vehicle. On the other hand, there are progress in technology era that present online transportation service. Online transportation is considered the fastest and flexible mobility for consumers. In addition, the cost of travel is more expensive than other vehicle. The research purpose was to examine the characteristics and model of online transportation demand in residential and education area. The method is quantitative using accidental sampling techniques, which is addressed to residents of Perumnas Tlogosari and Tembalang campus area who have used online transportation. The analysis tool used are linear regression analysis. The result of this research can find demand variables for movement by transportation online in residential and education area.

*Keywords: online transportation; demand travel; residential area; education area*

## 1. Introduction

Semarang city is one of the metropolitan cities, so have higher intensity of activity and travel demand. The travel demand has been served by public transportation but the services provided are not efficient in terms of cost and time [4]. Public transportation is considered to fail at meeting the mobility needs, makes people prefer to use private transportation. This condition is caused due to the fact that the community is reluctant to use public transportation such as buying a motorcycle. Meanwhile, the rapidly growth in motor vehicle ownership in Semarang reached 12 percent per year while a road



improvement of the growth was only 0.9 percent per year. In these conditions, the capacity of the road will not be able to accommodate well with the number of vehicles that are available so there is congestions on some roads in Semarang City, especially during peak hours.

Transportation will grow as the activity grows and the wider the area to be serviced, the more transportable the movement will be. Problems such as congestion and other public transport problems start to emerge [1]. The development in the technology, present online transportation services. This mode provides motorcycle services where users do not need to go to the base camp, using only the smartphone application, the driver can come directly to the place according to the user's order. This mode is considered to provide mobility services that are fast, flexible, comfortable that can reach areas which are not easy to find public transportation. Online transportation services are chosen as there is less waiting time [5]. This is supported by Smart, Rowe, Hawken, etc, (2015) which states that ride sourcing provides services that are cheaper, faster and require a waiting time of half than normal taxi services. In addition, this service can also be tracked so that it becomes one of the advantages compared to other modes.

Online transportation serves areas with high centers of economic activity and has high densities such as urban centers (Hall & Krueger, 2016). The high use of online transportation is based on efficiency and security for users of transportation services [7]. This efficiency and security are internal factors that influence the development of online transportation. Internal factors are factors in the system that affect the development of online transportation.

Perumnas Tlogosari is one of the largest housing in the city of Semarang raising the flow of movement in the form of travel demand. The movement has been served by public transport, but nowadays people tend to use private vehicles. The presence of online transportation services makes this mode an alternative mode. Online transportation is considered to be able to answer the failure of public transport, which is fast, flexible and comfortable in the urban areas. However, the travel costs that must be incurred by users of online transportation are greater than using private transportation or taxis [6]. Even so, the demand for online transportation still exists and continues to increase. People are not able to see the cost of travel, the price of travel time and waiting time is also taken into account. This is evident from the many active users of the Gojek platform services, as many as 15 million people with 25 million transactions each week [2].

Based on these problems, it is necessary to conduct research in order to determine the characteristics and demand models for online transportation, especially in the Perumnas Tlogosari and Tembalang Education Area in Semarang City. This analysis needs to be done to find out who is the user of online transportation and the demand model of online transportation services. The demand model is used to determine what factors influence the demands for online transportation. Based on this explanation, the research question formulated is "What are the characteristics and models of demand for online transportation at Perumnas Tlogosari and Tembalang Education Area of Semarang City?".

## 2. Method

The research uses a quantitative method with accidental sampling techniques which the sample given to anyone who uses when conducting research. The sample used was 100 respondents with the criteria of the people of Tlogosari and Tembalang, who used transportation techniques. The analysis technique used is descriptive statistics and multiple linear regression using SPSS 20. Multiple linear regression can also be used to find out what factors influence in demand safety. Therefore, variable will be used to use the mode transportation within a week. While the independent variables are age, occupation, income, vehicle ownership and travel costs. The variables are as follows:

$$Y = a + b_1(X_u) + b_2(X_{pj}) + b_3(X_{pk}) + b_4(X_{kk}) + b_5(X_o) + e \quad (1)$$

where :

Y = Intensity of use mode of transportation within a week

a = constant

b<sub>1</sub>..b<sub>5</sub> = coefficient

X<sub>u</sub> = variable of age

X<sub>pj</sub> = variable of job status

X<sub>pk</sub> = variable of income per month

X<sub>kk</sub> = variable of vehicle ownership

X<sub>o</sub> = variable of travel cost

e = other variables that is not observed / detected by observer

## 3. Result

### 3.1 The Characteristics of Perumnas Tlogosari Users

The characteristics of online transportation users are reviewed based on socio-demography which of covering about sex, age, occupation, income, education, job, marital status, driver's license, and ownership vehicle. Users of online transportation at Perumnas Tlogosari are dominated by women aged 17-25 years, married, education, student, get income 1-3 millions, has driving license (SIM), and have own vehicle like a motorbike (see table 1). Refer to this results are known that group of young people more using online transportation compared the old people. This happened because the young people more getting and dominate development of technology especially smartphone, so that they often more using online transportation compared old people [3].

**Table 1.** Characteristics of online transportation users at Tlogosari Residence Semarang

Variable	%	Variable	%
Age		Job	
12-16	13%	Student	51%
		College Student/	
17-25	51%	University student	13%

26-35	20%	Housewife	2%
		Government	
36-45	5%	Employees	20%
46-55	9%	Private employees	5%
56-65	2%	Services / Others	5%
		Ownership of Driver's License	
Gender			
Men	73%	Have	65%
Woman	27%	Do not have a driving license	35%
		Vehicle ownership	
Income			
Less than 1 million	34%	Motorcycle	56%
1 - 3 million	39%	Car	1%
3 - 5 million	14%	Motorcycles and cars	40%
5 - 10 million	10%	Do not have a vehicle	3%
More than 10 million	3%		

According to age of people, it happens harmony between age and graduate education, employment and marital status. Users of online transportation is dominated by age 17-25 years, so that level education already taken is high school level. Then that is certain dominated by single status, and college student. From table 1, it is known that group of college student is the most using online transportation compared segment others. Then these is followed by student. With dominated status by college student or still not have work yet, the average income owned by this segment that less of 3 million.

If it seen based on ownership of the vehicle, 97% of respondents have own vehicle like a motorbike, a car, or both of them. Based on this, the fact is the users evidently permanent use online transportation as one alternative for supporting their activities although have own vehicle. Based on this, it could said that online transportation is not only used by the people that don't have vehicle personal, however used by the people that has own vehicle.

### *3.2 The Characteristics of Tembalang Campus Area Users*

The characteristics of online transportation users are reviewed based on socio-demographic aspects including gender, age, occupation, income, ownership of driver's license, and ownership of own vehicles. Users of online transportation in the Tembalang Campus Area are dominated by women aged 17-25, status as college student/university student, have income of 1-3 million, have a Driving License (SIM), and have a own

vehicle in the form of a motorbike (see table 2.). Based on these results it can be seen that users of online transportation are dominated by young people compared to old people. This is because young people tend to have and know the development of technology, especially smartphone, so that they use online transportation services more often than the old people

**Table 2.** Characteristics of online transportation user's in the CBD Semarang

Variable	%	Variable	%
Age		Job	
12-16	12%	Student	26%
17-25	71%	College Student/ University student	64%
26-35	8%	Hous [3]. ewife Government	1%
36-45	5%	Employees	5%
46-55	3%	Private employees	4%
56-65	1%		
Gender		Ownership of Driver's License	
Men	31%	Have	81%
Woman	69%	Do not have	19%
Income		Vehicle ownership	
Less than 1 million	26%	Have	92%
1 - 3 million	45%	Do not have	8%
3 - 5 million	30%		
5 – 10 million	9%		

Based on Table 2. It is known that student groups are segments that use online transportation more frequently than other segments. Then followed by student groups. When viewed based on vehicle ownership, users who own a private vehicle, whether it is motorbike or car, still use online transportation as an alternative mode of transportation. So that it can be seen that online transportation is used by groups that have private vehicles and do not have private vehicles.

### 3.3 Demand Model of Online Transportation at Perumnas Tlogosari Semarang

The demand model is used to determine what factors influence the demand for online

transportation. The dependent variable (Y) is the intensity of modal usage within a week. While the independent variable (X) is age, occupation, income, vehicle ownership and travel costs. After testing the classical assumptions and statistics obtained the following equation.

$$Y = 7,226 - 0,54 (X_{age}) - 0,795 (X_{cost}) \quad (2)$$

Based on the above model, it can be seen that the demands for online transportation is influenced by the user's age and travel costs. The older the users age the less the intensity to use online transportation. Conversely, the younger the users age the higher the intensity of using online transportation. This is because the use of online transportation must be through smart phone technologies, the old user age tends to have limitations in adapting to smart phone technology while young users tend to have greater potential in accessing the development of smart phone technology [3].

Not only because of age, travel expenses also affect the use of online transportation. The costs to travel in increased travel costs that must be issued, the lower intensity of using online transportation. On the contrary, the less travel costs must be paid, the higher the intensity of using online transportation.

#### *3.4 Demand Model of Online Transportation at Tembalang Campus Area Semarang*

Similar to the online transportation demand model at Perumnas Tlogosari, the demand model in Tembalang Campus Area is used to determine the factors that influence the demand for online transportation. The dependent variable (Y) is the intensity of the mode of use in a period of one week. While the independent variable (X) is age, occupation, income, vehicle ownership and travel costs. Following are the models or demand equations for online transportation in Tembalang Campus Area:

$$Y = 9,087 - 1,030 (X_{cost}) - 0,108 (X_{age}) \quad (3)$$

Based on the model, it can be seen that the demand for online transportation is influenced by the user's age and travel costs. The older the user age the less the intensity to use online transportation. Conversely, the younger the user age the higher the intensity of using online transportation. This is because the use of online transportation must be through smart phone technology, the old user age tends to have limitations in adapting to smart phone technology while young users tend to have greater potential in accessing the development of smart phone technology [3].

Not only age, travel costs also affect the use of online transportation. The higher the cost of travel that must be issued, the lower the intensity of using online transportation. On the contrary, the less travel costs must be paid, the higher the intensity of using online transportation.

#### 4. Discussion

The higher the cost of travel, the less demand for online transportation. The lower the cost of travel, the higher the demand for online transportation. This context is in accordance with the theory of transportation demand which states that the less the price must be paid, the higher the demand for transportation services. On the other hand, people not only see the cost of travel, the cost of travel time and waiting time are also taken into account. Online transportation services that provide fast services with fewer waiting times compared to other modes, make demand for these services continue to increase.

#### 5. Conclusion

Online transportation is an alternative mode of transportation for the people of Semarang in meeting mobility needs. This mode is dominated by female users, aged 17-25 years, having student status, and having a private vehicle. So it can be said that students are the segment that contributes the most in increasing the demand for online transportation. Unlike the results of previous studies which stated that ridesourcing services were dominated to relax, users of online transportation at Perumnas Tlogosari and Tembalang Campus Area actually used the mode to carry out routine activities such as learning and work. Although it is used to support daily activities, this mode is only used to supplement the user's routine trips, for example, public transportation is not available or no one is delivered to the destination..

Demand for online transportation at Perumnas Tlogosari and Tembalang Campus Area are influenced by age and travel costs. The older the user age, the less demand for online transportation. On the contrary, the younger the user age, the higher the demand for online transportation. This is because older users tend to have limitations in using smart phones considering the use of this mode must go through the application. While young users have the greater potential to use online transportation because they tend to master the use of smart phone technology compared to older age groups. The same thing applies to travel costs.

The existence of online transportation has supported the concept of smart city in terms of technological progress. With the advancement of technology in the field of transportation, it is able to provide convenience, accuracy and public trust. This convenience is expected to be able to provide maximum service to all communities both young and old. Based on research that has been done that users of online transportation are dominated by young people because they are able to use smartphones. And the old age group experiences the opposite. A new concept is needed to make it easier for older age groups to access online transportation. So that old age groups that have not been able to master smartphones can access online transportation services.

#### 6. References

- [1] Dewi, D. I. K., Rakhmatulloh, A. R. and Anggraini, P. (2018) 'Mapping between Bus Rapid Transit Shelter and High School Location in Semarang', *IOP Conference Series: Earth and Environmental Science*, 123(1). doi: 10.1088/1755-1315/123/1/012013.

- [2] Bohang, Fatimah Kartini. 2017. "Berapa Jumlah Pengguna Dan Pengemudi Go-Jek?" *Kompas.com*. <https://tekno.kompas.com/read/2017/12/18/07092867/berapa-jumlah-penggunaan-pengemudi-go-jek>.
- [3] Dias, Felipe F et al. 2017. "A Behavioral Choice Model Of The Use Of Car-Sharing And Ride-Sourcing Services." (March). [http://rampendyala.weebly.com/uploads/5/0/5/4/5054275/17-06359\\_rv\\_cp01\\_11152016033523.pdf](http://rampendyala.weebly.com/uploads/5/0/5/4/5054275/17-06359_rv_cp01_11152016033523.pdf).
- [4] Dong, Yongqi, Shuofeng Wang, Li Li, and Zuo Zhang. 2018. "An Empirical Study on Travel Patterns of Internet Based Ride-Sharing." *Transportation Research Part C: Emerging Technologies* 86(July 2016): 1–22.
- [5] Efthymiou, Dimitrios, Constantinos Antoniou, and Paul Waddell. 2013. "Factors Affecting the Adoption of Vehicle Sharing Systems by Young Drivers." *Transport Policy* 29: 64–73. <http://dx.doi.org/10.1016/j.tranpol.2013.04.009>.
- [6] Flores, Onesimo, and Lisa Rayle. 2017. "How Cities Use Regulation for Innovation: The Case of Uber, Lyft and Sidecar in San Francisco." *Transportation Research Procedia* 25: 3760–72. <http://dx.doi.org/10.1016/j.trpro.2017.05.232>.
- [7] Henao, Alejandro. 2017. ProQuest Dissertations and Theses "Impacts of Ridesourcing - Lyft and Uber - on Transportation Including VMT, Mode Replacement, Parking, and Travel Behavior."
- [8] Lavieri, Patricia S, and Felipe F Dias. 2017. "A Model Of Ridesourcing Demand Generation And Distribution."
- [9] Lekshmi, G. R.Amruha, V. S. Landge, and V. S.Sanjay Kumar. 2016. "Activity Based Travel Demand Modeling of Thiruvananthapuram Urban Area." *Transportation Research Procedia* 17(December 2014): 498–505. <http://dx.doi.org/10.1016/j.trpro.2016.11.100>.
- [10] Meyer, Gereon, and Susan Shaheen. 2017. *Disrupting Mobility Impacts of Sharing Economy and Innovative Transportation on Cities*. Springer International Publishing.
- [11] Poushter, Jacob. 2017. "Smartphones Are Common in Advanced Economies, but Digital Divides Remain." <http://www.pewresearch.org/fact-tank/2017/04/21/smartphones-are-common-in-advanced-economies-but-digital-divides-remain/>.
- [12] Rakhmatulloh, A. R. et al. (2018) 'What is the Role of Land Value in the Urban Corridor?', *IOP Conference Series: Earth and Environmental Science*, 123(1). doi: 10.1088/1755-1315/123/1/012033.
- [13] Rayle, Lisa et al. 2016. "Just a Better Taxi? A Survey-Based Comparison of Taxis, Transit, and Ridesourcing Services in San Francisco." *Transport Policy* 45: 168–78. <http://dx.doi.org/10.1016/j.tranpol.2015.10.004>.
- [14] Rithoma, Ricky, and Anita R Rahmatullah. 2013. "Kajian Rute Angkutan Umum Di Banyumanik Semarang Terkait Transportasi Yang Berkelanjutan." *Jurnal Perencanaan Wilayah dan Kota* 9(1): 65–73.

- [15] Shaheen, Susan, Adam Cohen, and Ismail Zohdy. 2016. "Shared Mobility: Current Practices and Guiding Principles." *Fhwa-Hop-16-022 2*. (Washington D.C.): 120.
- [16] Siuhi, S. and Mwakalonge, J. (2016) 'Opportunities and challenges of smart mobile applications in transportation', *Journal of Traffic and Transportation Engineering (English Edition)*. doi: 10.1016/j.jtte.2016.11.001.

### **Acknowledgements**

The author expresses his deepest gratitude to the Department of Urban and Regional Planning, Faculty of Engineering, Diponegoro University. The author also expresses his deepest gratitude to the literature that has been cited in order to support the analyze process.

This article is presented at the International Conference on Smart City Innovation 2018 that supported by the United States Agency for International Development (USAID) through the Sustainable Higher Education Research Alliance (SHERA) Program for Universitas Indonesia's Scientific Modeling, Application, Research and Training for City-centered Innovation and Technology (SMART CITY) Project, Grant #AID-497-A-1600004, Sub Grant #IIE-00000078-UI-1.