The impact of online transportation growth on the level of road services

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Abstract. The presence of online transportation has met the needs of the citizens of the city of Bandung for public transportation services that are safe, fast, cheap, and comfortable. This potential market is captured by online transportation companies by increasing the number of service fleets through the recruitment of driver partners of online transportation companies. The research objective is to identify whether the growth of online transportation has an impact on the level of service of Bandung city's road network. This research was conducted using a qualitative approach, trying to explore the perceptions of consumers and driver partners and road service level data. The results showed that in the period of 2015 to 2018, where the mobility of people and goods used online transportation services, it was accompanied by a decrease in the level of road services. Traffic volume has approached or exceeded the road capacity. Local governments must prepare mass public transportation that is responsive to requests; flexible routes according to community needs; the capacity of the vehicle is bigger than the motorbike and city car but smaller than the bus; ability to compete with the private sector.

1. Introduction

Online transportation became popular in early 2015 when its service base made use of mobile applications for Android and iOS devices. Bandung City is one of the operational areas of online transportation services from two of the best-known big startup companies, GO-JEK and Grab. Until the beginning of 2018, the paradigm of the industrial revolution in the digital era has encouraged consumers to switch from conventional transportation services to online-based services and have become part of everyday life in the city of Bandung. But the fact that the fleet unit used is a new unit with limited capacity, the most likely impact is the increasing problem with the burden of the highway in Bandung, namely traffic congestion. In the science of transportation, congestion is a reflection of the low level of road services, where the high volume of traffic has exceeded the capacity that can be accommodated by the road itself. If the new fleet unit on online transportation services continues to grow, it means that there is an increase in moving vehicles while the road capacity does not change and ultimately worsens congestion problems in the city of Bandung.

Over the past 15 years, IT development has become a new factor affecting the development of the transportation sector in many developing countries. Technological advancements, infrastructure deployment, and low prices have brought very rapid growth in ICT and connectivity to billions of people around the world. IT development has an impact on the management of urban transportation systems which are able to provide quality and efficiency of individual public transportation services such as taxis.
The transportation sector is currently shifting into private interests [2]. The presence of online transportation guarantees customers to have access to transportation according to the desired time and place, no need to wait for taxis or public transportation on the roadside, and save on expenses [3].

One of the biggest challenges facing local governments in cities around the world is mobility, which also affects most urban services. Urban transportation systems usually consist of a chain of transportation modes such as city buses, trains, and taxi systems that offer various transportation modalities for users to choose from without having to drive their own vehicles. The main purpose of the city transportation system is the mobility of people not vehicles, so what must be done is to maximize the capacity of the transportation system (the number of people transported in one hour), not the capacity of the road (the number of vehicles that can be circulated in one hour). Public transportation systems, whether individual or public, must be fast and convenient and flexible and achievable for all motorists [1].

In most developed countries, the rate of motorization will continue to increase to the current level, but one must distinguish between the phenomenon of motorization and the use of this media effectively. Efficient and scheduled public transportation can encourage vehicle users to reduce private vehicle use, especially for routine schedules such as work and school. Likewise, the condition of a compact city that provides space for pedestrians and bicycle users can reduce the number of private car use [4].

Publication of research on online transportation has examined a lot about social impacts, service performance, and user satisfaction from online transportation services. This study was conducted to examine the other side of online transportation related to its impact on the transportation system, especially on the level of road network services.

2. Methods

The method used in extracting information and data for this study uses a qualitative approach [5], with the nature of the research being explorative [6]. While the method of discussion of analysis is descriptive [7].

The sampling technique for collecting consumer preference data and the perception of the driver's partners is done through the distribution of questionnaires and interviews, with accidental sampling techniques. In accidental sampling techniques, sampling is not predetermined. The researcher immediately collected data from the sampling unit encountered [8].

The technique for collecting traffic volume data for 2018 is obtained through traffic counting. The survey is conducted for three days, on weekdays (26, 27, and 28 June 2018) at the peak hour in the morning - afternoon - evening. The observation point for traffic counting is at the Jl. Merdeka, Jl. Asia-Afrika, Jl. Surapati, and Jl. Ibrahim Adjie. While the traffic data for 2013 and 2016 was obtained from the Bandung City Transportation Agency.

3. Results and discussion

Based on the results of consumer preference data processing, the perception of the driver's partners and traffic data, it can be identified that the growth of online transportation has an impact on the level of service. The discussion is as follows:

3.1. Development of online based transportation services

The presence of online transportation services since the beginning of 2015 continues to experience a fairly rapid development until today. This is caused by:

- as presented in figure 1, 87.72% of respondents prefer to use online-based transportation services compared to conventional public transport. This is a potential market (demand) that drives the development of online application-based transportation companies.
**Figure 1.** Respondents' preference for utilization of transportation services.

- Figure 2 shows the passenger character dominated by students and private employees who require high mobility, speed, and practicality. In addition, the character of the passengers growing in the ICT era became easy to adapt to the presence of services based on online applications.

**Figure 2.** Percentage of respondents based on work.

- Online-based transportation services also provide ease of mobility for those who have limitations both physically (people with special needs) and those who have economic limitations (do not have private vehicles), so they can feel comfortable traveling, privacy such as using private vehicles, fast and cheap. The quality of online transportation services is considered very easy to use, web innovation that is trusted, up-to-date, accurate, and can understand user needs [9].

- In addition to demand, from the supply side, the number of driver partners continues to increase, supported by the ownership of new vehicles in the period 2015-2017. Drivers choose this job because it is considered to guarantee their future, with more and more people and tourists using online transportation in the city of Bandung, means that their sources of income also continue to increase [10].

- The majority of respondents who joined as driver partners in 2017 - 2018 amounted to 72%, meaning a new working period of 6 months - 1 year. While those who joined in 2016 were 18% and those who joined since 2015 were 10%. The interest of the people of Bandung City to join...
as a driver of online transportation partners continues to increase. This condition was also revealed verbally in the interview session, where the number of drivers is currently increasing so that the competition in getting orders began to be felt by respondents.

- This phenomenon contributes to a large number of motorbikes/scooters and private vehicles that cross the road. The type of vehicle composition in Bandung City in 2017 is 73.35% motorcycle/scooter, 21.44% private vehicle, while public transportation is only 0.60%, the rest is freight transportation.

- Vehicles used by respondents in this service are privately owned vehicles. As many as 44% of respondents use vehicles in the year 2015-2017, with a purchase status of 68% is credit. With a revenue range of IDR 3,000,000 to IDR 4,000,000 on four-wheeled services (R4) and the range of IDR 1,000,000 to IDR 3,000,000 on two-wheeled services (R2), depending on the number of operating hours per day, have met the monthly needs or payment of installments of the respondent’s vehicle (see table 1).

| Vehicle Ownership | Production Year | Purchase Status | The Desire to Add Vehicles |
|-------------------|-----------------|-----------------|----------------------------|
|                   | 2008 - 2014     | Credit 14%      | Yes 39%                    |
|                   |                 | Paid off 86%    | No 61%                     |
|                   | 2015 - 2017     | Credit 68%      | Yes 55%                    |
|                   |                 | Paid off 32%    | No 45%                     |

Revenue earned as a driver partner is enough to improve the quality of life from an economic standpoint [11] and also enough to pay off the vehicle loan installments. This condition encouraged 46% of respondents, in the productive age of fewer than 45 years, to increase ownership of new vehicles both motorcycles and cars.

3.2. Traffic volume growth

In the period 2015 to 2018 where the mobility of people and goods uses a lot of online-based transportation services, this has an impact on the increasing movement of vehicles on the highway. It is evident from the data on the level of road service that is in the condition before the existence of online-based transportation services (in 2013) the level of road services is still in a stable condition. Whereas in 2016 when online-based transportation services had developed, the level of road services became unstable and traffic jams occurred (see table 2).

| No | Section Name   | Section Function | Road Type | Path Width (m) | Capacity (smp/hour) | Level of Service 2013 | Level of Service 2016 | Level of Service 2018* |
|----|----------------|------------------|-----------|----------------|---------------------|-----------------------|-----------------------|-----------------------|
| 1  | Jl. Asia Afrika| Secondary arteries | 4/1 UD     | 14             | 7,907,33            | C                     | 1,278                 | F                     | 0,724                 | D                     |
| 2  | Jl. Ibrahim Adjie | Primary Collector | 4/2 D      | 10             | 8,006,17            | C                     | 0,753                 | D                     | 0,379                 | B                     |
| 3  | Jl. Surapati    | Secondary arteries | 4/2 D      | 13             | 6525,09             | C                     | 0,801                 | D                     | 0,812                 | D                     |
| 4  | Jl. Merdeka     | Primary Collector | 4/1 UD     | 12             | 7610,80             | D                     | 0,914                 | E                     | 0,591                 | C                     |

Source: Bandung City Transportation Agency and Traffic counting Survey, 2018
Remarks: * TC surveys are conducted when traffic conditions are not normal because of the school and college holidays.

In 2018, for the Asia Africa road segment, Ibrahim Adjie, and Jalan Merdeka, street vendors have been structured, widening road bodies, arranging sidewalks in early 2017 so that their capacity increases and the level of service increases. But this 2018 data was obtained during the school holidays and vacation activities in the city of Bandung, so the actual traffic conditions are not normal.
4. Conclusion

Based on the previous discussion, it can be concluded that:

- The presence of online transportation services, since the beginning of 2015, continues to experience rapid growth until today.
- From 2015 to 2018 where the mobility of people and goods uses a lot of online-based transportation services, it has an impact on the increased movement of vehicles on the highway.
- The number of driver partners continues to grow, supported by ownership of new vehicles with limited capacity, in the period of 2015 to 2017, contributing to a large number of motorbikes/scooters and private vehicles that cross the road.
- The level of road service in the conditions before the existence of online-based transportation services (in 2013) until 2016 when online-based transportation services had developed, the level of service on the four observed road segments had decreased and there was traffic congestion.

We suggest a number of points to consider, specifically related to the arrangement and improvement of services for public transport systems. Local governments must prepare mass public transportation that can carry a number of movements at once in one go. With the criteria that must be considered is safe, comfortable, fast, affordable prices, decent for the community, and most importantly, easy to access. This means that the Regional Government must be able to provide a system of public transport services that are similar to the existing online transportation services, with service specifications:

- responsive to requests;
- without routes, flexible routes that fit the needs of the community;
- the capacity of a vehicle is greater than a motorbike and a city car but smaller than a bus;
- management is handled by government-owned enterprises, to maintain service quality and the ability to compete with the private sector
- there need to be special regulations governing:
- tariffs for upper and lower limits that apply in the city of Bandung, to maintain healthy market competition.
- limitation on the number of online-based transportation vehicles that may operate, in addition to limiting the growth of motorized vehicles and reducing the volume of traffic also to avoid over-supply.
- incentive and disincentive programs in the public transport service system in the city of Bandung.

There needs to be effective cooperation and control of the private sector engaged in public transportation services, especially for application-based transportation service companies. For example, from the side of data collection, the number of driver partners must be reported every month/year to the Regional Government through the Bandung City Transportation Agency, so that the local government can properly evaluate regional policies.

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