Train users’ perceptions of walking distance to train station and attributes of paratransit service: understanding their association with decision using paratransit or not towards the train station

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Abstract. Access mode is an important factor in public transport systems. Most of the train users from Cicalengka to Padalarang via Bandung use paratransit as access mode. Access modes under this study are only paratransit and walking. This study aims to explore the relationship between access mode choice to the station and the perception about walking distance to station, perception about attributes of paratransit service quality which consist of accessibility, cheapness, comfortable, swiftness, safety, security and easiness. Of all the variables tested, walking distance to the station is the only variable relating to the mode access choice. So, a person will tend to use paratransit when his/her perception of walking distance to station is relatively far away. While perceptions about the quality of paratransit service can not determine whether a person will choose paratransit or not.

1. Introduction

Access mode affects the use of public transport [1-2], so that the integration of public transport as the main mode with access mode is an important factor that determines the success of the public transportation procurement objectives. Accessibility to public transport system is an important aspect that takes effect to the system's effectiveness and attractiveness [3].

Access mode to public transport is generally distinguishable for short distances and longer distances. Accessibility for short distances is fulfilled by making it easier for people to walk in walking distance range around public transport facilities. While for a longer distance accessibility to public transport can use private vehicles or provided some feeders. Therefore, walking distance is an important factor in the provision of public transport services [4-6].

In Bandung Metropolitan Area (West Java, Indonesia), train is a popular public transport used for commuting from Cicalengka to Padalarang and vice versa. For train users commuting from Cicalengka to Padalarang via Bandung, there are several access modes that can be used, i.e. walking, ojek (motorcycle taxi), angkot or urban transportation, and private vehicle (usually a motorcycle). Ojek and angkot are two modes of transportation which belongs to paratransit group. Among the two paratransits, angkot is the dominant access mode chosen by train users boarding from Cicalengka.
station [7], and the paratransit which refers to in this study is *angkot*. *Angkot* classified as paratransit is land-based mode owned and operated by private companies or individuals [8]. *Angkot* in Indonesia is like a *jeepney* in Philippines or *tuk-tuk* and *songtaew* in Thailand.

For a more macro purpose, ie sustainability, train users who live in the walking distance range around the train station are not expected to use the vehicle to the railway station, even if it is a paratransit. Choosing walking as access mode will bring many benefits, not only for the walking individual but also for the environment. Access mode share with paratransit to Cicalengka train station reaches 48.3%, while with walking is as much as 11.3%; the rest uses motorcycle taxi or private vehicle. At glance, the proportion of access mode share shows that the rail users to Cicalengka Station are only a few who live around the station because built environment around the station is not walkable. Although it is not yet clear, there is a relationship between walking and built environment [10-12].

If it is only based on the walking distance range, the rail users outside walking distance range will use paratransit or other vehicles to Cicalengka train station. In conditions outside the walking distance range, the attributes of paratransit services may influence the decision to use paratransit or not. Furthermore, the satisfaction of public transport users is influenced by the quality of public transport services [13,14], especially the user perceptions of service quality [15,16], in addition to the influence of socio-economic characteristics. Simply stated that the perception of something will affect people to use or do something. Therefore, the variables to be analyzed in relation to the selection of paratransit as an access mode are in the form of the perception of traveler.

However, there is a study that cannot be ignored, the finding of scientists at Stanford University in the US revealing that Indonesians are the laziest for walking among the 46 countries [17]. If indeed Indonesians are lazy to walk, despite the perception of walkability especially about the distance of a good category included, there will be inconsistent perceptions of walking distance with the mode of choice. Simply stated, although the perception of walking distance is good, they still do not want to walk.

The data used in this research is the railway user data that depart from Cicalengka train station using paratransit and walking as access mode. The purpose of this study is to find consistency/inconsistency of rail users who ride from Cicalengka train station in selecting paratransit as access mode with their perception of walking distance to station and their perceptions about the quality of paratransit services. If there is a relationship between the selection of paratransit as an access mode and the perception of walking distance to station, then there is a consistency. In other words, the rail users who ride from Cicalengka train station are not among Indonesian people who are lazy for walking. They will only choose paratransit as an access mode if they think the distance to the station is far or far enough. If there is no relationship, there is inconsistency which means reinforcing the results of research scientists at Stanford University; the Indonesian people are lazy to walk and prefer the paratransit although the close range and the services of paratransit are considered not good. Then, if there is a relationship between the selection of paratransit as an access mode to a station and the quality of paratransit service, there is a consistency. Thus, it can be found out what factors are related to the decision to choose a paratransit as an access mode, whether the perception of walking distance to train station or perception of the quality of paratransit services. The ideal condition is access mode related to walking distance with every attribute of paratransit services. Consistency will be achieved when people will ride paratransit and the distance cannot be reached by walking and good paratransit service.

This paper was begun with the formulation of research background, including the importance of access mode in the public transport system, the description of popular paratransit, previous research which becomes the basis of this research, as well as the research objectives. The earlier research related to this study is outlined to formulate the variables used in the analysis. Methodology and results are described in the next section. The last is outlined in the discussion and conclusions of this study.
2. Literature Review

The reviewed previous studies are divided into two sections. The first is the walking distance in public transport service. The second is the attributes associated with public transport service.

2.1. Walking Access in Public Transport System

It is important to understand the influence of walking distance to public transport as it is a key element of establishing equitable access to public transport [4]. This type of mode is the most important determinant of walking distance. In a research conducted in Sydney, Australia, it was found that more people walk to the station than to the bus stop. This shows that the distributions of walking distances are different for each mode and the most important feature of walking distance is the availability of stops and stations. In research on travel behavior, distance to transit is one of the D of 5 D’s used to analyze the influence of built environment on travel behavior, especially walking and cycling [12].

The behavior to decide to walk or not to a public transport facility may vary. It is hard to find the same pattern. As well as research conducted by Walton and Sunseri [18], walking distance did not affect the decision to walk or not to public transport facilities. Factors that affect precisely is the weather and comfort for the car park. This finding is reasonable because the respondents are people who usually drive, although residing maximum 1 km from public transport facilities.

Accessibility to public transport is represented not only by walking distance, but also by other factors that overall reflect walking accessibility [19]. In a study conducted by Wibowo and Olszewski, walking accessibility represents not only the actual walking distance but also generalized walking effort. The assumption used is for every distance to the terminal so there is a probability of walking to access. Type of walking routes to access public transport are distinguished by walkways, sidewalks, road crossings, etc., that influence the effort of walking.

Studies on the effect of walking distance on the use of public transport for older adults in California and New York have been conducted [20]. There are several findings, namely, the drivers are more sensitive to walking distance than nondrivers. Walking time affects the use of public transport. In addition, older adult men, not white, and low income, more often use public transport.

In addition to walking distance and walking efforts, accessibility for walking to public transport can also be represented by the time required to walk to the station or bus stop or other public transport facilities. There are different ranges for walking distance and walking time for male and female [21]. Another study conducted in Brisbane, Australia, found that walking time is the most sensitive among the part-time workers, high-income earners, and elderly travelers. While among postsecondary students who are studying and working at the same time, walking time is least sensitive [22].

2.2. Quality of Public Transport Service

Previous research on the quality of public transport service varies greatly, both on variables and methods. However, the quality of public transport service is mostly discussed based on the perception perceived or the experience of public transport user. The attributes used to analyze the quality of public transport service are bus stop availability, route characteristics, frequency, reliability, bus stop furniture, overcrowding, cleanliness, cost, information, promotion, safety on board, personal security, personnel, complaints, environmental protection, bus stop maintenance [13]. The method used is the structural equation modeling.

The importance of integrated multimodal in public transport [23] is basically related to access and egress mode. Through user perspective, authorities can develop attractive transfer routes with comfortable transfers. The theory of planned behavior (TPB) was adopted to investigate the role of perceived behavioral control (PBC) in travelers’ intentions to use public transport (PT) routes with transfers.

In the transportation domain, the guarantee for safety is absolutely essential. Bad experience about safety can affect the frequency of use of public transport [24].
There are times when individual perceptions can be the same as or different from reality (objective measurement of the quality of public transport services). In a study conducted in Tallahassee, Florida, it was found that the perception of changes in transit services is greater than reality [15].

In Indonesia, the perceptions of paratransit users are examined with six variables [16]. These variables are availability, accessibility, information, customer service, fare, and negative experience with crew attitude. Path analysis is used to indicate the association between variables, including testing the loyalty of paratransit users. Another public transport service attribute is used to analyze the user perceptions in Indonesia, involving users from Bandung, Jakarta and Yogyakarta. The attributes are cleanliness in vehicle, cleanliness in the station/stop, condition in the vehicle, comfort in the vehicle, security in the station/stop, route coverage, ease of payment, safety and security in the vehicle, security in the station/stop, access to the vehicle, driver's skill, punctuality, attitude of the staff, and ease of getting the mode [25].

The government of Indonesia issues minimum service standards for public transportation. Minimum service standards for urban public transport are security, safety, convenience, affordability, equality, and regularity [26]. Each of these service components is detailed to facilitate use in performance evaluation of services. The safety and comfort components was revised in 2015, with more detail on both components of the service. [27].

3. Methods

The respondents were the train users departing from Cicalengka train station to Bandung and Padalarang, departing at 06.15, 07.25, 09.00, and 09.45. The survey was conducted for 3 days, Monday - Wednesday in November 2016. The survey involved 20 surveyors. Questionnaires were prepared in advance to be filled by respondents. Most of the questionnaires were filled over trains during the trip by respondents with the help of surveyors. Only a few questionnaires were filled at the station because most of them came to the station before the train departures.

In accordance with the purpose of the study, the respondents are limited to rail users who use paratransit or walking as an access mode to the station. Of the nearly 203 filled questionnaires, only 116 questionnaires could be used. Access mode was then analyzed in relation to other variables using crosstabulation analysis. Significance level (α) used is 5%. SPSS is used for data processing and analysis. Thus, Ho will be rejected if the probability value of Asymp. Sig. (2-sided) is < 0.05, which means there is a relationship between the variables tested. Furthermore, Spearman Correlation was used to determine the level and mark correlation. Although crosstabs and Spearman Correlation are simple, they are sufficient to achieve research objectives due to the fact that what will be explored is still limited to the relationship between access mode and other variables. However, to get a more complete result, it needs to use another method. For example, if we want to know the effect of walking distance and attributes of paratransit service on paratransit selection as access mode and by involving latent variables, structural equation modeling can be used.

Access mode is set as an ordinal variable, with value 1 representing paratransit as access mode and value 0 for walking as access mode. The determination of value 1 for paratransit choice is due to other variables that will be analyzed including the quality of paratransit services and the focus of research on selecting paratransit as an access mode instead of walking.

Based on the previous research, the minimum service standards for public transport in Indonesia, and the conditions in the field, the tested variables which are related to access mode to determine what factors determine the decision to use paratransit as access mode are:

3.1.1 Perception of walking distance to the station. In the previous research, walking distance is the dominant factor in the public transport system [4-6], i.e. people will walk to the station if the distance to the station is close for walking. It means that people will not walk to the station if they assume the distance to the station is not close enough. Paratransit can be an option if the distance to the station is not close enough to walk. However, other studies suggest Indonesians are lazy to walk [17]. If the perception of respondents about walking distance is not close enough and they still ride paratransit, it
means they are lazy to walk. Therefore, the perception of walking distance to station is one of the factors tested to access mode selection.

The respondents were required to provide an assessment of the requested agreement on 5-point Likert scale from "strongly agree to strongly disagree". If the respondents feel they can walk to station, they will answer strongly agree, and the point given for this answer is 5. Point 1 is given for strongly disagree answers from the respondents. With the answer of the agreement, this variable also includes ordinal variables.

The assumption for this variable is if the respondents disagree that distance to station is close enough for walking, there will be a bigger chance of election of paratransit as access mode. This assumption is based on previous research which states that walking distance to station is a factor that determines whether people will walk or not to station [4, 6, 18]. If in a short distance people tend to walk, in the longer distance, they will prefer doing the paratransit to walking to the station. Thus, the sign of correlation between the access mode relationship and the perception of walking distance is negative.

3.1.2 Perceptions about attributes of paratransit service quality. The variables tested in the study were determined based on previous studies, applicable regulations, and characteristics of paratransit services. The assumption is that the better the user's perception of the attribute of paratransit services, the satisfaction level is higher and the greater the chance that paratransit is chosen as access mode [13]. The relationship between access mode and every paratransit service attribute is positive. These variables are: accessibility [14, 15, 25], cheapness [13, 14, 26, 28], comfortable [13, 14, 15, 25, 26, 28], swiftness [14], safety [13, 14, 15, 25, 26, 28], security [13, 14, 25, 26, 28], and easiness [15, 25].

- Accessibility is all about the convenience of reaching the paratransit, not only the walking distance, but also the other attributes of accessibility, including comfort, safety, and security reaching the paratransit.
- Cheapness associated with paratransit rates.
- Feeling comfortable on the vehicle, so it does not include comfortable headed or waiting for paratransit.
- Swiftness concerns about the quality of travel time of the paratransit to the station.
- Safety is the safety of traffic during a trip with a paratransit or during on a vehicle.
- Security is the security of crime during travel with paratransit.
- Easiness is a practical measure of using paratransit, including the need for special shelters along the route of service.

The respondents were also required to provide an assessment of the requested agreement on 5-point Likert scale from "strongly agree to strongly disagree" for all variables including attributes of paratransit service quality.

As for walking distance to station, attributes of paratransit service quality were also measured through user perceptions. User perceptions represent what they feel. Perceived and actual distance can be different and transport mode choice is correlated with perception [29]. The perception of paratransit service also influences attitude and travel behavior more than 'reality' [15].

### Table 1. Variables

| Access Mode to Train Station | Perceptions about walking distance to station |
|-----------------------------|----------------------------------------------|
| Paratransit = 1             | 5 point scale from strongly agree to strongly disagree |
| Walking = 0                 | - Strongly agree if the distance to station is very close by walking = 5 |
|                            | - Agree if close distance to station is reached by walking = 4 |
|                            | - Ordinary if distance to station is not far or not close to go by = 3 |
- Disagree if distance to station is far by walking = 2
- Strongly disagree if distance to station is very far by walking = 1

**Perceptions about attributes of paratransit service quality**

Accessibility, Cheapness, Comfortable, Swiftness, Safety, Security, Easiness

Each attribute of paratransit service quality is given a 5-point scale from strongly agree to strongly disagree
- Strongly agree = 5; Agree = 4; Ordinary = 3; Disagree = 2; Strongly disagree = 1

All variables tested include ordinal variables, so the correlation test used is Spearman Correlation. Furthermore, to analyze the relationship of choice mode access and other variables, the relationship hypothesis is determined and the correlation mark. There are eight hypotheses formulated, including the sign of correlation and assumptions used.

**Table 2. Hypothesis**

| No. | H<sub>0</sub> | Sign of Correlation | Assumption for Correlation |
|-----|---------------|---------------------|-----------------------------|
| 1.  | There is no relationship between Access Mode Choice and Walking Distance to Station. | - | The further walking distance to station, the greater the chance of selecting paratransit as access mode. |
| 2.  | There is no relationship between Access Mode Choice and Accessibility to Paratransit | + | The better the perception of accessibility to paratransit, the greater the chances of selecting paratransit as access mode. |
| 3.  | There is no relationship between Access Mode Choice and Cheapness of Paratransit | + | The better the perception of Cheapness of Paratransit, the greater the chance of selecting paratransit as an access mode. |
| 4.  | There is no relationship between Access Mode Choice and Comfortable of Paratransit | + | The better the perception of Comfortable of Paratransit, the greater the chances of paratransit selection as access mode. |
| 5.  | There is no relationship between Access Mode Choice and Swiftness of Paratransit | + | The better the perception of Swiftness of Paratransit, the greater the chance of selecting paratransit as access mode. |
| 6.  | There is no relationship between Access Mode Choice and Safety of Paratransit | + | The better the perception of Safety of Paratransit, the greater the chance of paratransit selection as access mode. |
| 7.  | There is no relationship between Access Mode Choice and Security of Paratransit | + | The better the perception of Security of Paratransit, the greater the chance of paratransit selection as access mode. |
| 8.  | There is no relationship between Access Mode Choice and Easiness of Paratransit | + | The better the perception of Easiness of Paratransit, the greater the chance of selecting paratransit as an access mode. |

Note: H<sub>1</sub> = There is a relationship between pair of variables tested

**4. Data and Results**

Most respondents chose the paratransit as access mode to station, almost four times the size of walking to station. The perception of walking distance to station is almost the same as strongly agree, agree, ordinary, and disagree. Almost all perceptual-related variables are few or none answered strongly disagree. Many respondents answered disagree for the attributes of paratransit quality service. In general, it can be said that paratransit services based on the perception of rail users are good.
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Table 3. Description of Variables

| Variables                      | Description                                      |
|-------------------------------|--------------------------------------------------|
| Access Mode                   | Paratransit = 96 (82.76%); Walking = 20 (17.24%) |
| Perception of Walking Distance to Station | 5 = 21; 4 = 33; 3 = 27; 2 = 31; 1 = 4          |
| Perception of Accessibility to Paratransit | 5 = 19; 4 = 66; 3 = 29; 2 = 2; 1 = 0          |
| Perception of Cheapness of Paratransit | 5 = 13; 4 = 55; 3 = 42; 2 = 6; 1 = 0          |
| Perception of Comfortable of Paratransit | 5 = 14; 4 = 23; 3 = 64; 2 = 15; 1 = 0          |
| Perception of Swiftness of Paratransit | 5 = 12; 4 = 26; 3 = 60; 2 = 17; 1 = 1          |
| Perception of Safety to Paratransit | 5 = 9; 4 = 30; 3 = 58; 2 = 18; 1 = 1          |
| Perception of Security of Paratransit | 5 = 10; 4 = 29; 3 = 55; 2 = 20; 1 = 2          |
| Perception of Easiness of Paratransit | 5 = 11; 4 = 52; 3 = 45; 2 = 8; 1 = 0          |

Of the seven attributes of paratransit service quality, accessibility to paratransit received the best rating from respondents, because those who answered agree and strongly agreed reached more than 70%. Security, safety, swiftness, and comfortable are good enough according to the perception of respondents. However, most respondents’ answers are ordinary and disagree.

![Figure 1. Perceptions Percentage of Walking Distance to Station and Paratransit Service Quality Attributes](attachment:image.png)

From the characteristics of socio-economics respondents, the number of male respondents is more than female respondents. The respondent are mostly 25-50 years old. Most of the respondents have a vehicle. It shows that many respondents choose to walk or use paratransit to the railway station though they have vehicle.

Based on the analysis of crosstabs, Asymp values. Sig. (2-sided) is > 0.05 which means there is no relationship between access mode choice and walking distance to station since $H_0$ is rejected. With correlation test result of -0.375 and the minus sign, it can be explained that the better perception of walking distance to station, the more people tend to choose walking than paratransit as access mode to station.
The correlation between access mode and security is very small (0.099). Thus, further analysis is needed to obtain better results. Meanwhile, the female is more likely to choose a paratransit than a male. The correlation value is sufficient to state that there is a relationship between gender and the selection of paratransit as an access mode.

Table 4. Result

| Variables                                      | Asymp. Sig. (2-sided) - Pearson Chi-Square | Related or not | Spearman Correlation |
|------------------------------------------------|--------------------------------------------|----------------|----------------------|
| Access Mode vs Walking Distance to Station     | 0.001 (< 0.05)                             | Related        | -0.375               |
| Access Mode vs Accessibility to Paratransit   | 0.414 (> 0.05)                             | Not related    |                      |
| Access Mode vs Cheapness of Paratransit      | 0.336 (> 0.05)                             | Not related    |                      |
| Access Mode vs Comfortable of Paratransit    | 0.072 (> 0.05)                             | Not related    |                      |
| Access Mode vs Swiftness of Paratransit      | 0.132 (> 0.05)                             | Not related    |                      |
| Access Mode vs Safety of Paratransit         | 0.161 (> 0.05)                             | Not related    |                      |
| Access Mode vs Security of Paratransit       | 0.017 (< 0.05)                             | Related        | 0.099                |
| Access Mode vs Easiness of Paratransit       | 0.211 (> 0.05)                             | Not related    |                      |

5. Discussion and Conclusion

The results of this study is different than of the earlier study which presents that Indonesians are lazy for walking [17]. The Indonesians are not lazy to walk. It is disproven by the railway users case departing from Cicalengka train station because there is a connection between access mode choice and walking distance to station. The respondents chose paratransit if the perception about distance to station is far enough to walk. Instead, they tend to walk if perceptions about the distance to the station are relatively close. However, because in this study walking distance is a perceived distance, there is a gap possibility between the perceived distance and the factual distance. It is possible that the factual distance is still within walking distance range. They do not like to walk then their answer about the distance to the station is far enough if they travel by walking. Therefore, for further research it is necessary to compare between the perceived distance and the factual distance so that the actual walking distance can be captured to find the relationship and its effect on the access mode choice. More complex methods are needed to obtain a true description of Indonesians' walking habit, particularly towards and from the public transport facility. In addition to walking distance, it also needs to consider the other built environment factors for walking, such as comfort, safety, security, cleanliness, and even the beauty of the environment.

From the results obtained, it can be said that there is no relationship between the quality of paratransit services and the access mode choice. It means that the respondents choose a paratransit not because the quality of paratransit service is good, or they choose to walk not because the quality of paratransit service is not good. Thus, the quality of the paratransit services is not the determinants of the access mode choice. Good or bad perception, respondents do not necessarily choose or do not choose paratransit. Although the access mode choice is related to the security of paratransit, the correlation value is very small. To obtain better result about the relationship between access mode and security, it requires further statistical analysis. For service quality, it is also necessary to compare between perceived and reality. In case of access mode to Cicalengka train station, the paratransit is not selected because of the quality of service. The user is reluctant to walk, including due to distance factors. Therefore, regulators, the central, provincial and district/city government should still pay attention on the quality of paratransit services, including formulating a more applicable service standard.
In conclusion, respondents are consistent when expressing their perception of walking distance to station by selecting access mode to station. Conversely, there is an inconsistency between an assessment of the quality of paratransit services and access mode.

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