

# Innovation of Electronic Card-Based Public Transportation Fare Payment Systems

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**Abstract.** The development of technology is increasingly rapid, encouraging the people of Indonesia, especially Bandung city, to start shifting from cash to the era of a cashless society, especially when it is currently in the Covid-19 pandemic. This research aims to design the concept of electronic services for transportation in Bandung. The method used was descriptive to 25 respondents. These results indicated that the Bandung communities need the latest innovations to simplify the payment system. The use of the EBAP Card is only by using a card that is attached to a sensor machine provided by public transportation. EBAP Card is made as a substitute for cash for public transportation payment transactions. This EBAP Card payment transaction is faster than using cash. The direct impact of this program's benefits for the community is that the public can pay public transport fares with an EBAP Card that is safe, comfortable, accurate, and efficient. This payment system will reduce direct contact during this Covid-19 period. With the implementation of electronic-based payments, payment transaction services on public transportation are faster, so it is hoped that the travel convenience of public transport users in Bandung will increase.

**Keywords:** Electronic Card, Public Transportation, Payment System, Innovation.

## 1. Introduction

Traffic congestion is a major problem in urban areas, especially related to environmental pollution. Vehicle emissions generated by this mode of transportation trigger an increase in carbon dioxide, so that urban transportation management that utilizes public transportation modes is needed [1,2]. Automatic Fare Collection through "smart cards" is becoming a standard in the most advanced public transport networks of major cities worldwide. Using such cards has an advantage for users as well as operators. Whereas smart cards are mainly

increasing convenience for travellers, operators value particularly reduced money handling fees. Smart cards further make it easier to integrate several operators' vane systems within a city and split the revenues [1]. The digital industry in Indonesia continues to grow. The impact of fintech advances is to bring digital payment innovation or better known as Digital Payment. There are also several types of digital payments, such as, in this case, e- money. With increasing technological developments, people are generally more accustomed to using electronic money or e-money to make transportation payments [3].

The smart card transactions are electronically recorded, commonly providing data about the transaction time, identity of the Card, the fare charged, and locations of the card reader. While these data are primarily collected to manage fare collection, the availability of their data is certainly desirable to public transport planners; the data are passively collected, without requiring more expenditure, and in many cases represents a large or nearly complete sample of journeys or trip legs made by public transport [4]. The use of electronic money has proliferated from year to year. The data published by Bank Indonesia can prove this, every year, the number of users and the number of transactions always increases. This increase was confirmed because, in 2015, more and more people used e-money to introduce an electronic payment system in the form of an e-card (electronic Card) that uses electronic money for payments for public transportation. [5]. The data can be used in various fields such as analysis of transit riders' travel patterns [6], behaviour analysis [7], performance assessment of bus transport reform [8], and planning of the public transportation system [9]. Some retail transactions have been converted to electronic form, where information has on a card or server to be transmitted to open information systems such as the internet. E-Cards can reduce the circulation of cash in the community. And the reduced use of cash is also very good for the economy. European Region Visa Executive Vice President Steve Perry also said cash costs were expensive. In the business world, they feel they have to get cash out of their system, making it easier to control. Because more cash means it is more costs. [10] Electronic money in the future is considered to have the potential to shift currency in retail payment transactions [11].

## **2. Method**

### **2.1. Research area**

This research was conducted in Bandung with the selection of research locations in the city of Bandung. Bandung is a big city where the use of transportation is generally relatively high.

### **2.2. Research Subject**

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In this study, the community was the subject of research, whereas users of public transportation. The subject is as many as 25 respondents as the subject of respondents. In this subject, the selection was made randomly.

### 2.3 Data collection technique

This research data used primary data types obtained from interviews using a questionnaire. The questionnaire was conducted by interviewing respondents with variables leading to the perception and use of the EBaP Card.

### 2.4 Data analysis technique

This research used descriptive analysis. Descriptive analysis is used to analyse data by describing or describing the data that has been collected as it is without intending to make general conclusions or generalizations. The use of this analysis is to determine the perception of the EBaP Card and the extent to the use public transportation.

### 3. Results and Discussion

Smart card data are increasingly used for transit network planning, passengers' behaviour analysis, and network demand forecasting. Public transport origin-destination(O-D) estimation is a significant product of processing smart card data. In recent years, various O-D estimation methods using the trip-chaining approach have attracted much attention from researchers and practitioners. However, the validity of these estimation methods has not been extensively investigated. It is mainly because these datasets usually lack data about passengers' alighting, as passengers are often required to tap their smart cards only when boarding a public transport service [11].

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#### 3.1 Solo-economic characteristics

The study results found that the respondents' age was 18, 28, 29 years as many as 4%, then as many as 32% aged 20 to 21, 8% aged 19 to 22 years. The respondents' dominant age was between 20 and 21 years, where this age is entered in the middle of the college study period and is familiar with the environmental conditions of Bandung City and is familiar with appropriate public transportation facilities in Figure 1.

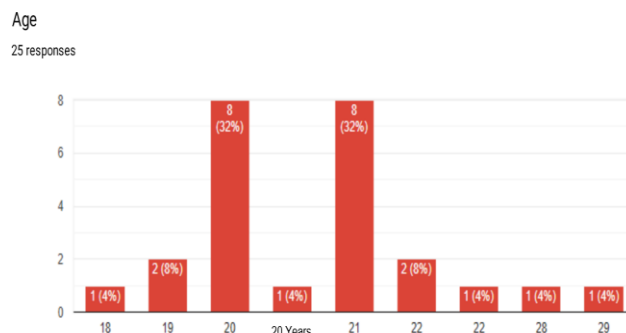
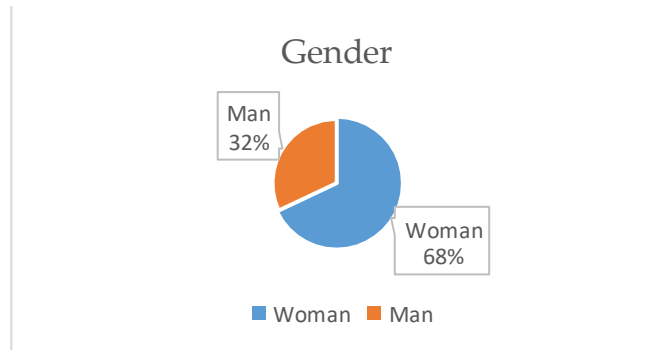


Figure 1. Result of respondents based on age

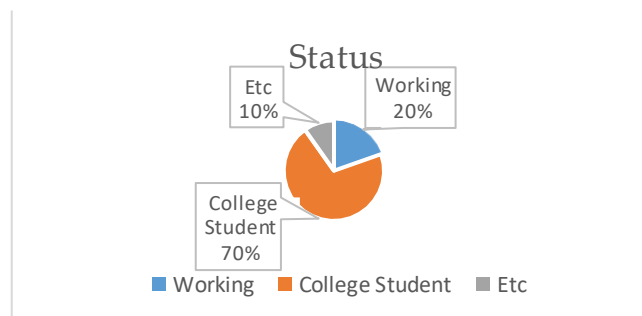
On the EBaP Card respondents according to gender, from the results of the study, the number of female respondents was 68%, while men were only 32%. More men likely own

private vehicles such as motorbikes than women. Some women cannot use personal vehicles such as motorbikes in Figure 2.



**Figure 2.** Result of respondents based on gender

Based on 25 samples, including employees, students, and housewives' respondents. This study's most obtained status was students as many as 72% or 18 people, then 20% or five people. The two statuses have the highest number of statuses received when collects data. These two statuses are the ones that most often use public transportation to travel, especially going to campus or going to work in Figure 3.



**Figure 3.** Result of respondents based on status

### 3.2 Public perception of the EBap Card

Messner and Meyer (2005) state that differences will influence perceptions in each individual's information, differences in values in attitudes, and individual interests. Bandung consists of layers of society, so they perceive each, including students, about the EBaP Card used as an electronic card for public transportation payments. Different mobility needs give rise to different perceptions. Some users use public transportation because they do not have private vehicles. In addition, it also indirectly reduces the number of private vehicles, especially for students, so that to fully contribute to reducing congestion, it is necessary to have an awareness of each individual to switch to public transportation [12].

Smart card data makes use of relevant spaces in public traffic. In applying the smart Card's date, the public transport destination's estimated origin plays an important role. Recently, many researchers have been motivated to conclude the purpose of public transport using smart cards [13].

### 3.3. Questions about the EBap card

From the data we have received from respondents, we ask some questions on Google Form to support our research, and these are the results:

Do we ask if there is a transportation card in Bandung? The result is that 96% or about 24 respondents agreed, while 4% or 1 disagreed. These results show that the people of Bandung agree to the transportation card in Figure 4.

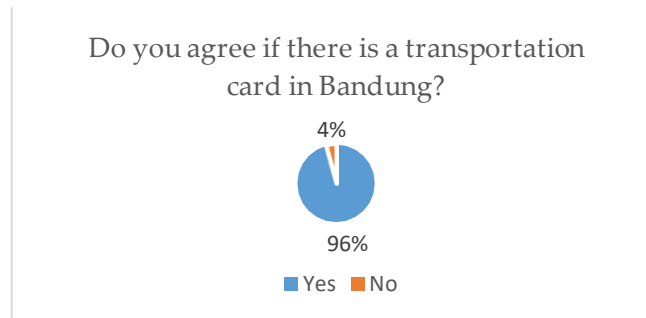


Figure 4. Result of respondents based on status

The advantages of using a transportation card in Bandung will make it easier for people to use public transportation because using an electronic card will be more practical, efficient, and flexible in Figure 5.

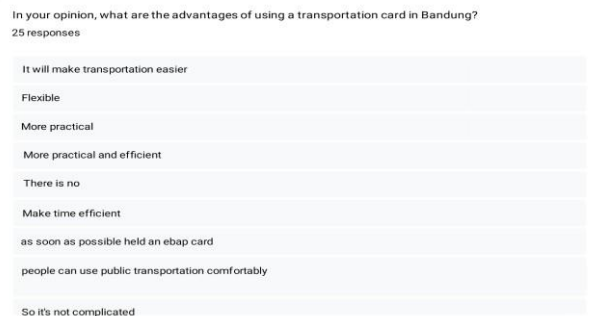
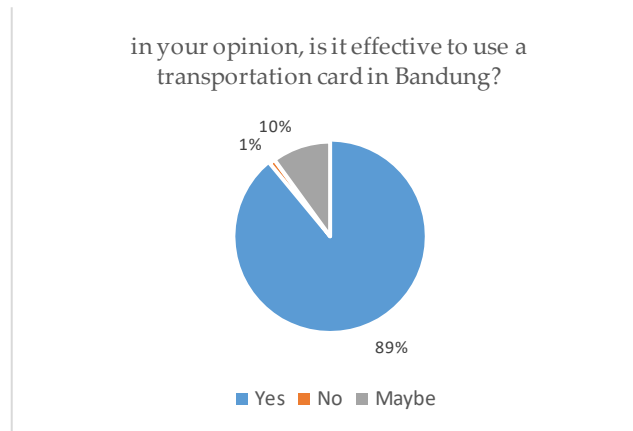


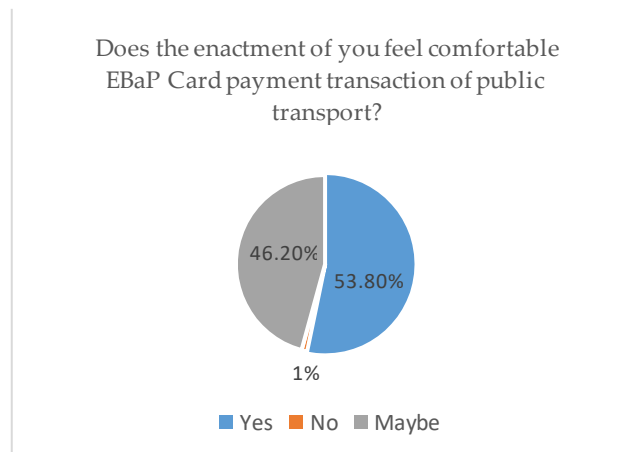
Figure 5. Result of respondents

The respondents' results conclude that most of them answered it is effective because many in this era have implemented cashless and technology should have advanced with the latest innovations. And some responded that it was not effective because people were accustomed to using cash to use public transportation, so that that adaptation will be needed for some communities in Figure 6.



**Figure 6.** Result of respondents

The question is, does the application of the EBaP Card feel comfortable making public transport payment transactions? And the respondent's answer was 53.8%, or about 13 people answered yes, and 46.2% or about 12 people answered maybe. Judging from the respondents' answers, we conclude that some are still hesitant to use electronic cards as transportation payments for their daily needs in Figure 7.



**Figure 7.** Result of respondents

All respondents were very positive and supported this innovation to advance technology in Bandung. The hope is that the EBaP Card innovation can make it easier for people to use public transportation in their daily lives, and people also hope that if this program is implemented, it can make the city of Bandung with the lowest level of congestion in Figure 8.

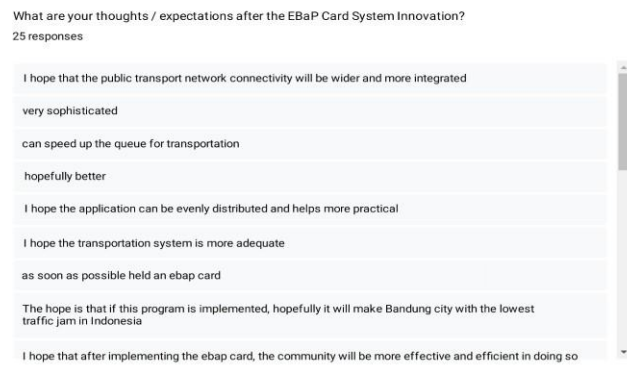


Figure 8. Result of respondents based on question 4

#### 4. Conclusion

The research concludes that 90% of people in Bandung need a transportation card (EBAP Card). Because with the EBAP Card, people don't need to queue long, and it's more effective when traveling using public transportation. With its cashless nature, the EBAP Card makes it easier to make payments without carrying cash. With the EBAP Card implementation, payment transaction services on public transportation will be faster, so it is expected to add more convenience to travel for public transport users in Bandung.

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