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Preference Model For Using Intermoda Transport During COVID-19 Pandemic In Cirebon City

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Abstract

This investigation aims to model the preferences of intermodal transportation users during a period of large-scale social restrictions in the Cirebon area of West Java, Indonesia. The research population is intermodal transportation users in the Cirebon area. Samples were taken by accidental sampling technique as many as 300 respondents taken from 3 locations namely Harjamukti bus terminal, Kejaksan train station, and Prujakan train station. Data was collected by means of questionnaires and on-site interviews. Data analysis technique using Conjoint analysis. The investigation concluded that the preference models for road and rail intermodal transportation users in the Cirebon area are convenience, comfort, security, crowds, density, and facilities

Keywords: user preferences, intermodal transportation, Conjoint

Introduction

The contribution of roads as the backbone of national transportation must be immediately reduced, the contribution of mass transportation to urban areas is immediately implemented with the train mode as an alternative in the development of transportation networks. The low efficient value in transportation makes sharing of other modes to be implemented immediately and the intermodal transportation system is one solution that can solve national transportation problems (Siswanto, 2014).

Many options are considered to deliver people and goods as quickly as possible using available resources and costs. This can be accomplished by using various modes of transportation such as road, rail, air, and water which can increase the range of options for decision makers (Ertem et al., 2017).

The concept of customer behavior and inclinations cannot be isolated from the investigation to discover out the variables that are considered and inclinations in choosing the correct course and assembly the wishes of numerous buyers. The concept of investigate utilizing multi-attribute is an choice in getting a course choice inclination show. Multi-attribute inquire about allows that numerous qualities utilized within the examination are combined in one investigate show. Besides, the advancement of course choice by combining perspectives of the most limited course with buyer inclinations or behavior is possible to fathom the issue of choosing the most excellent course for the improvement of thruway and rail intermodal courses

Public transportation in Cirebon City consists of several routes, namely 10 urban transportation routes and 5 inter-city transportation routes within the province (AKDP). Transportation nodes in Cirebon City that serve passenger transportation are Harjamukti Terminal, Kejaksan Train Station, and Prujakan Train Station. Currently, the three transportation nodes have not been connected by road transportation services. The problem of transportation in the city of Cirebon is starting to be felt. Congestion in big cities, including Cirebon, has almost spread to almost all road networks and occurs almost every day at busy times. According to (Kadarisman, 2015) that a common issue in enormous cities within the world, counting Indonesia, particularly in Cirebon City is transportation where the development of individuals is getting higher. This should be adjusted with the speed of transportation facilities (modes) and framework (Gusleni, 2016).

The problem becomes even more difficult when people choose private vehicles to facilitate their movement. When the development of private vehicles isn't commensurate with the increment within the length of existing streets, this will make approach producers start to stifle the utilize of private vehicles and make strides open transportation foundation. This could be accomplished through an intermodal transport framework and an coordinates (multimodal) open transport framework. This implies that different modes can be combined legitimately and productively, as well as viably so that individuals can move from one sort of transportation to another rapidly, cheaply, securely, and comfortably.

However, another problem occurred in Indonesia, specifically the Covid-19 widespread caused by the intense respiratory disorder coronavirus 2 (SARS-CoV-2). This widespread was to begin with distinguished in Wuhan, China, in December 2019. Within the to begin with quarter of 2020, this widespread was detailed to have spread to more than 200 nations. The IMF (2020) predicts that the COVID-19 widespread will cause world financial development to decrease by 3 percent in 2020. Financial development in created nations will decrease by 6.1 percent, whereas financial development in creating and creating nations will decrease by 1 percent. World exchange is assessed to drop between 13% and 32% in 2020 as the Covid-19 widespread disturbs financial movement and ordinary life around the world (WTO, Haryanto, 2020). The Covid-19 pandemic has affected almost all aspects of human life such as economy, politics, education, and transportation (Buana, 2020).

The Indonesian government received special recommendations from WHO regarding the prevention of Covid transmission including (1) announcing confirmed cases and submitting contact tracing details immediately to WHO so that it can be analyzed and provide advice to the government, (2) containment options include: closing schools; cancelling a huge number of gatherings; dodging trips to open places; (3) advance and keep up social remove when socializing ought to not shake hands, kiss or embrace and other fundamental defensive measures (hand washing and masks), (4) advise people showing respiratory symptoms to stay home, self-isolation, and immediately check himself to a health care facility(Arifin, 2020).

In accordance with the latest developments in global issues with the corona virus pandemic that causes disease (Covid-19) throughout the world, the government has adopted a 5M policy, namely washing hands with soap and running water, wearing masks, maintaining social distance, staying away from crowds, and reducing mobility in public areas. outside the house. This is done as an anticipation and precaution against the spread of the corona virus. In addition, to anticipate the spread of the COVID-19 virus which caused many deaths, the government enforced the Large-Scale Social Restrictions or semi-lockdown policy contained in Law Number 6 of 2018 concerning Health Quarantine in conjunction with Government Regulation (PP) 21 of 2020 concerning Large-Scale Social Restrictions to accelerate the anticipation of the spread of COVID-19 cases. Another social distancing policy, namely physical distancing aimed at people in Indonesia since March 2020, which was implemented through various appeals from the head of state (president), heads of state institutions, and community leaders, communication was carried out through print and electronic media. Various kinds of policies from the State are expected to be able to overcome the spread of COVID-19.

Considering the current issue that the Covid-19 pandemic has occurred globally which has caused the government and the Department of Transportation as the responsible stakeholder in national transportation issues to implement a 50% capacity policy for passengers of public transportation vehicles including buses and trains, comprehensive research is needed to examine the intermodal transportation user preference model is related to the transportation policy set by the government recently.

This investigation highlights the issue of what are the preferences of users of road and rail intermodal transportation during the Covid-19 pandemic? Analyzing user preferences for road and rail intermodal transportation during the Covid-19 pandemic in Cirebon, Indonesia

Research Methods

The place of investigation is at the train station and bus terminal of Harjamukti Cirebon during April-Juni 2020. The population in this study are users of intermodal transportation between road and rail

modes which can be found at the train station and Harjamukti Cirebon bus terminal. The sampling technique in this study was purposive/judgment sampling, namely sampling based on the considerations or research objectives of the sample, sampling was carried out randomly and by chance. The sample size used to answer the research objectives 1 to 2 uses accidental sampling taken because the population size isn't estimated (infinite) using the Zikmund formula (Kuncoro, 2003) as follows:

$$n = \left(\frac{ZS}{E} \right)^2$$

information :

n = number of samples

Z = value that has been standardized according to the degree of confidence

S = sample standard deviation or population standard deviation estimate

E = tolerable error rate, plus minus an error factor of 10%

Based on the above formula with a degree of confidence of 1.96 ; standard deviation of 0.5; and the tolerable error rate is 0.05; then the sample size is:

$$n = \left(\frac{(1{,}96)\ (0{,}5)}{0{,}05\qquad 0{,}1} \right)^2 = \left(\frac{0{,}98}{\qquad} \right) = 96{,}04$$

The population in this analysis, prospective users of road and rail transportation services in the Cirebon area also has an infinite number. For this reason, using the above formula, a sampling of 100 samples was taken for preference analysis in the Cirebon area. Samples were taken from respondents by filling out a questionnaire. The validity of the instrument with Pearson correlation where an indicator or question is said to be valid if the correlation value of r-count > r-table, then the question can be said to be valid. The r-table value with 5% alpha and dk = 28 (30-2) is 0.361. While the results of the reliability test can be seen in the value of Cronbach's alpha. If Cronbach's alpha value is higher than 0.7 then the measuring instrument has good reliability. The test results are presented in the table below.

Table 1. Instrument Validity Test Results

Variable	Symbol	r-calculation	Information
Security	A1	0.969	Valid
	A2	0.971	Valid
Comfort	B1	0.939	Valid
	B2	0.944	Valid
Facility	C1	0.920	Valid
	C2	0.962	Valid
Convenience	D1	0.920	Valid
	D2	0.846	Valid
Crowd	E1	0.916	Valid
	E2	0.925	Valid
Density	F1	0.949	Valid
	F2	0.965	Valid

Furthermore, the value of Cronbach's Alpha reliability test results are presented in the table below.

Table 2. Alpha Cronbach's Value

Variable	Alpha Cronbach's	Information
Security	0.936	Reliable
Comfort	0.871	Reliable
Facility	0.896	Reliable
Convenience	0.720	Reliable
Crowd	0.820	Reliable
Density	0.900	Reliable

In the table above, the value of Cronbach's Alpha obtained by the security variable is 0.936, comfort is 0.871, facility is 0.896, convenience is 0.720, crowd is 0.820 and density is 0.900. Because the output value (Cronbach's alpha) obtained is higher than criteria 0.7. So it can be concluded that all question items have good reliability or have good consistency as a measuring tool.

Result and Discussion

Conjoint analysis is applied in this study as an effort to design an intermodal route preference model that can meet consumer tastes. This analysis is applied because the mode model as studied is not yet available so that the preference model seems to be a more appropriate type of analysis. An investigation data were obtained from distributing questionnaires to 300 people. selected to represent users of public transportation services in the Cirebon area.

Conjoint analysis was applied using 6 attributes which were developed based on the characteristics of the route network perceived by users of transportation services, namely: comfort, crowds, road facilities, ease of reaching the road at the user's location, and road safety, as well as road density. For modeling preferences for route selection based on perception of the six attributes, the researchers distributed as many as 300 questionnaires to respondents obtained by non-probability sampling technique, namely by accidental sampling. Samples are people who happen to be met by researchers when they are going to use transportation.

Conjoint uses a full profile method where respondents rank, sort or score a set of profiles based on their preferences. Each profile depicts a item or benefit that comprises of a combination of diverse levels of variables from all components. The main problem that arises with the full-profile approach is that if more factors are involved and each factor consists of several levels, then the total number of profiles generated from all combinations of level factors becomes too large for respondents to rank or score. To solve this problem, the full-profile approach uses the terminology fractional factorial design, which presents the appropriate fractions for all possible combinations of factor levels. The resulting set is called an orthogonal array, which is formed to describe the main effect of each level factor. Interaction between levels of one factor with the level of other factors is assumed to be meaningless.

Orthogonal strategies are by and large utilized to create an orthogonal cluster and are especially the beginning point of conjoint examination. Each figure level in an orthogonal plan speaks to a diverse adaptation of the item beneath think about and must be presented to the subject within the frame of a profile.

In mathematics, an orthogonal array is a table whose contents are derived from a finite set of symbols (usually {1, 2, …n}, which are arranged in such a way that there is one integer t such that for each choice of column t of the table, all pairs of t sorted order, is formed by taking the input of each row that is limited to that column.

Determination of orthogonal arrays in this study using the help of SPSS software. The following is the process of determining the orthogonal array.

1. This investigation uses 6 attributes, each of which has 2 alternative attribute values, so that the combination of all attribute values is shown in table 3 belowz

Table 3. Attributes and Levels

No	Atribut	Level
1	Comfort	Less comfortable Comfortable
2	Crowd	not crowded Crowded
3	Facility	few facilities Many facilities
4	Convenience	Not easy Easy
5	Security	Less safe Safe
6	Density	Not solid solid

2. The results of the combination of the six attributes are:
The combination (Convenient * Crowded * Facilities * Easy * Safe * Solid) is

2 x 2 x 2 x 2 x 2 x 2 = 64 combinations as shown in table 4 below:

Table 4. Combination Full Profile

No	Comfort	Crowd	Facility	Convenience	Security	Density
1	Comfortable	Crowded	Many	Easy	Safe	Not crowded
2	Less comfortable	Crowded	Few	Easy	Safe	Crowded
3	Comfortable	Not crowded	Many	Easy	Safe	Not crowded
4	Less comfortable	Not crowded	Many	Easy	Safe	Crowded
5	Comfortable	Crowded	Few	Easy	Safe	Not crowded
6	Less comfortable	Crowded	Few	Easy	Safe	Crowded
7	Comfortable	Not crowded	Few	Easy	Safe	Not crowded
8	Less comfortable	Not crowded	Few	Easy	Safe	Crowded
etc . 64						

With the number of combinations as many as 64, respondents will have difficulty in scoring each combination of factors. The results of the SPSS version 19 program using 6 factors can obtain orthogonal values, in this case 16 orthogonal values are produced. The investigative instrument for conjoint analysis was carried out by ranking 16 orthogonal combinations from the SPSS version 19 program. Conjoint analysis is used to identify attributes that are considered the most important and

least important, determine the combination of attributes that are preferred by consumers, and determine the order of priority of attributes that are preferred by consumers in the use of intermodal transportation.

The applied conjoint analysis produces the utility value of each level of each attribute and its average importance score. The importance value shows how important an attribute is to the overall preference. The utility value and the importance value generated by the conjoint analysis are shown in table 5 following.

Table 5. Results of the Analysis of Respondents' Preferences

No	Attribute	Level	Usability Value	Important Score (%)
1	Comfortable	Less comfortable	-0.158	18.421
		Comfortable	0.158	
2	Crowded	Not crowded	-0.017	16.695
		Crowded	0.017	
3	Facility	Few	-0.070	12.753
		Many	0.070	
4	Convenience	Not easy	-0.151	19.164
		Easy	0.151	
5	Security	Less safe	-0.157	17.286
		Safe	0.157	
6	Density	Not crowded	-0.015	15.680
		Crowded	0.015	

Source: Processed primary data, 2021

Based on Table 5, the usability value for the road comfort attribute at the less comfortable level is -0.158 while for the comfortable level it has a usability value of 0.158. For the crowd attribute, each level has a usability value of -0.017 for not crowded and 0.017 for crowded level. In the facility attribute, the value for the little level is -0.070 and for many is 0.070. On the attribute of ease of reaching the road, the less easy level has a usability value of -0.151 and the easy level of 0.151. On the security attribute, the less safe level has a usability value of -0.157 and the safe level has a usability value of 0.157. The road density attribute at the non-congested level is -0.015 and the solid level is 0.015. If displayed graphically, the importance value of each attribute is presented as shown in Figure 1 below:

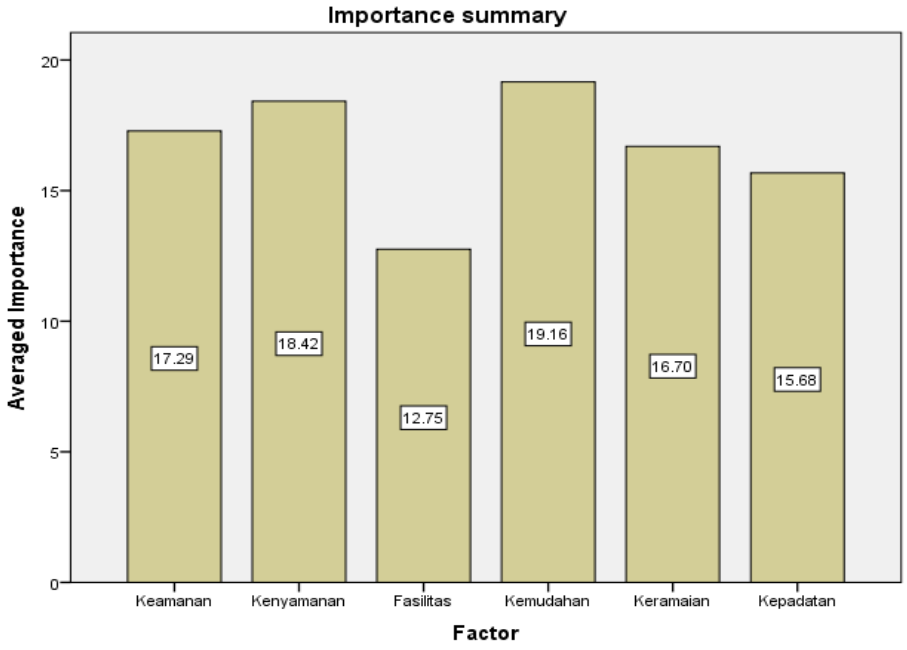

Figure 1. Attribute importance value

The attribute that is considered the most important is the attribute of ease of reaching the road, with a percentage of attribute importance of 19.16%, while the attribute that is considered relatively unimportant is the attribute of facilities, which is 12.75%. This means that the users of feeder transportation services on the intermodal route network are first to pay attention to the ease of road access, then comfort, security, road crowds, road density and road facilities.

Setting Preferences

After the respondent's preference on the attribute is known which has the higher preference, then it is known the respondent's preference at the attribute/level. A negative utility estimate value indicates that the respondent does not like the level of the attribute/level. While the positive indicates that the respondent likes the attribute level/level. The respondent's utility value from the highest to the lowest is obtained in the Comfort variable, the respondent prefers the Convenience attribute at 0.158. In the Facility variable, respondents prefer the many facilities attribute of 0.070 . In crowds, respondents prefer crowds of 0.017. On density, respondents prefer a density of 0.015. For more details, see the utilities table below.

Table 6. Attribute Combination Preference Ranking

		Utility Estimate	Std. Error
Security	Less safe	-.157	.126
	Safe	.157	.126
Comfortable	Less comfortable	.158	.126
	Comfortable	-.158	.126
Facility	Few	-.070	.122
	Many	.070	.122
Convenience	Not easy	-.151	.122
	Easy	.151	.122
Crowded	Not Crowded	-.017	.122
	Crowded	.017	.122
Density	Not solid	-.015	.121
	Solid	.015	.121
(Constant)		3.091	.121

Source: Processed primary data, 2021

Linearly the mathematical model of intermodal route selection preferences can be obtained as follows:

$$Y_b = 0{,}151Xp_1 + 0{,}158Xp_2 + 0{,}157Xp_3 + 0{,}017Xp_4 + 0{,}015Xp_5 + 0{,}07Xp_6$$

Information:

Y_b = Transportation user preferences
Xp_1 = Convenience
Xp_2 = Comfortable
Xp_3 = Security
Xp_4 = Crowded
Xp_5 = Density
Xp_6 = Facility

Prediction Accuracy

Measurement of predictive accuracy of the sample is needed in conjoint analysis. Predictive accuracy is measured by using the correlation value between the estimated variable and the actual. To identify this accuracy, it can be seen in the correlation coefficient which is reflected in Pearson's R and Kendall's tau. According to the results of the conjoint analysis, it is obtained as in table 7.

Table 7. Correlation Value of Conjoint

	Value	**Sig.**
Pearson's R	**0.683**	**0.007**
Kendall's tau	0.273	0.109

Source: Processed primary data, 2021

Based on these results, it can be seen that the probability is < 0.05, then this means that there is a strong relationship between the estimation results and the actual or high predictive accuracy in the conjoint process. From a human perspective, virtually everyone has a high regularity in their daily journeys, both spatially and temporarily, and this can

be predicted (Song et al., 2010). A person usually visits two main locations (home and work) with characteristic time patterns (Hasan et al., 2013). At the same time, it is expected that people change their travel behavior at some point, if they move or change their job, but we also change movement in day-to-day activities (Espinoza et al., 2018).

The results of this investigastion are in accordance with the research of (Lebeu et al., 2012) which found all part-worth utilities for the vehicle attribute level by conjoint analysis, it is possible to set different scenarios for 2012, 2020 and 2030. Travel behavior can be strongly associated with attitude. When a person uses his car more often than public transportation, attitudes towards car use are likely to be more positive when attitudes towards other modes are negative (Paepe et al., 2018). Previous research of (Pyzalska et al., 2022) exhibits that the results of the conjoint analysis place safety as the most important feature of car use, followed by price, range and type of car.

Conclusion

The model of road and rail intermodal transportation in the Cirebon area based on the order of preference is convenience, comfort, safety, crowd, density, and facilities. Improve vehicle facilities used by users (community) such as adequate seats or according to the maximum vehicle load, sufficient place for placing goods, adequate air ventilation, waiting room facilities at terminals/stations that are safe, comfortable.

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