Understanding changes in perceptions and behaviour of train passengers during the Covid 19 pandemic

Nurhadi* and R T Suryadari
Faculty of Economics and Business, Universitas Sebelas Maret, Surakarta, Indonesia
*Corresponding author: nurhadicrb.hadi@gmail.com

Abstract. Transportation is considered as one important area that contribute to energy emission. The transportation sector accounts for 15% of total GHG emissions and 23% of CO₂ emissions, of which 30% of CO₂ comes from burning fossil fuels. Government policies in the context of preventing the spread of Covid 19 and enforcement of restrictions on Community Activities (PPKM), have provided benefits for the environment in terms of reducing air pollution by up to 42% (liputan6.com). The Covid 19 pandemic has an impact on the public transportation business, based on sales data from PT KAI (Persero) that there was a decrease in the number of long-distance train passengers using rail transportation services, namely in April 2019 there were 3,879,792 passengers while in April 2020 it fell to 286,268 passengers. This research aims at understanding the risk perception that affects the planned attitudes and behaviour of potential passengers to travel by train during the pandemic. 368 samples were collected from Operation Area 1 to Operation Area 9. Employing SEM analysis with the SmartPLS, the result shows that the customers intend to continue traveling using railway public services. However, a certain level of anxiety and perceived risk grows due to a lack of information. namely, uncertainty whether the use of public transportation may bear the potential for covid 19 transmissions. Hence the government's actions in dealing with the pandemic could reassure the customers to continue using the railway services.

1. Introduction
The corona virus pandemic has had a devastating impact on all industries, especially the railroad transportation industry in 2020. Laato S et al. [1], travel ban issued by the Minister of Transportation Regulation Number 13 of 2021 concerning Control of Transportation during the Eid Al-Fitr 1442 H Period in the context of Preventing the Spread of Covid 19, Large-Scale Social Restrictions (PSBB) and the Enforcement of Restrictions on Community Activities (PPKM) by implementing it from quarter 1 of 2020 to 2021 on an ongoing basis, this causes air pollution reduce up to 42% and creates uncertainty for the passenger transportation business. The Indonesian Railway Company (PT. KAI) as a state-owned company engaged in the implementation of railways has greatly felt the impact of the Covid 19 pandemic. This business uncertainty is due to the low purchasing power of people (decreased income) and environmental factors (travel restrictions). In data PT. KAI 2020 [2] based on sales from Indonesian Railway Company (PT. KAI) March 2020, there began to be a decrease in the number of long-distance train passengers compared to March 2019 of 1,151,365 passengers, April 2020 there was a significant decrease in long-distance train passengers compared to April 2019 of 3,593,524 passengers as well as in May 2020 a decrease of 3,278. 496 compared to May 2019. The dominant perception with the potential condition for the transmission of Covid 19 is the perception of the risk that is in him so that it affects him in taking a stance to use public transportation. Perceptions of the risk felt by potential passengers include anxiety if there are many people (physical/health) the possibility of transmission. In
addition to the risk perception of using rail transportation, there are attitudes, subjective norms and behavioural control (Figure 1). According to Ajzen [3], he explains the theory of behavioural planning (Theory Planning Behaviour), namely the dimensions of attitudes, subjective norms and behavioral control that are built from interactions to influence purchase behaviour intentions. In this "New Normal", individuals will carry out their activities with restrictions that have been determined by the health procedure, including social distance and healthy lifestyles, individuals are even required to use masks in every activity and some areas apply sanctions if they do not use masks. This research aims at understanding the risk perception that affects the planned attitudes and behaviour of potential passengers to travel by train during the pandemic.

2. Theoretical framework

According to Kotler and Keller [4] related to perception in general, it describes an individual process in selecting and organizing information to get the choice and connecting individuals with companies. The process of individuals selecting and organizing the information they get into a picture.

2.1 Perceived risk

Consumers in obtaining products and services have a perceived risk, namely the uncertainty between expectations and the realization of the decision at the time of their purchase, Schiffman and Kanuk [5] from the above definition obtained the relevant dimensions of perceived risk, namely uncertainty and consequences. In facing risk, consumers have tolerance limits that affect purchases made. According to research by Choi et al. [6], the perceived uncertainty regarding the possible negative consequences of using a product or service, according to Bauer [7] is consumer behavior that involves risk in the sense that every consumer action will result in consequences that cannot be anticipated in any way, approaching certainty, and some of it unpleasant. Based on the risk there are 2 (two) factors that can reduce it Cox et al. [8], namely:

2.1.1. Reducing the amount wagered on the consumer. PT KAI (Persero) seeks to reduce the spread of Covid 19 in terms of passenger mobility by following health procedures regulated by the Ministry of Health, Ministry of BUMN and Ministry of Transportation, namely social distancing for passenger seats, thereby reducing the number of facilities to operate.

2.1.2. Increasing the consequences of certainty reduces the risk. Based on information from WHO that Covid 19 is transmitted through solid (unprotected close contact) or liquid (droplets) particles in the air, these particles float and land on the surface. PT KAI (Persero) is consistent in terms of cutting off the transmission and spread of Covid 19 by installing a hand sanitizer on facilities and infrastructure, providing facelifts and periodic body temperature measurements on the train Customers’ observations about high risk are often described as classifications to limit their choice of a product and try to find alternative options. Research Hwang and Choe [9] in Bardin et al. [10], Chen [11], explained the relationship between risk perception and attitudes towards genetically modified foods and found that the higher the level of general risk perception reported by consumers, the more negative their attitude towards the product. Likewise in Hwang and Choe [9] explored the relationship between perceptions of food risk and genetically modified attitudes and confirmed that there is a significant negative relationship between the two, the more people perceive the risk, the more negative impressions people have of a product, Chen [11]. Research by Yoon and Chung [12] explains that hygienic and environmental risks in food can have a negative relationship with consumer image about the food served on street food. In an experiment conducted by Verneau et al. [13] with participants in Denmark and Italy, a video was shown about the benefits of consuming food made from insects, thereby reducing risk perceptions in consumers. The results showed that respondents formed a positive image about the consumption of edible insects, indicating that reducing risk perceptions helps to create a good image. Consumers perceive a lower level of health risk associated with edible food products, they are more likely to form positive attitudes towards edible products.
H1: Consumer risk perceptions affect attitudes

2.2 Theory planning behavior

The theory of planned behavior (TPB) is a development of the Theory of Reasoned Action (TRA), Ajzen [3]. Qu W et al. [14] The theory of planned behaviour is an individual's intention to perform a certain behaviour, intention is assumed to capture the motivational factors that influence behaviour, which is an indication of how hard people are willing to try and how much effort they are planning to make. In TPB, there are 3 (three) types, namely attitude, Subjective norms and Planning Behaviour Control (PBC).

2.2.1 Attitude. Jiang et al. [15], Attitude is defined as the extent to which a person evaluates or assesses behavior well. People have a positive attitude toward certain behaviours when they firmly believe that they will get positive results if they perform the behaviour. Conversely, people have a negative attitude when they hold a strong belief that a negative outcome will result from that behaviour. Empirical work has consistently reported positive effects of attitudes on behavioural intentions in contexts related to acceptance or adoption of internet services, Baker and White [16].

H2: The attitude of a prospective passenger affects the intention to travel by using the train

2.2.2 Subjective norms. Subjective norms refer to the perceived social pressure that comes from certain important references for carrying out certain behaviours of Jiang et al. [15] in Ajzen [3]. These referrals can be through friends, family members and other people who are important to the person. People are always more easily motivated to follow referral sources from those closest to them. People are more likely to engage in a behaviour when they believe that a particular referent thinks they should perform a behaviour, and they are encouraged to live up to that referent's expectations otherwise people will be less likely to engage in a behaviour.

H3: Subjective norms of potential passengers affect the intention to travel using train.

2.2.3 Planning Behaviour Control (PBC). PBC refers to the perceived ease in performing a behaviour and it is a significant predictor of Jiang et al. [15] intention in Ajzen [3]. The two main factors that may influence PBC are access to the resources and opportunities needed to perform the behaviour. People have high levels of PBC when they feel they have access to the resources and opportunities needed to successfully perform a behaviour, Conner and Armitage [17] which in turn leads to a greater intention to perform the behaviour. Previous research found that PBC significantly predicts the intention to obtain information about and purchase products from internet vendors, Pavlou and Fygenson [18].

H4: The behavioral control of prospective passengers influences the intention to travel using rail transport.

![Diagram](perceived_risks_and_planned_behaviour.png)

**Figure 1.** Perceived risks and planned behaviour of prospective passengers in travel intention using the train.
2.3 Intention
Jiang et al. [15] explains intention refers to a person's willingness to carry out a behavior. The intention is considered to be a determinant of proximal behavior. A meta-analysis reports that intention accounts for 28% of behavioral variance [19]. Previous research has explained that the relationship between intention and actual behavior in the context of social networks is also in accordance with the predictive power of intention, Heirman et al. [20] means that greater intentions show more related behaviors for intentions.

3. Empirical study
The population of these respondents was taken from the Operational Area 1 Jakarta up to Operation Area 9 Jember by considering these areas to be operational rail passenger transportation. Research data were collected using self-administered questionnaires through interviews and online surveys. Participant respondents have the criteria of at least 17 (seventeen) years of age with the consideration that at that age they can better understand the contents of the questionnaire and are included in the productive age. The number of respondents obtained in this research was 368 people who were represented from the Operational Area 1 Jakarta to the Operation Area 9 Jember. As for the profile of respondents, 51.40% were men and 48.60% were women, the intention to travel by train by prospective passengers was 26.40% for work, 20.70% for holidays and 14.90% for school. Respondents for the Operational Area 1 Jakarta including Banten only got 10.3% of the total respondents in the entire region, the respondents from West Java Province were 45.1% including the Operational Area 2 Bandung and the Operation Area 3 Cirebon from the total respondents from all regions, the respondents from the Java Province Central which includes Operation Area 4 Semarang, Operational Area 5 Purwokerto and Operation Area 6 Yogyakarta amounting to 29.4% of the total respondents of all regions and respondents from East Java Province which includes Operation Area 7 Madiun, Operation Area 8 Surabaya and Operation Area 9 Jember amounting to 15.2% of the total respondents in all regions. For the distance of the respondent from home to the train departure station, which is the distance of 6 km - 10 km, the highest is 27.7%, while the second place is the distance of more than 20 km by 25.5% where this distance is enough to make a sense of concern about the transmission of Covid 19 from prospective passengers if using public transportation to get to the departure station.

3.1 Survey instrument and measurement
All variables were measured with several items adapted from the literature and modified to fit the context of rail public transport. Perception of risk and planned behavior using a 7 point Likert scale following previous research Wang et al. [21], Hwang and Choe [9], Yu J et al. [22], Bardin et al. [10], Martin et al. [23] and Featherman and Pavlou [24] while on planned behaviour (TPB) namely Yang [25], Darvell et al. [26], Xin et al. [27] and Jiang et al. [15]. As for the consideration of this research using a 7-point Likert scale, namely making it easier for respondents, selecting categories in the questionnaire will be more specific and used previous research.

3.2 Measurement model
In the measurement model analysis stage (outer model), there are two things to be analysed, namely the analysis of validity (Convergent Validity, Discriminant Validity) and reliability analysis (Cronbach's Alpha and Composite Reliability).

Table 1 explains that Convergent Validity is carried out to determine whether the measuring instrument used can perform its function properly, the indicator is considered valid if it has a correlation value of more than 0.50 or if the t value of outer loading is > 1.960 [28]. The next Outer Model measurement is Discriminant Validity (Cross Loading) which is used to prove whether the indicator in a construct will have a greater value on the construct it forms than the value with other constructs, the cross-loading value in this research shows that each indicator of its latent variable is proven large
compared to the relationship to other latent variables so that it can be concluded that discriminant validity is fulfilled. After the validity test is fulfilled, the reliability test of the measurement model is carried out, namely Cronbach's Alpha and Composite Reliability with the recommended value to fulfill above 0.700.

**Table 1. Construct assessment.**

| Variabel Latent        | AVE   | Cronbach’s Alpha | Composite Reliability | Information |
|------------------------|-------|------------------|-----------------------|-------------|
| X11 Physical Risk      | 0.893 | 0.940            | 0.961                 | Reliabel    |
| X12 Performance Risk   | 0.908 | 0.899            | 0.952                 | Reliabel    |
| X13 Psychology Risk    | 0.892 | 0.940            | 0.961                 | Reliabel    |
| X14 Financial Risk     | 0.757 | 0.849            | 0.903                 | Reliabel    |
| X15 Time Risk          | 0.831 | 0.897            | 0.936                 | Reliabel    |
| X16 Social Risk        | 0.675 | 0.849            | 0.860                 | Reliabel    |
| X2 Attitude            | 0.877 | 0.930            | 0.955                 | Reliabel    |
| X3 Subjective Norm     | 0.834 | 0.900            | 0.938                 | Reliabel    |
| X4 Attitude Control    | 0.781 | 0.861            | 0.914                 | Reliabel    |
| Y Intention of Traveling by Train | 0.912 | 0.952            | 0.969                 | Reliabel    |

**Table 2. Paths analysis results.**

| Hypothesis                  | Original Sample (O) | Standard Error | T Statistics | P-Value | Results                                                                 |
|-----------------------------|---------------------|----------------|--------------|---------|-------------------------------------------------------------------------|
| X1 Attitude → Attitude      | -0.228              | 0.074          | 3.092        | 0.002   | Perception of physical/health risks have a significant effect on attitudes |
| X2 Attitude → Attitude      | -0.029              | 0.052          | 0.552        | 0.581   | Perception of performance/quality risks does not have a significant effect on attitudes |
| X3 Subjective Norm → Attitude| -0.570              | 0.080          | 7.102        | 0.000   | Perception of psychological risk have a significant effect on attitudes |
| X4 Attitude Control → Attitude | 0.002               | 0.045          | 0.051        | 0.959   | Perception of financial risk has no significant effect on attitudes |
| Time risk → Attitude        | 0.136               | 0.069          | 1.978        | 0.049   | Perception risk time has a significant effect on attitudes |
| Social risk → Attitude      | 0.131               | 0.078          | 1.683        | 0.093   | Perception of social/environmental risks do not have a significant effect on attitudes |
| Attitude → Intention of traveling by train | 0.456 | 0.077          | 5.920        | 0.000   | Attitude has a significant effect on the intention to travel by train |
| Subjective norm → Intention of traveling by train | 0.287 | 0.067 | 4.284 | 0.000 | Subjective Norms have a significant effect on the intention to travel by train |
| Attitude Control → Intention of traveling by train | 0.110 | 0.040 | 2.782 | 0.006 | Behavior control has a significant effect on the intention to travel by train |

The results in Table 2 describe the 6 (six) perceptions of risk that affect attitudes, namely the perception of health risk, psychological perception and time risk perception, while other risk perceptions have a T Statistics value below <1.960 and a P-value above >0.05 so that it does not affect attitudes. The interest in using trains is influenced by attitudes, subjective norms and behavioural control (TPB), namely that individuals will be willing to pay extra and follow health protocols for safety during their travels during the Covid 19 pandemic.
4. Discussion

4.1 Results
The purpose of this study was to determine the dimensions of risk perception that affect attitudes and the theory of planned behaviour (TPB) that affect the intention to travel by train. The dimension of risk perception used in this research follows previous research, namely Hwang and Choe [9], Sánchez-Cañizares et al. [29] and Featherman and Pavlou [24], namely health risk perception, perceived quality/performance risk, financial risk perception, time risk perception, risk perception, psychology and social/environmental risk perception.

The dimensions of risk perceptions above that affect attitudes during this pandemic are the perception of health risks, perceptions of psychological risks and perceptions of time risks, this is a concern of potential passengers or passengers when using public train stations and public transportation facilities. The health dimension, the psychological dimension and the time dimension have a T-value of more than 1.960 and a maximum P-value of 5%.

While the intention to travel by train is influenced by planned behaviour (TPB) which consists of attitude, subjective norms and behaviour control. TPB explains the attitude from within the potential passenger and the environment that influences the decision of the passenger in the intention to travel using the train. This research was made before the government's 2021 homecoming ban to cut the spread of Covid 19 so that the results of this research show that attitudes, subjective norms and behavioural control (TPB) affect the intention to travel by train with a T-value of more than 1.960 and a maximum P-value of 5%.

To find out how much the influence of risk perceptions on attitudes and TPB on intention to travel using trains, the R-Square ($R^2$) analysis is used, which states that the effect of risk perception on attitudes is 47% while TPB on intention to travel by train is 56.8% according to Hwang and Choe [9] and Bettman [30], Peter and Olson [31] perceived risk tends to be strong due to a lack of information and trust.

Based on the results of the research above, the anxiety of the public's attitude in reducing the mobility of their activities using public rail transportation and the government's appeal regarding the Implementation of Community Activity Restrictions (PPKM) during the Covid 19 pandemic contributed to reducing air pollution nationally by up to 40%.

4.2 Limitation and future research
This research is open without limitations, so further research is needed to validate the conclusions drawn. First, this research is specifically for public transportation Railways in Indonesia with characteristics in terms of the size and consequences of Covid 19. Therefore, the results cannot be generalized to other modes of public transportation due to differences in countries and cultures in dealing with Covid 19 handling. This relies on an online survey that respondents collected based on representatives of each area from Operating Area 1 Jakarta to Operating Area 9 Jember (East Java) so that it may not represent the social conditions of the public using rail public transportation. In this survey, respondents indicated that traveling by train was predominantly male 51.4% and 48.6% female who intended traveling for work/business by 26.4% and on vacation by 20.7% besides that this research found out that the distance from the respondent's house to the departure station, which is between 6 - 10 km of 27.7% and >20 km of 25.5%, this could be further research related to service to customers during the Covid 19 period or normal conditions. Finally, the survey was carried out from December 2020 to January 2021 where the government has not issued a counter-productive regulation between the 2021 Homecoming Prohibition (SE-13 of 2021) and the community is allowed to travel in cities or agglomeration areas, this can be further research related to perceptions. risks and planned behaviour (TPB) on these external factors.

5. Conclusions
The COVID-19 pandemic has resulted in a decline in all types of business, especially the transportation and warehousing business. This research focuses on rail public transportation during the Covid 19
pandemic at the Indonesian railway company (PT. KAI), namely to determine the effect of risk perception on planned attitudes and behaviour (TPB) on intentions to travel by train.

The dimensions of risk perception that affect the attitudes of prospective passengers are the health dimension, the psychological dimension and the time dimension. Prospective passengers feel anxiety in using public transportation during the Covid-19 pandemic, to reduce the anxiety of prospective passengers in using public rail transportation, namely by providing information or communication repeatedly related to novelty and quality (S Al-Jundi & A Shuhaimer, 2019)[32] handling of Covid-19 in rail transportation is in accordance with health protocols. Another factor that can reduce the anxiety of prospective passengers is to provide a sense of confidence to prospective passengers that using train transportation is safe.

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