



# Alternative Policy Management Framework in Determination of Long-Distance Travel Permit Based on Covid-19-like Symptoms Using Data Mining

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**Abstract.** Even though the obligation to carry out a Covid-19 booster vaccination still applies to long trips using public transportation in Indonesia. One clause regarding checking policy for symptoms of Covid-19 is still often ignored by train passengers because the symptoms of Covid-19 are still similar to those of influenza. Somehow, the travel policy is not fair for comorbid person which cannot have Covid-19 vaccination. This research goal is to propose an alternative policy, which is a part of policy management framework, to prevent the transmission of covid-19 by long-distance train travel in new era when the enforcement of Covid-19 regulation has been repealed. As alternative of Covid-19 vaccination requirement, the use of data mining algorithm will be proposed ning algorithm to determine whether or not it is permissible to travel long distances by using the dominant covid-19 like symptoms. The results of this study are in the form of a reasoning knowledge regarding the symptoms that passengers need to pay close attention to avoid the risk of transmission of Covid-19. Even though the accuracy of the decision is still 66.67% using C4.5 algorithm, it is the first step to be implemented in a new era, namely the era of prevention of Covid-19, no longer an era of mitigation. The publication of this result is put on bulletin board design.

## 1. Introduction

Policies can be expressed as high-level statements of corporate beliefs, goals, and common goals and means for achievement for a particular field of study [1]To guarantee that all policies are implemented according to their targets, is important to compile this policy [2]. Indonesia government about Covid-19 handling has been changed. At the national level there is also a government mandate to make policy changes, namely Presidential Decree Number 07 of 2020 concerning the Task Force Acceleration of Handling Corona Virus Disease 2019. Government policies implemented the change is Presidential Decree Number 9 of 2020 concerning Amendments to Presidential Decrees President of the Republic of Indonesia Number 07 of 2020 concerning the Task Force Acceleration in 2019 and strategies for dealing with Corona-19.

On December 30, 2022, the Implementation of Restricting Community Activities (PPKM), namely the policy to deal with the covid-19 pandemic in Indonesia, was repealed. However, in the long-distance public transportation sector, such as trains, it is still mandatory to get the first booster vaccination and be healthy and not have flu, cough and fever symptoms. However, these three symptoms are still too common and resemble the symptoms of ordinary influenza. The travel policy that requires a Covid-19 vaccination is considered unfair for comorbid sufferer, there needs to be a policy loophole that can



shelter these comorbid sufferers. Practically, there should be a travel policy in new era of Covid-19 pandemic which is not depend on vaccination but to the symptoms themselves. If the prevention of Covid-19 transmission is based on themselves the two types of passengers can be involved in one policy. The vaccinated passenger and comorbid passenger can have selfcare when they feel and knew the symptoms of Covid-19 like symptoms. Research by Soegoto et al [3] tried to find symptoms that could represent the symptoms of Covid-19 through survey and empirical method in several community health centre in Indonesia. These symptoms are called the dominant symptoms. Departing from this research and using dominant symptoms termination, we will try to use them to determine symptoms that can cause transmission of Covid-19 on long-distance train trips. The goal is that long-distance train passengers, whether they have received fist booster vaccine or not if at any time have dominant symptoms, they can have self-precaution to check themselves to not infected or carry Covid-19. The use of data mining for solve Covid-19 has also done by to predict the Covid-19 incident [4]. The data mining used in this research is in the kind of decision tree with C4.5 algorithm.

# 2. Methodology

## 2.1. Policy Management Frameworks

The policy management framework is the steps to make policy that takes into account stakeholders need and environment changes. The policy framework takes into account the company's operating environment changes, such as the introduction of new or updated legislation, industry and other standards and society expectations. By making sure to know how to respond to these events now, it will be able to more effectively develop new policies and procedures that make every stakeholder comply. and of course, make it more efficient in achieving the mission and goals of the organization. From Compliancebridge [5] the policy management frameworks can be depicted in Figure 2.



Figure 1. Policy Management Framework [5]

The point in a policy management framework is when it goes into the nitty gritty of creating policies and procedures. Before deciding on a process, it's worth taking a moment to consider the initial build base. What are the triggers that drive the policy or procedure to need improvement. Triggers can be new

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laws, changes in the community or operating environment or a re-evaluation of the company culture and strategic direction of the organization.

## 2.2. Reasoning of Policy Updating

At least there is three reasons why policy should by update, Bradley [6] said there are a) Your business can be liable for outdated and inconsistently-enforced policies b) Your business can be liable for the policies that you don't have (and are ignoring). c) The longest policy is not always the best. We cannot ignore the emergence and proliferation of new threats and evolving laws. Over time, there will be gaps that no policy can cover. So that it needs repair, patching or change of policy. What should we do when the Indonesian government has revoked the implementation of the Covid-19 Restrictions (PPKM). We can no longer force ourselves to stand on the same policy, we must be open to every new accessibility to be overcome [7]. We cannot let comorbid sufferers not have the right to use long-distance public transportation. But on the other hand, we are continuing to prevent and control the spread of Covid-19 that may occur on long-distance public transportation.

From a policy framework, in updating a policy, we need some comprehensive research that we are currently doing. The policy of limiting public transportation just because it has been vaccinated causes the community to lose money in terms of inter-regional income transfers and limits the financial capacity of workers who have to travel long distances.

#### 2.3. Research Problem

There is a hierarchical structure of policies adapted to the management environment in which the policies are implemented. This study tries to provide suggestions at the functional level (see Figure 2, infra), it consists [8]:

- Corporate policies or high-level policies: These policies are directly derived from corporate goals and embody aspects of strategic business management rather than aspects of technology-oriented management.
- Task-oriented policies: Their field of action is sometimes referred to a task or process management, where they define the way how management tools are to be applied and used to achieve the desired behaviour of the resources.
- Functional policies: These policies operate at the level of and define the usage of management functions; and
- Low-level policies: these policies operate at the level of managed objects.



Figure 2. Policy Hierarchy [8]



Research conducted by Soegoto et al [3] tried to find a new approach in the Covid-19 new era, the time when Covid-19 was under control and Covid-19 phase is not mitigation any more but become prevention phase. Soegoto et al research proposes a prevention approach as a substitute for mitigation. If mitigation looks at the number of sufferers of Covid-19, then prevention refers to people who are healthy but have symptoms that are considered to represent the symptoms of Covid-19.

Looking at Figure 3, we have to look for the policy door in prevention phase, the conditions have two policy for traveling: the normal policy or vaccinated policy and exceptional policy or not (full) vaccinated..



Figure 3. Exceptional Policy and normal policy in Covid-19 Prevention Phase

An important question is if we do not use the vaccination requirements anymore, that apply to longdistance train passengers. then what tools can we use to prevent the spread of covid-19. This is the question that this research will try to answer by proposing independent detection of dominant symptoms that are believed to be symptoms of Covid-19. An important question is if we do not use the vaccination requirements that apply to long-distance train passengers. then what tools can we use to prevent the spread of covid-19. This is the question that this research will try to answer by proposing independent detection of dominant symptoms that are believed to be symptoms of Covid-19. Starting with conducting a survey of dominant data, then an automatic classification is carried out by a data mining algorithm to see how likely it is that someone with dominant symptoms can be a carrier of Covid-19 (as illustrated in Figure 2). The research flowchart is shown in Figure 4.



#### 2.4. Data

Primary data was obtained from the research of Handoko et al [9], namely the four dominant symptoms that are empirically believed to be symptoms of the Covid-19 variant in Indonesia until this research takes place (2022). Table 1 shows the data class type of the primary data.



| Table 1. Data Class Type |                 |                 |                             |  |  |  |  |
|--------------------------|-----------------|-----------------|-----------------------------|--|--|--|--|
| Symptoms                 | Symptoms Name   | Data Class Type | Data Class Used             |  |  |  |  |
| S1                       | Sore throat     | Text            | not often, often            |  |  |  |  |
| S2                       | Dry Cough       | Text            | light, severe, more severe, |  |  |  |  |
| <b>S</b> 3               | High fever      | Text            | Light, severe               |  |  |  |  |
| S4                       | Hard to breathe | Text            | Moderate, intermediate      |  |  |  |  |

# 2.5. Data Mining Algorithm

Data mining is the process of discovering knowledge from a collection of data. This knowledge can be in the form of associations, patterns of similarity or difference, significant anomalies for decision-making or classification purposes [10]. Data mining itself is a derivative of the science of pattern recognition from a database that has been conditioned or tidied up. One form of decision-making is in the form of a decision tree [11]which can be made manually or using an algorithm. Algorithm C4.5 is one of the algorithms that can make a decision tree, beside decision tree there is also Naïve Bayes Algorithm. Research by Handoko et.al [12] has use Naïve Bayes algorithm to solve the travel permit in Covid-19 adjoined areas.

This C4.5 algorithm is used to create a decision tree based on data in to predict and classify the decision [13]. Then the reasoning in the form of a decision tree can also be rewritten to a rule form. The process of making the first decision tree is to entropy each class and attribute, then calculating the acquisition of information [14]. Information obtained from the tree the decision will be easier to understand because the attribute with the highest gain value will be the roots of the tree are followed by the branches. Pruning, in some situations, stopping stop rules doesn't work well. Alternative way to build a decision tree is to grow a large tree first, then prune it to the optimal size by removing the node that provides less additional information.

According to Lakshmi et al. [15] the stages of the C4.5 algorithm process are described as follows. a. Prepare data

- b. Select attributes as root
- c. Calculate the value of gain and entropy

$$Gain(S,A) = Entropy(S) - \sum_{i=1}^{k} \frac{|S_i|}{|S|} x Entropy(S_i)$$
(1)  

$$Entropy = -\sum_{i=1}^{k} p_i \log_2 p_i$$
(2)

where S is a set of cases, A is an attribute, |Si| is the number of cases on the i-th partition, and |S| is the number of cases in S. In algorithm C4.5, the gain value is used to determine the variable which are the nodes of a decision tree. A variable that has the highest gain will be used as a node in the decision tree.

- d. Share cases in branches
- e. Repeat the process for each branch until all cases in the branch have the same class and or there are no attributes in the tuples that are partitioned again and/or there are no tuples in the empty branch.

## 2.6. Concept of Designing Billboard

Billboards (or billboards) are large boards provided by governments, industrialists and suppliers of goods with adequate space for advertising and referring to anything external space where advertisements can be placed. In government companies, of course, billboards are installed an area that is easy to see, both in the direction of the eye and at a height so that it can be seen from a distance. Two definitions can be considered for the billboard advertising concept [16]:

- 1. Send as many messages as possible in as few words as possible in the shortest possible time via environmental space assigned to it
- 2. Provide information that can be guaranteed



Billboard users believe that billboards have unique advantages so they are preferred compared to other media. Billboards are usually near major roads, in terms of size, colour and location [17]. That the environmental advertising industry promotes billboards to attract more attention. For example, outdoor advertising creates more visual effect and attention.

## 3. Results and Discussion

## 3.1. Pre-processing data

Pre-processing needs to be done on primary data, including by conducting opinion surveys of prospective passengers who feel they have Covid-19 symptoms both before boarding the train and after getting off the train. This survey was conducted not too in-depth, only asking whether the passenger has all four symptoms and what is the level for each symptom, then the last question is whether he feels he has Covid-19. Without doing a medical check. The pre-processing data is developed from the primary data (Table 2).

|      | Table 2. En | hanced Table fo | or Long T  | raveling of Tra | in Passenger                       |
|------|-------------|-----------------|------------|-----------------|------------------------------------|
| Case | <b>S</b> 1  | S2              | <b>S</b> 3 | <b>S</b> 4      | Permitted for long<br>Train Travel |
| 1    | not often   | Light           | Light      | Moderate        | No                                 |
| 2    | not often   | Light           | Light      | Intermediate    | No                                 |
| 3    | not often   | Light           | Severe     | Moderate        | No                                 |
| 4    | not often   | Severe          | Light      | Moderate        | No                                 |
| 5    | not often   | Severe          | Severe     | Moderate        | Yes                                |
| 6    | not often   | More Severe     | Light      | Moderate        | Yes                                |
| 7    | not often   | More Severe     | Severe     | Moderate        | Yes                                |
| 8    | not often   | More Severe     | Severe     | Intermediate    | Yes                                |
| 9    | often       | Light           | Light      | Moderate        | Yes                                |
|      |             |                 |            |                 |                                    |
|      |             |                 |            |                 |                                    |
|      | often       | More Severe     | Severe     | Intermediate    | Yes                                |

# 3.2. Decision tree with C4.5 Algorithm

Algorithm C4.5 execution is assisted by using the Rapidminer application with a program modelling form as shown in the figure 5. The data source are divided as training and testing data



Figure 5. Execution model for C4.5 Algorithm Using Rapidminer

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The results obtained can be seen in the Figure 6, at the flow of the tree which gives a Yes decision, it appears that there is a branching which gives the decision that passengers need to be suspected being carriers of the Covid-19 virus or are vulnerable to contracting Covid-19, so the Passengers are not being allowed to travel. i.e. when Symptom 1 is often and Symptom 2 is severe. We can also see two branches giving a 50% yes decision, which means that the passenger is likely to be a carrier of Covid-19 or has a 50% vulnerability to contracting Covid-19, that is when Symptom 1 = often, Symptom 2 = Light, Symptom 4 = Moderate and when Symptom 1 = not often, Symptom 2 = Light, Symptom 3 = Severe.



Figure 6. Visualization of Decision Tree C4.5 Prediction Model Without Pruning

Classifying the decision tree from the dataset being tested, so that the calculation is carried out in the test and then described in a table called confusion matrix. All about the good and bad parameters in classifying with test data in different classes, namely negative and positive classes, namely the process of the confusion matrix as shown in table 3.

| Table 5. Comusion Maura of C4.5 |              |          |  |  |  |  |
|---------------------------------|--------------|----------|--|--|--|--|
|                                 | Actual Class |          |  |  |  |  |
| Predicted class                 | true No      | true Yes |  |  |  |  |
| pred. No                        | 0<br>FP      | 0<br>TN  |  |  |  |  |
| pred. Yes                       | 1<br>FN      | 2<br>TP  |  |  |  |  |
| class recall                    | 0.00%        | 100.00%  |  |  |  |  |

**Table 3.** Confusion Matrix of C4.5

. We calculate accuracy = (TP+TN)/(TP+TN+FP+FN) = 66,67%. The accuracy of the results of this study is 66.67% but can be used as a suggestion to be used as an alternative policy from a policy that refers to obtaining the first booster covid-19 vaccination.

## 3.3. Implemented the Regulation in Public

The publication of this result is put on bulletin board as can be shown in the Figure 7, designed by our team. The notification about Level 1 and 2 on bulletin board are the results from decision tree (Figure 6).

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(a) Designed by Y. Handoko (2022) put on railway side



(b) Designed by Wantoro (2023) put on social media

Figure 7. Result of new policies published on bulletin board

## 4. Conclusion

An alternative policy management framework has been produced in determining long-distance travel permits based on symptoms similar to Covid-19 using data mining. Even though the accuracy of the decision is still 66.67% using C4.5 algorithm, it is the first step to be implemented in a new era, namely the era of prevention of Covid-19, no longer an era of mitigation.

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