Evaluation of Customer Satisfaction with Public Transportation in Yogyakarta
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Abstract: Yogyakarta is one of the cities that provides public transportation facilities to support the activities of its people in traveling. However, the use of public transportation is still a little in demand in Yogyakarta, whether it’s because the desired travel route is not available, the tariff is not reasonable, the driver is reckless, or the physical condition of the vehicle is no longer suitable for use. Usually, after people use public transportation, the satisfaction that has been felt will appear. Therefore, a sentiment analysis study will be conducted to determine the value of customer satisfaction on the use of public transportation in Yogyakarta. This research uses social media twitter to get data. The data will identify an opinion or problem from someone whether it tends to be positive, negative, or neutral. The author uses the SentiStrength method to classify tweet data to get a value. This study will produce a summary of customer satisfaction values that can be used as a reference in increasing customer satisfaction so that people are more interested in using public transportation in Yogyakarta.

Keywords: Public Transportation, Twitter, SentiStrength, Sentiment Analysis, Customer Satisfaction

1. Introduction

Public transportation is a service to support community activities in traveling which is managed by the government and the private sector with certain rules such as operating schedules, routes provided, and prices for each trip [1][2]. Public transportation has an important role to increase economic and regional growth, because public transportation is closely related to community activities, one of which is for people who do not have private vehicles [3]. Various forms of public transportation with the type and level of service provided must prioritize comfort and safety, so that it can increase people to choose to use public transportation [4][5]. Yogyakarta is one of the areas where the government wants its people to use public transportation, with the reason to reduce air pollution and congestion [6]. To encourage people to change their mindset and awareness in using public transportation is certainly not easy.

There are several reasons why public transportation is still in low demand in Yogyakarta [7], whether it’s because the desired travel route is not available, the fare is unreasonable, the driver is reckless, or the physical condition of the vehicle is no longer suitable for use [8]. Public transportation service providers must be able to maintain customer satisfaction because this is the key to getting long-term benefits in increasing customer loyalty and growing a positive company image for the most effective completion advantage [9]. If the customer is satisfied with the services provided, it will have an impact on the public and it is possible that satisfied customer testimonials will appear [10].
Based on the problems described previously, it is necessary to know the value of customer satisfaction by finding out public comments about the services that have been felt when using public transportation. One way to find out public comments is to use social media called twitter [11]. Based on the delivery of a tweet from someone will produce a sentiment. From these sentiments, it can be classified by using the sent-strength method to get the value of a tweet [12]. By doing this analysis, it is hoped that the value of customer satisfaction on the use of public transportation can be known, so that it can be used to help make the best solution in building service strategies so that people are more interested in using public transportation in Yogyakarta.

The response or enthusiasm of the community is very important to determine the level of development in a region. One of the ways people give their feedback can be using social media called twitter [13]. Everyone has different needs and satisfactions in using social media [14]. The average person will post his tweet on Twitter when something happens to be conveyed [1]. From the tweets they convey, it will generate a sentiment. This sentiment can be analyzed to find out whether the opinion that has been conveyed is positive, negative, or neutral [2].

2. Related Works

Research [3] is an analysis of certain figures who deserve to run in the 2014 general elections in Indonesia. Tweet data taken in the form of Indonesian-language tweets discussing certain figures in the 2014 general election. Then using the naive bayes classifier classification method, TF-IDF, and term frequency for word weighting. The selection of categories in the assessment of figures is chosen based on indicators from the Indonesian Survey Institute (LSI). The analysis in this study uses Weka software to assist in the data management process, then for the database using SQL Server [3].

Research [4] is an analysis of customer satisfaction with a cellular telecommunications service provider. From year to year telecommunications technology is growing. Cellular telecommunications services are very important for the community in supporting smooth communication. In order to know the level of satisfaction from customers, it is necessary to analyze the sentiment on Twitter related to the cellular telecommunications service provider. This sentiment analysis will be grouped by polarity to find out whether the opinion is included in the positive or negative group. Sentiment analysis in this study uses a method called support vector machine, where the method uses lexicon based features to assess a tweet. Then using two types of data including 70% training data and 30% test data with a total of 300 data. The analysis in this study uses tableau software to assist in the data management process, then for the database it uses mysql [4].

Research [5] is an analysis of rumors on 13 February 2014 about the eruption of Mount Kelud on Twitter. Twitter users are certainly curious about other users in providing an opinion or response. But the news posted can not be said to be true. As heard in the news, there are rumors that Mount Kelud will erupt on February 13, 2014. This analysis aims to assist in designing the mindset and impact obtained from Twitter social media. Then use a method called automated network discovery which serves to judge from a tweet. The analysis in this study uses ucinet and netdraw software to assist in the process of data management and network visualization, then for the database using microsoft access [5].

Research [6] is an analysis in choosing urban quality improvements in DIY tourist attractions. In this research, the writer looks for emotional tweets or opinion arguments of someone with
Yogyakarta tourism experience. The method used is sentience, which is enough to make an 
assessment of a tweet. In addition, the author collaborates with Civil Engineering materials to see 
what can be taken and assessed to improve the quality of urban tourism in Yogyakarta. From these 
materials the author provides an assessment that must be a benchmark and consistent for the results 
later. Then the author makes modifications to get the level code value on the results of the previous 
sentiment. The centstrength program was changed so that it could provide a suitable value and a 
decision could be made. The result of this research is a graph that already has each desired 
dimension or level and depends on the tweet itself. So it can be seen clearly which ones can be used 
as a reference to improve the quality of the graphs. The analysis in this study uses Weka software, 
Microsoft Excel, NetBeans, and Pycharm to assist in the data management process, then for the 
database using Microsoft Access [6].

3. Experiment and Analysis

3.1. Data Collection

For data collection or retrieval from social media, Twitter uses the getOldTweet program from 
the github.com account with the python programming language. The total tweet data obtained in 
this study were 31,314 tweets. But the tweets that have been obtained still have some similarities in 
status, therefore it is done to remove duplicates on the same tweet using the existing features in 
Microsoft excel. So, the amount of data after removing duplicates is 26,583 tweets. The following 
code for retrieval of tweet data can be seen in Figure 1 and an example of tweet data can be seen in 
Table 1.

```
C:\Users\Niko Guntara>python F:\GetOldTweets-python\python Exporter.py --querysearch 
""TransportasiUmumJogja" --since 2015-01-01 --until 2020-06-30
```

**Figure 1** This is a figure. Schemes follow the same formatting.

<table>
<thead>
<tr>
<th>No</th>
<th>Tweets</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Taksi di jogja itu sombong sekali, tidak mau melayani jarak dkt dan tidak mau pake argo</td>
</tr>
<tr>
<td>2</td>
<td>transportasi umum di jogja memang buruk.. apa memang tidak ada ya? selain taksi dan ojol hahaha</td>
</tr>
<tr>
<td>3</td>
<td>angkot butuh kebijakan yang menciptakan kebutuhan publik agar angkutan umum di perkotaan lebih handal</td>
</tr>
<tr>
<td>4</td>
<td>Horee! Jadi juga kabur dari jogja setelah perjuangan nelpon 6 agen taksi pada full semuaâ€¦ (at Terminal Jombor)</td>
</tr>
<tr>
<td>5</td>
<td>Rumah di pinggiran kota tak jd masalah untuk pesen ojek argo.. Terima kasih banyak ojek taksi 86 jogja...sangat membantu dan cepet tanggap..</td>
</tr>
</tbody>
</table>

3.2. Data Preprocessing

After data collection is complete, the data is still dirty, therefore it will be processed to make it 
cleaner, make it easier to carry out sentiment analysis, and speed up the data processing process 
when it enters the analysis stage. In this study, stopwords will be carried out, namely removing 
mentions (@), hashtags (#), alphanumeric characters, question marks, exclamation points, periods,
commas, slashes, and emoticons in tweets. In addition, case folding will be carried out, namely changing uppercase letters to lowercase letters, and eliminating words that have no meaning.

3.3. Determining Sentiment Dictionary Weights Using the Sentistrength Method

The author uses the sentistrength method to help make weights or scores on words (sentiments) that will be included in the dictionary. This sentistrength program was taken from the github.com masdevid/sentistrength_id account which was later modified by the author. In this method will be given a weight from -5 to +5 based on the level of meaning of a word. In addition, the sentistrength method also provides five dictionaries consisting of a sentiment dictionary, a figurative dictionary, boosterwords, negation words, and question words which are used as clues to determine the weight of sentiment. This weighting will later help classify sentiments into positive, negative, and neutral categories according to the values contained in these sentiments at the next classification stage.

3.4. Sentiment Analysis Classification

After determining the weight of the sentiment dictionary in the previous stage, then reviewing everything related to the opinions or opinions of others in the form of judgments, attitudes, and emotions. This program uses the sentistrength method with a lexicon-based approach, where this approach measures the strength of sentiment in a sentence or short text. The following are the rules of the sent-strength method to determine the final value in a sentence:
1. If Positive Value > Negative Value Then Positive Sentiment
2. If Positive Value < Negative Value Then Negative Sentiment
3. If Positive Value = Negative Value Then Sentiment Neutral

3.5. Determining Corpus Based on Service Quality Dimension Category

At this stage the author determines the corpus that will be used as a tool in classifying the five categories of service quality dimensions to measure the level of customer satisfaction. Here are the five dimensions:
1. Tangible: Appearance of officers, physical facilities, modern tools.
2. Reliability: Service provision, expertise in using tools in the service process (less errors).
3. Responsiveness: All customer complaints are responded to; service response time is fast.
4. Assurance: Provide guarantees of security and certainty of costs as well as an attitude of courtesy.
5. Empathy: Special understanding and mutual respect.

3.6. Classifying Tweets into Service Quality Dimension Categories

After the corpus creation process was completed in the previous stage, then coded the five dimensions. The coding process is carried out with the aim of separating tweets that have been identified and those that have not been identified. In the process of separating tweets into each dimension, they are marked with a code from numbers one to five, such as: Tangible (1), Reliability (2), Responsiveness (3), Assurance (4), and Empathy (5). Then the author enters the corpus that has been coded into the word library in the sent-strength program. Tweets that are successfully identified will have a code. It is very possible if one tweet contains more than one code, therefore it is possible that one tweet can be in more than one dimension.

3.6. Combining Sentiment Analysis Results with Service Quality Dimension Category
After getting the output from the previous steps, then combining the results of the classification of sentiment analysis with the results of the five dimensions of service quality. For the merging process, use the features in Microsoft Excel. In addition, a sentiment polarity calculation will be carried out with each service quality dimension based on the dimension code that has been made previously to simplify the calculation process. The following is an example of incorporating the results of sentiment analysis classification into service quality dimensions, which can be seen in Table 2.

<table>
<thead>
<tr>
<th>No</th>
<th>Tweets</th>
<th>Dimension</th>
<th>Sentiment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Taksi di jogja itu sombong sekali, tidak mau melayani jarak dkt dan tidak mau pake argo</td>
<td>Tangible</td>
<td>Negative</td>
</tr>
<tr>
<td>2</td>
<td>transportasi umum di jogja memang buruk.. apa memang tidak ada ya? selain taksi dan ojol hahaha</td>
<td>Tangible</td>
<td>Negative</td>
</tr>
<tr>
<td>3</td>
<td>angkot butuh kebijakan yang menciptakan kebutuhan publik agar angkutan umum di perkotaan lebih handal</td>
<td>Tangible</td>
<td>Positive</td>
</tr>
<tr>
<td>4</td>
<td>Horee! Jadi juga kabur dari jogja setelah perjuangan nelp 6 agen taksi pada full semua (at Terminal Jombor) Rumah di pinggiran kota tak jd masalah untuk pesen ojek argo.. Terima kasih banyak ojek taksi 86 joga...sangat membantu dan cepet tanggap..</td>
<td>Tangible</td>
<td>Positive</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>Responsiveness</td>
<td>Assurance</td>
</tr>
</tbody>
</table>

Equations (1) to (15) are the formulas used to calculate sentiment polarity.

Calculating Tangible sentiment:
- \( =\text{COUNTIFS}(\$A2:\$A26584, "\text{[1]}\"\text{,}\$B2:\$B26584, "\text{=Positive}\") \) \hspace{1cm} (1)
- \( =\text{COUNTIFS}(\$A2:\$A26584, "\text{[1]}\"\text{,}\$B2:\$B26584, "\text{=Negative}\") \) \hspace{1cm} (2)
- \( =\text{COUNTIFS}(\$A2:\$A26584, "\text{[1]}\"\text{,}\$B2:\$B26584, "\text{=Netral}\") \) \hspace{1cm} (3)

Calculating Reliability sentiment:
- \( =\text{COUNTIFS}(\$A2:\$A26584, "\text{[2]}\"\text{,}\$B2:\$B26584, "\text{=Positive}\") \) \hspace{1cm} (4)
- \( =\text{COUNTIFS}(\$A2:\$A26584, "\text{[2]}\"\text{,}\$B2:\$B26584, "\text{=Negative}\") \) \hspace{1cm} (5)
- \( =\text{COUNTIFS}(\$A2:\$A26584, "\text{[2]}\"\text{,}\$B2:\$B26584, "\text{=Netral}\") \) \hspace{1cm} (6)

Calculating Responsiveness sentiment:
- \( =\text{COUNTIFS}(\$A2:\$A26584, "\text{[3]}\"\text{,}\$B2:\$B26584, "\text{=Positive}\") \) \hspace{1cm} (7)
- \( =\text{COUNTIFS}(\$A2:\$A26584, "\text{[3]}\"\text{,}\$B2:\$B26584, "\text{=Negative}\") \) \hspace{1cm} (8)
- \( =\text{COUNTIFS}(\$A2:\$A26584, "\text{[3]}\"\text{,}\$B2:\$B26584, "\text{=Netral}\") \) \hspace{1cm} (9)

Calculating Assurance sentiment:
- \( =\text{COUNTIFS}(\$A2:\$A26584, "\text{[4]}\"\text{,}\$B2:\$B26584, "\text{=Positive}\") \) \hspace{1cm} (10)
- \( =\text{COUNTIFS}(\$A2:\$A26584, "\text{[4]}\"\text{,}\$B2:\$B26584, "\text{=Negative}\") \) \hspace{1cm} (11)
- \( =\text{COUNTIFS}(\$A2:\$A26584, "\text{[4]}\"\text{,}\$B2:\$B26584, "\text{=Netral}\") \) \hspace{1cm} (12)

Calculating Emphaty sentiment:
- \( =\text{COUNTIFS}(\$A2:\$A26584, "\text{[5]}\"\text{,}\$B2:\$B26584, "\text{=Positive}\") \) \hspace{1cm} (13)
3.7. Results

Based on the research that has been done by the author, the results of the measurement of five dimensions of service quality are obtained where the tangible, reliability, and responsiveness dimensions tend to be neutral sentiments, while the assurance and empathy dimensions tend to be positive sentiments. The following diagram of the measurement of the five dimensions of service quality and the results of the sentiment can be seen in Figure 2.

![Figure 2 Five Dimensions of Service Quality and Sentiment Results.](image)

It turns out that the tangible dimension is the dimension that gets the most attention or attention from its customers, because the tendency or human habit to judge everything starts from its physical appearance first. In this dimension, there are 5,192 positive sentiments, 2,756 negative sentiments, and 12,086 neutral sentiments. However, the value of neutral sentiment on this dimension is too high, therefore the author assumes that the neutral value is an empty value. There is a significant difference between positive and negative values where the positive value is higher than the negative value. This proves that the level of customer satisfaction in public transportation in Yogyakarta in general on this dimension has felt fulfilled and satisfied with the physical facilities provided, including the appearance of employees, supporting facilities for public transportation, and modern equipment used.

Furthermore, on the reliability dimension, there are 2,221 positive sentiments, 960 negative sentiments, and 3,643 neutral sentiments. However, the value of neutral sentiment on this dimension is too high, therefore the author assumes that the neutral value is an empty value. There is a significant difference between positive and negative values where the positive value is higher than the negative value. This proves that the information service provider and public transportation administration in Yogyakarta has been running quite well. In addition, it also shows that the aspect of expertise or reliability of its employees in serving customers is carried out with minimal errors. Therefore, the level of customer satisfaction on this dimension is generally sufficient and satisfied. Then on the responsiveness dimension, the number of positive sentiments is 551, negative sentiment is 285, and neutral sentiment is 711. However, the value of neutral sentiment on this dimension is too high, therefore the author assumes that the neutral value is an empty value. There is a significant difference between positive and negative values where the positive value is higher than the negative

```excel
=COUNTIFS($A$2:$A$26584,"*[5]*",$B$2:$B$26584,"=Negative")
=COUNTIFS($A$2:$A$26584,"*[5]*",$B$2:$B$26584,"=Netral")
```
value. This proves that the management of public transportation in Yogyakarta, which includes employees in general, is sensitive and understands in helping customers when asking for help. In addition, it also shows that the response time given to customers has been carried out quite well. Therefore, the level of customer satisfaction on this dimension is generally sufficient and satisfied.

Then on the assurance dimension, the number of positive sentiments is 1,976, negative sentiment is 522, and neutral sentiment is 631. The difference in positive values is quite significant when compared to negative and neutral values, proving that the ability of public transportation employees in Yogyakarta to build trust in customer service has been carried out well, including building trust in terms of safety assurance and cost certainty. In addition, it also shows that the polite attitude that is carried out when dealing with customers has manifested itself in real terms. Therefore, the level of customer satisfaction on this dimension is generally good.

After that on the empathy dimension, the number of positive sentiments is 708, negative sentiment is 158, and neutral sentiment is 290. There is a significant difference between positive, negative, and neutral values where positive values are higher than negative and neutral values. This proves that the relationship between public transportation employees in Yogyakarta and their customers has fully established communication and a fairly good understanding of needs, which includes providing special understanding if customers need something and respecting each other. Therefore, the level of customer satisfaction on this dimension is generally sufficient and satisfied.

The following can be seen in Table 3, which is a summary of the outputs that have been processed based on sentiment analysis and service quality to assist in determining the value of customer satisfaction for public transportation in Yogyakarta.

### Table 3 Summary of Service Quality Factor Analysis to Determine the Value of Public Transportation Customer Satisfaction in Yogyakarta.

<table>
<thead>
<tr>
<th>No</th>
<th>Service Quality</th>
<th>Sentiment</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Positive</td>
<td>Negative</td>
<td>Neutral</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Tangible</td>
<td>5192</td>
<td>2756</td>
<td>12086</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Reliability</td>
<td>2221</td>
<td>960</td>
<td>3643</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Responsiveness</td>
<td>551</td>
<td>285</td>
<td>711</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Assurance</td>
<td>1976</td>
<td>522</td>
<td>631</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Emphaty</td>
<td>708</td>
<td>158</td>
<td>290</td>
<td></td>
</tr>
</tbody>
</table>

### 4. Conclusions

Based on the research that has been done by the author, it can be concluded that the service quality on public transportation in Yogyakarta has met expectations. With this, it is found that the level of customer satisfaction is generally satisfied and satisfied. In this study, the author assumes that the value of neutral sentiment is an empty value, therefore it only focuses on positive sentiment and negative sentiment. The results of the overall analysis show that positive sentiment is superior to negative sentiment. With the results of this research, it can be used to make future solutions in building a better service strategy, so that people are more interested in using public transportation in Yogyakarta. There are several suggestions from the author for further research regarding knowing customer satisfaction by using sentiment analysis, including:

1. In accordance with the results obtained in this study, it turns out that the vocabulary dictionary in the sentistrength program has not maximally helped the analysis process, because the
contents of the dictionary in it are not complete. Therefore, the author suggests that the next researcher add the contents of the Sentistrength Dictionary in accordance with the rules imposed in the program.

2. The author suggests that the next researcher add a corpus that is used to find the level of customer satisfaction based on the service quality dimension so that the output obtained is even better.

3. The author gives suggestions for future researchers to add keywords when collecting data from Twitter so that more data can be obtained.

References


