Assessment The Method of Fuzzy Logic to Determine The Quality of Service Expedition in Jabodetabek Area

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Abstract

Search application services that was designed, could be the based on the difficulty to find out, and to select expedition services which have provided. In these case, when someone who wants to send the packages to a particular destination. Each shipper will see the name of courier services, the god arrive of speed at the destination, prices, and customer services. This application is designed with fuzzy logic method that can be based on the selection of criteria, and specific category. The use of fuzzy logic method can to help and ensure the selection of expedition service that based in variable or criteria are price, speed, location, and services. The result of this research will to display of application that was supported with database systems such as expedition services information and location, and then table of price is available.

Keyword: fuzzy method, expedition, service, aploication, criteria.

1. INTRODUCTION

The development of technology is currently growing rapidly, especially information technology. Development of information technology is characterized by the presence of online selling sites activity to the information supply chain of goods. That is because each the seller who is selling goods through online sites want to view and monitor the status of shipments and in order to ensure the goods have been received by the customer or buyer. Currently, many companies are providing and offering freight forwarding services from one city to another city, even to the inter-provincial cross-country. Every provider of goods forwarding services will provide service rates, type of service, delivery time and so on. Everyone who wants to send the goods (package) in this case can be referred to as the sender, are given free to choose services expeditions. However, in his election often encounter obstacles, such as service charges, as well as delivery time and location of the agent who sometimes travel long distances. Sender also consider services when they want to send goods (package). Based on these cases, in this paper will examine the theory of fuzzy logic method in determining the quality of service courier delivery of goods from various companies.
2. METHOD

2.1. Fuzzy Logic
Fuzzy logic was first discovered by Professor Lotfi A. Zadeh, from the University of California, in June 1965. Fuzzy logic is a generalization of the classical logic which only has two membership values, 0 and 1. In fuzzy logic, the truth value of a statement ranged from entirely true, up to a completely wrong [7-9]. With fuzzy set theory, an object can be a member of many subsets with different degree of membership in each set. This concept differs from the classic sets (crisp). Classical set theory depends on the logic of the two values (two-valued logic) to determine whether an object is a member of the set or not [12].

2.2. The Difference with the Association Definitely Fuzzy Logic Association (Crisp)
In the decisive set (crisp), the value of membership of an item x in a set A, which is often written with $\mu_A[x]$, has two possible [12], which are [1], [3-4]:

1) One (1), which means that an item is a member in a set, or
2) Zero (0), which means that an item is not a member in a set.

For Example: age variable is divided into three categories, namely:

- **MUDA**: umur < 35 tahun
- **PAROBAYA**: 35 \leq \text{umur} \leq 55 tahun
- **TUA**: umur \geq 55 tahun

Membership value graphically, set young, middle-aged, and old are shown in the following the picture:

![Figure1. Membership value](image_url)
In the picture above, it can be explained that:

a. If a person aged 33 years, it said MUDA ($\mu_{MUDA}[33] = 1$);
b. If a person is 35 years old, it said TIDAK MUDA ($\mu_{MUDA}[35] = 0$); 
If a person aged 35 years less one day, it said TIDAK PAROBAYA ($\mu_{PAROBAYA}[35th - 1\ hari] = 0$);

2.3. Research Methodology

In this research study to determine the quality of service expedition, researchers will collect data by means of 13:

1. Interview 
   The author did a question and answer to related parties directly to obtain concrete data and complete analysis that will be used as the penelitian.
2. Observation 
   In this method, the authors conducted a direct observation of everyday activities both care providers and shippers who want to send packages of some shipping agents [12].
3. Questionaire 
   We are to consider in the questionnaires using a questionnaire form, a questionnaires are created structured form of multiple choice questions. This method is used to obtain data on the type of service, rates, speed of delivery and so on.

In this research, the authors used a sample of data. The data used to analyze is with 10 to which service provider expedition. Of the 10 samples of the company that operates around Jakarta, Bogor, Depok, Tangerang, and Bekasi.

3. RESULT AND ANALYSIS

3.1 Fuzzy Association For the Selection of Freight Forwarding Services
In this study, in order to determine the quality of shipping services, the data values that were the result of the formula calculation membership degree function [8], [10].
Value - The value is the result of fuzzification, which has a function as an input value for defuzzification process [8-9]. The data is started from a variable price, speed, location agents, as well as service [12], [14].

3.2 Variable of Price
One of thing in determining the quality is the price. The price will be categorized into sets: murah, sedang, mahal.
Figure 2. Price variables membership functions

The following based on the picture above, it can be made a function of membership as follows:

\[
\begin{align*}
\mu_{\text{Murah}}[x] & = \begin{cases} 
1; & x \leq 5000 \\
\frac{15000-x}{10000}; & 5000 \leq x \leq 15000 \\
0; & x \geq 15000
\end{cases} \\
\mu_{\text{Sedang}}[x] & = \begin{cases} 
0; & x \leq 5000 \text{ atau } x \geq 30000 \\
\frac{x - 5000}{10000}; & 5000 \leq x \leq 15000 \\
1; & \frac{30000 - x}{15000}; 15000 \leq x \leq 30000
\end{cases} \\
\mu_{\text{Mahal}}[x] & = \begin{cases} 
0; & x \leq 30000 \\
\frac{x - 15000}{15000}; & 15000 \leq x \leq 30000 \\
1; & x \geq 30000
\end{cases}
\end{align*}
\]

There are the following table presents the quality of service based on the variable price.
### Table 1. The quality of the price variable

| ID   | Expedition Name   | Value | Muah | Sedang | Mahal |
|------|-------------------|-------|------|--------|-------|
| D001 | Pos Indonesia     | 8500  | 0,65 | 0,35   | 0     |
| D002 | Tiki              | 7500  | 0,75 | 0,25   | 0     |
| D003 | JNE               | 9000  | 0,6  | 0,4    | 0     |
| D004 | Wahana            | 5000  | 1    | 0      | 0     |
| D005 | Pandu Logistic    | 10000 | 0,5  | 0,5    | 0     |
| D006 | Indah Cargo       | 14000 | 0,1  | 0,9    | 0     |
| D007 | TAM               | 35000 | 0    | 0      | 1     |
| D008 | Satuan Prima Antaran | 23000 | 0    | 1      | 0     |

#### 3.3 Variable of Speed

The second variable is a variable speed. Variable speed of the set we will categorized into rendah, sedang, tinggi.

![Membership function variable speed](image)

**Figure 3. Membership function variable speed**

The following based on the picture above, it can be made a function of membership as follows:

\[
\mu_{\text{rendah}}[x] = \begin{cases} 
1; & x \leq 4 \\
\frac{7 - x}{3}; & 4 \leq x \leq 7 \\
0; & x \geq 7 
\end{cases}
\]

\[
\mu_{\text{sedang}}[x] = \begin{cases} 
0; & x \leq 4 \text{ atau } x \geq 10 \\
\frac{x - 4}{3}; & 4 \leq x \leq 7 \\
1; & \frac{10 - x}{3}; 7 \leq x \leq 10 
\end{cases}
\]
The following table presents the quality of service based on the variable speed

| ID   | Expedition Name | Value | Tinggi | Sedang | Rendah |
|------|-----------------|-------|--------|--------|--------|
| D001 | Pos Indonesia   | 3     | 1      | 0      | 0      |
| D002 | Tiki            | 4     | 1      | 0      | 0      |
| D003 | JNE             | 2     | 1      | 0      | 0      |
| D004 | Wahana          | 5     | 0,67   | 0,33   | 0      |
| D005 | Pandu Logistic  | 5     | 0,67   | 0,33   | 0      |
| D006 | Indah Cargo     | 6     | 0,33   | 0,67   | 0      |
| D007 | TAM             | 5     | 0,67   | 0,33   | 0      |
| D008 | Satuan Prima Antaran | 5 | 0,67 | 0,33 | 0 |
| SAP  |                 |       |        |        |        |

3.4 Variable of Agent Area

The Variable agent locations will describe the its distance traveled by each sender when is trying to send a package to the destination city. The Variables agent locations will be categorized into a set of dekat, sedang, jauh.
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\[ \mu_{dekat}[x] = \begin{cases} 1; & x \leq 5 \\ \frac{14-x}{9}; & 5 \leq x \leq 14 \\ 0; & x \geq 14 \end{cases} \]

\[ \mu_{sedang}[x] = \begin{cases} 0; & x \leq 5 \text{ atau } x \geq 20 \\ \frac{x-5}{9}; & 5 \leq x \leq 14 \\ 1; & \frac{20-x}{6}; 14 \leq x \leq 20 \end{cases} \]

\[ \mu_{jauh}[x] = \begin{cases} 0; & x \leq 14 \\ \frac{x-14}{6}; & 14 \leq x \leq 20 \\ 1; & x \geq 20 \end{cases} \]

There are the following table presents the quality of service based on the variable of agent area

| ID  | Expedition Name | Value | Dekat | Sedang | Jauh |
|-----|-----------------|-------|-------|--------|------|
| D001| Pos Indonesia   | 13    | 0,11  | 0,89   | 0    |
| D002| Tiki            | 16    | 0     | 1      | 0,33 |
| D003| JNE             | 4     | 1     | 0      | 0    |
| D004| Wahana          | 18    | 0     | 1      | 0,67 |
| D005| Pandu Logistic  | 23    | 0     | 0      | 1    |
| D006| Indah Cargo     | 21    | 0     | 0      | 1    |
| D007| TAM             | 24    | 0     | 0      | 1    |
| D008| Satuan Prima Antaran | 22 | 0 | 0 | 1 |

| SAP |

3.5 Variable of Service

Variable of service will describe the services in serving the sender, especially if there are problems in delivery. Variable service will be categorized into a set of kurang, memuaskan, sangat memuaskan.
Figure 5. Membership function variable service

The following based on the picture above, it can be made a function of membership as follows:

$$\mu_{\text{kurang}}[x] = \begin{cases} 
1; & x \leq 5 \\
\frac{7-x}{2}; & 5 \leq x \leq 7 \\
0; & x \geq 7 
\end{cases}$$

$$\mu_{\text{memuaskan}}[x] = \begin{cases} 
0; & x \leq 5 \text{ atau } x \geq 10 \\
\frac{x-5}{2}; & 5 \leq x \leq 7 \\
1; & \frac{10-x}{3}; & 7 \leq x \leq 10 
\end{cases}$$

$$\mu_{\text{sanat memuaskan}}[x] = \begin{cases} 
0; & x \leq 7 \\
\frac{x-7}{3}; & 7 \leq x \leq 10 \\
1; & x \geq 10 
\end{cases}$$

There are the following table presents the quality of service based on the variable of service

| ID  | Expedition Name      | Value | Kurang | Memuaskan | Sangat memuaskan |
|-----|----------------------|-------|--------|-----------|------------------|
| D001| Pos Indonesia        | 7     | 0      | 1         | 0                |
| D002| Tiki                 | 9     | 0      | 1         | 0,67             |
| D003| JNE                  | 8     | 0      | 1         | 0,33             |
| D004| Wahana               | 6     | 0,5    | 0,5       | 0                |
| D005| Pandu Logistic       | 10    | 0      | 0         | 1                |
| D006| Indah Cargo          | 4     | 1      | 0         | 0                |
| D007| TAM                  | 5     | 1      | 0         | 0                |
| D008| Satuan Prima Antaran SAP | 7 | 0 | 1 | 0 |
The following image is of a quality comparison of 8 service providers expedition.

**Figure 6.** The comparison of quality

4. CONCLUSION

The best quality is made of the price factor, which at this price would have a strong relationship with quality goods speeds when to place the goal. Then, after the tariff is the distance factor agents, easily accessible by the sender wants to send packets to destination. It caused, the sender is easier to know the company name.

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