



vol. 17 / 2023



## **The 7th International Conference on Science Technology**

organized by  
Faculty of Social Science and  
Law Universitas Negeri Manado and  
Consortium of International Conference  
on Science and Technology

# **The Innovation Breakthrough in Digital and Disruptive Era**

# Integration of Saving Matrix-Fishbone as Monitoring of Logistics Route PT. XYZ

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**Abstract.** Indonesia, with 2/3 of its territory being oceans, has the potential to have abundant natural resources in the form of salt. PT. XYZ is the only state-owned company that produces products salt start from process upstream until Downstream, with Wrong One product flagship is salt diet. The biggest challenge in Supply Chain Management at the company is capability compete in providing competitive prices so it is necessary to properly study the costs in the process of distribution and logistics do not charge much in the components of the Cost of Good sold. In study This discuss related determination router best with use method saving Matrix by comparing the Nearest Insert and Nearest Neighbor algorithms, which is then carried out analysis using Fishbone Diagram in mapping the source of constraints in the distribution process and logistics that focus on 5M+1E elements. The results of this study can be determined by 4 shipping routes according to the Nearest Neighbor algorithm. Improvements to problems that arise in existing conditions can be carried out by adding tools and infrastructure to the loading process facilities, such as hand pallets, forklifts as well as the construction of a loading dock including SOPs that regulate and can be used to measure effectiveness process loading. Indonesia, with 2/3 of its territory being oceans, has the potential to have abundant natural resources in the form of salt. PT. XYZ is the only state-owned company that produces products salt start from process upstream until Downstream, with Wrong One product flagship is salt diet. The biggest challenge in Supply Chain Management at the company is capability compete in providing competitive prices so it is necessary to properly study the costs in the process of distribution and logistics do not charge much in the components of the Cost of Good sold. In study This discuss related determination router best with use method saving Matrix by comparing the Nearest Insert and Nearest Neighbor algorithms, which is then carried out analysis using Fishbone Diagram in mapping the source of constraints in the distribution process and logistics that focus on 5M+1E elements. The results of this study can be determined by 4 shipping routes according to the Nearest Neighbor algorithm. Improvements to problems that arise in existing conditions can be carried out by adding tools and infrastructure to the loading process facilities, such as hand pallets, forklifts as well as the construction of a loading dock including SOPs that regulate and can be used to measure effectiveness process loading. Keywords : Salt, logistics, diagram fishbone, saving matrix, nearest insert, nearest neighbors

## 1 . Introduction

PT. XYZ is Wrong One Company Body Business which has a core business on 2 division, that is production salt material raw with salt krosok, and the salt industry that focuses on activity produce salt processed Good on classification product salt consumption nor food industry salt products at PT XYZ.

Wrong One product mainstay from company. This is salt which is product salt diet, Good For health, especially for people with hypertension. In carrying out the product marketing process mentioned, PT. XYZ team up with PT. Kimia Farma Pharmacy Which spread in whole region Indonesia. As a state company, the biggest challenge is able to compete competitively

in global market, so that needed effort- improvement efforts both from the production side to distribution process, because we understand it together that the biggest cost in the preparation of the Cost of Good Sold donated between 40% -70% of cost components formed from Supply Chains Cost. On condition existing, delivery to the Surabaya area are still found a lot waste activity Which naturally implicated on loading cost Which more tall, outside That decline performance Work become challenge Which need answered as effort company in guard supplies performance. Delivery schedule setting, Good route And time until technical handling as well as arrangement team in process loading unloading is a number of matter Which very possible to do distribution improvements (Lukmandono et al., 2019).

Activity distribution No will free from activity savings. Good from aspect finances, time and effort. One method analysis for minimizing distribution distance is saving matrix . Method analysis saving matrix very appropriate applied in corporate use determine more effective distribution channels. Saving matrix uses the Nearest algorithm Insert And Nearest neighbors (Adam et al., 2020). One of the algorithms will be selected with the smallest value (Putranto & Hendayani, 2014). As step consistency in reach mark saving matrix , integrated with fishbone diagram (Retnowati et al., 2014). function as identification root problem Which can proposed as better logistics distribution monitoring Again (Eris Kusnadi, 2014).

According to (Lukmandono et al., 2019), states that the calculation method Saving Matrix is pattern based route optimization distance travel shortest. According to (Kholil et al., 2019), state that capacity delivery to suppliers should be increased. Optimization capacity expected can support decrease distance travel become alternative For reduce cost transport. Based on the two predecessors, method saving matrix appropriate as method determine the distribution route. Both of these studies No discuss consistency For distribution route sustainability. Therefore, study Which will done with add Fishbone Diagram method as identification consistency in optimization route distribution product salt.

## 2 . Saving Matrix

Saving Matrix own objective so that delivery of goods according to the order effective and efficient. Reliable achievement namely steps to save costs, energy, and time delivery. saving Matrix Also determine product distribution routes. Determination distribution route to achieve the shortest route and minimal transportation costs (Ahsan & Lukmandono, 2021). The Saving Matrix Method Also is Wrong One technique Which used For schedule a number limited vehicles from the facility that has capacity maximum Which different. On method saving matrix there is step- step or some algorithm should be done. Process saving matrix that is determine matrix distance, determine matrix savings, integration of travel routes with customer Which will in aim, determine order arrival with method nearest inserts And nearest neighbors (Daughter et al., 2021).

Management transportation face task main that is compile plan And program For reach objective And mission organization in a manner whole, increase productivity And performance as well as face impact social And not quite enough answer social in operate transport (Salim, 2012). Management transportation as management activity transportation Which has scheduled with Good. Management transportation supported with estimate timetable, location destination, route traveled, transportation costs and post evaluation of transportation activities. Activity transportation demand will increase, if amount request product increase And segment market Which in accordance target.

## 3 Method Study .

### 3.1 Research Design

Design study This use model quantitative. Model quantitative characteristic implementation method saving matrix Which aim For determine route activity transportation. Activity transportation on this research is the distribution of salt products. Activity distribution use method saving matrix For reach parameter route closest with approach nearest neighbor and nearest insert algorithms , Which furthermore will compared to For choose the order of distribution routes and the total distance most optimal.

### 3.2.Population and samples

The research population is used as generalization of the selected object. Selected object is Pharmacy Chemistry Farma Which given supply stock product salt in whole Indonesia. Sample study that is some of Kimia Farma Pharmacies spread across several areas of the city of Surabaya that need given supply stock product salt m . Technique taking sample using a type of systematic sampling (Das, 2014). Systematic sampling that is with taking sample study with sorting the agent distance closest to Warehouse Distributions Centre. Distance most near assumed only covers region City Surabaya, Java East. sampling selected as following:

**Table 1. Research Sample**

|                                      | ADDRESS                              |     |
|--------------------------------------|--------------------------------------|-----|
| Kimia Farma Bratang Gede Pharmacy    | Bratang Gede Street No. 100A         | S1  |
| Kimia Farma Kendangsari Pharmacy     | Raya Kendangsari Street No 7         | S2  |
| Kimia Farma dharmawangsa pharmacy    | Dharmawangsa Street No. 24           | S3  |
| Kimia Farma darmo pharmacy           | Raya Darmo Street No. 2-4            | S4  |
| Kimia Farma darmo pharmacy           | Raya Darmo Street No.94              | S5  |
| Kimia Farma darmo indah pharmacy     | Darmo Indah Timur Street No.8        | S6  |
| Kimia Farma diponegoro pharmacy      | Diponegoro Street No. 94             | S7  |
| Kimia Farma ngagel pharmacy          | Ngagel Jaya Sel Street No.110        | S8  |
| Kimia Farma dukuh kupang pharmacy    | Raya Dukuh Kupang Street No. 110     | S9  |
| Kimia Farma A Yani pharmacy          | A Yani Street No. 228                | S10 |
| Kimia Farma Karangmenjangan pharmacy | Karangmenjangan Street No. 9         | S11 |
| Kimia Farma Arjuno pharmacy          | Raya Arjuno Street No. 151           | S12 |
| Kimia Farma Perak Timur pharmacy     | Perak Timur Street No. 166           | S13 |
| Kimia Farma muljosari pharmacy       | Raya Muljosari Street No. 228        | S14 |
| Kimia Farma Merr pharmacy            | Raya Merr 2 Street Penjarangan       | S15 |
| Kimia Farma ciliwung pharmacy        | Ciliwung Street, No 76, Surabaya     | S16 |
| Kimia Farma taman Gapuro pharmacy    | Ruko Taman Gapuro Street No, B-2     | S17 |
| Kimia Farma Klampis Jaya             | Klampis Jaya street A-30, Surabaya   | S18 |
| Kimia Farma rungkut madya pharmacy   | Rungkut Madya Street No 99, Surabaya | S19 |
| Kimia Farma menganti pharmacy        | Raya Menganti Street No A-171        | S20 |
| Kimia Farma manukan pharmacy         | Manukan Tama Street No. 79           | S21 |

Source: Results systematic sampling, 2021

### 3.3.Instrument Study

Instrument study function For make it easy in collection data. Collection data expected can systematic, accurate And detail. Instrument study using observation, documentation, google coordinate, And microsoft excel. Observation For Know the coordinates of the points google maps Which customized with data

address pharmacy from PT. Chemistry Farma. Documentation covers data pharmacy along the address Which stock up product Salt in area City Surabaya from PT XYZ . Google coordinate For know the coordinates of the address pharmacy. Microsoft Excel to process data raw from point coordinates into parameters saving matrix Good nearest neighbors And nearest insert . Instrument study For observation, documentation, google coordinates and Microsoft Excel software as primary data. While secondary data is a reference from e-journal reputable For support studies study this.

Procedure study This use 4 stages. This stage is (G. Kurnia et al., 2021):

a. Make matrix distance with formula:

$$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2} \quad (1)$$

b. Make matrix savings with formula:

$$Saving(A, B) = d(G, A) + d(G, B) - d(A, B) \quad (2)$$

c. Allocate route distribution with iteration model and determine route allocation distribution.

d. Make order objective delivery on each route using the nearest insert And nearest neighbors .

e. Compare the value of nearest insert and nearest neighbors with parameter order route and total distance as well as selected with mark most small (N. S. gift et al., 2021).

f. Remedial action on the distribution process use fishbone diagram with reference mark saving matrix .

#### 4 . Results and Discussion

Based on results systematic sampling, recapitulation coordinate (x,y) with code pharmacy objective as following:

**Table 2.** Coordinate Location (x,y)

| No | Code      | Location Coordinates |         |
|----|-----------|----------------------|---------|
|    |           | X                    | Y       |
|    | Warehouse | -7,189               | 112,649 |
| 1  | S1        | -7,299               | 112,756 |
| 2  | S2        | -7,324               | 112,749 |
| 3  | S3        | -7,279               | 112,756 |
| 4  | S4        | -7,299               | 112,738 |
| 5  | S5        | -7,299               | 112,738 |
| 6  | S6        | -7,264               | 112,686 |
| 7  | S7        | -7,290               | 112,736 |
| 8  | S8        | -7,294               | 112,757 |
| 9  | S9        | -7,280               | 112,717 |
| 10 | S10       | -7,308               | 112,735 |
| 11 | S11       | -7,271               | 112,761 |
| 12 | S12       | -7,256               | 112,728 |
| 13 | S13       | -7,225               | 112,732 |
| 14 | S14       | -7,258               | 112,796 |
| 15 | S15       | -7,336               | 112,782 |
| 16 | S16       | -7,292               | 112,737 |
| 17 | S17       | -7,286               | 112,673 |
| 18 | S18       | -7,290               | 112,775 |
| 19 | S19       | -7,331               | 112,776 |

|    |     |        |         |
|----|-----|--------|---------|
| 20 | S20 | -7,313 | 112,691 |
| 21 | S21 | -7,260 | 112,665 |

Source : Google maps coordinate

Table (2), show coordinate location (x,y) has is known in accordance address pharmacy objective along code pharmacy And warehouse. Coordinate (x,y) from whole pharmacy objective have values that are not much different. Reason almost similarity showed that pharmacy the destination is still in the Surabaya City area location, Java East.

| Distance Matrix |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |  |
|-----------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--|
| Distance        | G     | S1    | S2    | S3    | S4    | S5    | S6    | S7    | S8    | S9    | S10   | S11   | S12   | S13   | S14   | S15   | S16   | S17   | S18   | S19   | S20   | S21   |  |
| S1              | 0,153 | 0,000 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |  |
| S2              | 0,168 | 0,026 | 0,000 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |  |
| S3              | 0,140 | 0,020 | 0,046 | 0,000 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |  |
| S4              | 0,141 | 0,018 | 0,027 | 0,027 | 0,000 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |  |
| S5              | 0,141 | 0,018 | 0,027 | 0,027 | 0,000 | 0,000 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |  |
| S6              | 0,084 | 0,078 | 0,087 | 0,072 | 0,063 | 0,063 | 0,000 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |  |
| S7              | 0,133 | 0,022 | 0,036 | 0,023 | 0,009 | 0,009 | 0,056 | 0,000 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |  |
| S8              | 0,151 | 0,005 | 0,031 | 0,015 | 0,020 | 0,020 | 0,077 | 0,021 | 0,000 |       |       |       |       |       |       |       |       |       |       |       |       |       |  |
| S9              | 0,114 | 0,043 | 0,054 | 0,039 | 0,028 | 0,028 | 0,035 | 0,021 | 0,042 | 0,000 |       |       |       |       |       |       |       |       |       |       |       |       |  |
| S10             | 0,147 | 0,023 | 0,021 | 0,036 | 0,009 | 0,009 | 0,066 | 0,018 | 0,026 | 0,033 | 0,000 |       |       |       |       |       |       |       |       |       |       |       |  |
| S11             | 0,139 | 0,028 | 0,054 | 0,009 | 0,036 | 0,036 | 0,075 | 0,031 | 0,023 | 0,045 | 0,045 | 0,000 |       |       |       |       |       |       |       |       |       |       |  |
| S12             | 0,104 | 0,051 | 0,071 | 0,036 | 0,044 | 0,044 | 0,043 | 0,035 | 0,048 | 0,026 | 0,052 | 0,036 | 0,000 |       |       |       |       |       |       |       |       |       |  |
| S13             | 0,090 | 0,078 | 0,100 | 0,059 | 0,074 | 0,074 | 0,060 | 0,065 | 0,073 | 0,057 | 0,083 | 0,054 | 0,031 | 0,000 |       |       |       |       |       |       |       |       |  |
| S14             | 0,162 | 0,057 | 0,081 | 0,045 | 0,071 | 0,071 | 0,110 | 0,068 | 0,053 | 0,082 | 0,079 | 0,037 | 0,068 | 0,072 | 0,000 |       |       |       |       |       |       |       |  |
| S15             | 0,198 | 0,045 | 0,035 | 0,063 | 0,057 | 0,057 | 0,120 | 0,065 | 0,049 | 0,086 | 0,055 | 0,068 | 0,097 | 0,122 | 0,079 | 0,000 |       |       |       |       |       |       |  |
| S16             | 0,135 | 0,020 | 0,034 | 0,023 | 0,007 | 0,007 | 0,058 | 0,002 | 0,020 | 0,023 | 0,016 | 0,032 | 0,037 | 0,067 | 0,068 | 0,063 | 0,000 |       |       |       |       |       |  |
| S17             | 0,100 | 0,084 | 0,085 | 0,083 | 0,066 | 0,066 | 0,026 | 0,063 | 0,084 | 0,044 | 0,066 | 0,089 | 0,063 | 0,085 | 0,126 | 0,120 | 0,064 | 0,000 |       |       |       |       |  |
| S18             | 0,161 | 0,021 | 0,043 | 0,022 | 0,038 | 0,038 | 0,093 | 0,039 | 0,018 | 0,059 | 0,044 | 0,024 | 0,058 | 0,078 | 0,038 | 0,047 | 0,038 | 0,102 | 0,000 |       |       |       |  |
| S19             | 0,191 | 0,038 | 0,028 | 0,056 | 0,050 | 0,050 | 0,112 | 0,057 | 0,042 | 0,078 | 0,047 | 0,062 | 0,089 | 0,115 | 0,076 | 0,008 | 0,055 | 0,112 | 0,041 | 0,000 |       |       |  |
| S20             | 0,131 | 0,066 | 0,059 | 0,073 | 0,049 | 0,049 | 0,049 | 0,051 | 0,069 | 0,042 | 0,044 | 0,082 | 0,068 | 0,097 | 0,119 | 0,094 | 0,051 | 0,052 | 0,087 | 0,087 | 0,000 |       |  |
| S21             | 0,073 | 0,099 | 0,106 | 0,093 | 0,083 | 0,083 | 0,021 | 0,077 | 0,098 | 0,056 | 0,085 | 0,097 | 0,063 | 0,076 | 0,131 | 0,140 | 0,079 | 0,027 | 0,114 | 0,132 | 0,059 | 0,000 |  |

**Figure 1.** Table Distance Matrix

| SAVING MATRIX |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |  |
|---------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--|
| saving        | S1    | S2    | S3    | S4    | S5    | S6    | S7    | S8    | S9    | S10   | S11   | S12   | S13   | S14   | S15   | S16   | S17   | S18   | S19   | S20   | S21   |  |
| S1            | 0,000 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |  |
| S2            | 0,295 | 0,000 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |  |
| S3            | 0,273 | 0,262 | 0,000 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |  |
| S4            | 0,277 | 0,282 | 0,254 | 0,000 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |  |
| S5            | 0,277 | 0,282 | 0,254 | 0,283 | 0,000 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |  |
| S6            | 0,159 | 0,165 | 0,152 | 0,162 | 0,162 | 0,000 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |  |
| S7            | 0,265 | 0,265 | 0,250 | 0,266 | 0,266 | 0,161 | 0,000 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |  |
| S8            | 0,299 | 0,288 | 0,275 | 0,272 | 0,272 | 0,157 | 0,263 | 0,000 |       |       |       |       |       |       |       |       |       |       |       |       |       |  |
| S9            | 0,224 | 0,227 | 0,214 | 0,227 | 0,227 | 0,162 | 0,225 | 0,222 | 0,000 |       |       |       |       |       |       |       |       |       |       |       |       |  |
| S10           | 0,277 | 0,294 | 0,251 | 0,279 | 0,279 | 0,165 | 0,262 | 0,271 | 0,227 | 0,000 |       |       |       |       |       |       |       |       |       |       |       |  |
| S11           | 0,264 | 0,252 | 0,269 | 0,244 | 0,244 | 0,147 | 0,241 | 0,266 | 0,207 | 0,240 | 0,000 |       |       |       |       |       |       |       |       |       |       |  |
| S12           | 0,206 | 0,200 | 0,207 | 0,201 | 0,201 | 0,144 | 0,202 | 0,206 | 0,191 | 0,198 | 0,206 | 0,000 |       |       |       |       |       |       |       |       |       |  |
| S13           | 0,166 | 0,158 | 0,171 | 0,158 | 0,158 | 0,114 | 0,159 | 0,168 | 0,147 | 0,154 | 0,175 | 0,163 | 0,000 |       |       |       |       |       |       |       |       |  |
| S14           | 0,259 | 0,249 | 0,257 | 0,233 | 0,233 | 0,138 | 0,228 | 0,260 | 0,194 | 0,230 | 0,264 | 0,198 | 0,181 | 0,000 |       |       |       |       |       |       |       |  |
| S15           | 0,306 | 0,331 | 0,275 | 0,282 | 0,282 | 0,162 | 0,266 | 0,300 | 0,226 | 0,290 | 0,269 | 0,205 | 0,167 | 0,281 | 0,000 |       |       |       |       |       |       |  |
| S16           | 0,269 | 0,269 | 0,252 | 0,270 | 0,270 | 0,161 | 0,267 | 0,266 | 0,226 | 0,266 | 0,242 | 0,202 | 0,159 | 0,230 | 0,271 | 0,000 |       |       |       |       |       |  |
| S17           | 0,169 | 0,183 | 0,156 | 0,175 | 0,175 | 0,158 | 0,170 | 0,166 | 0,169 | 0,181 | 0,149 | 0,141 | 0,108 | 0,136 | 0,178 | 0,171 | 0,000 |       |       |       |       |  |
| S18           | 0,294 | 0,287 | 0,279 | 0,265 | 0,265 | 0,152 | 0,256 | 0,294 | 0,216 | 0,264 | 0,277 | 0,207 | 0,174 | 0,286 | 0,313 | 0,259 | 0,159 | 0,000 |       |       |       |  |
| S19           | 0,306 | 0,331 | 0,275 | 0,282 | 0,282 | 0,162 | 0,267 | 0,300 | 0,226 | 0,290 | 0,267 | 0,205 | 0,166 | 0,277 | 0,381 | 0,271 | 0,178 | 0,311 | 0,000 |       |       |  |
| S20           | 0,218 | 0,240 | 0,197 | 0,223 | 0,223 | 0,165 | 0,214 | 0,213 | 0,203 | 0,233 | 0,188 | 0,167 | 0,124 | 0,175 | 0,235 | 0,216 | 0,198 | 0,205 | 0,235 | 0,000 |       |  |
| S21           | 0,127 | 0,135 | 0,120 | 0,132 | 0,132 | 0,135 | 0,129 | 0,125 | 0,131 | 0,135 | 0,115 | 0,113 | 0,088 | 0,104 | 0,132 | 0,129 | 0,146 | 0,120 | 0,132 | 0,145 | 0,000 |  |

**Figure 2.** Table Matrix Savings

Figure (1), table distance matrix show recapitulation evaluation matrix distance. Determination matrix distance based on mark Which obtained from google maps coordinates as accuracy more detail with unit kilometers (km). Identification use distance between delivery from warehouse going to pharmacy objective. Figure (2), shows a matrix table savings Which has sequentially. Order Which classified that is start savings mark most big to mark most small.

| SAVING LIST |         |        |    |         |        |    |         |        |    |         |        |    |         |        |    |         |        |
|-------------|---------|--------|----|---------|--------|----|---------|--------|----|---------|--------|----|---------|--------|----|---------|--------|
| NO          | ROUTE   | SAVING | NE | ROUTE   | SAVING | NE | ROUTE   | SAVING | NE | ROUTE   | SAVING | NE | ROUTE   | SAVING | NE | ROUTE   | SAVING |
| 1           | 100-000 | 0.110  | 00 | 101-000 | 0.110  | 00 | 102-000 | 0.110  | 00 | 103-000 | 0.110  | 00 | 104-000 | 0.110  | 00 | 105-000 | 0.110  |
| 2           | 100-000 | 0.110  | 00 | 104-000 | 0.110  | 00 | 105-000 | 0.110  | 00 | 106-000 | 0.110  | 00 | 107-000 | 0.110  | 00 | 108-000 | 0.110  |
| 3           | 100-000 | 0.110  | 00 | 105-000 | 0.110  | 00 | 106-000 | 0.110  | 00 | 107-000 | 0.110  | 00 | 108-000 | 0.110  | 00 | 109-000 | 0.110  |
| 4           | 100-000 | 0.110  | 00 | 106-000 | 0.110  | 00 | 107-000 | 0.110  | 00 | 108-000 | 0.110  | 00 | 109-000 | 0.110  | 00 | 110-000 | 0.110  |
| 5           | 100-000 | 0.110  | 00 | 107-000 | 0.110  | 00 | 108-000 | 0.110  | 00 | 109-000 | 0.110  | 00 | 110-000 | 0.110  | 00 | 111-000 | 0.110  |
| 6           | 100-000 | 0.110  | 00 | 108-000 | 0.110  | 00 | 109-000 | 0.110  | 00 | 110-000 | 0.110  | 00 | 111-000 | 0.110  | 00 | 112-000 | 0.110  |
| 7           | 100-000 | 0.110  | 00 | 109-000 | 0.110  | 00 | 110-000 | 0.110  | 00 | 111-000 | 0.110  | 00 | 112-000 | 0.110  | 00 | 113-000 | 0.110  |
| 8           | 100-000 | 0.110  | 00 | 110-000 | 0.110  | 00 | 111-000 | 0.110  | 00 | 112-000 | 0.110  | 00 | 113-000 | 0.110  | 00 | 114-000 | 0.110  |
| 9           | 100-000 | 0.110  | 00 | 111-000 | 0.110  | 00 | 112-000 | 0.110  | 00 | 113-000 | 0.110  | 00 | 114-000 | 0.110  | 00 | 115-000 | 0.110  |
| 10          | 100-000 | 0.110  | 00 | 112-000 | 0.110  | 00 | 113-000 | 0.110  | 00 | 114-000 | 0.110  | 00 | 115-000 | 0.110  | 00 | 116-000 | 0.110  |
| 11          | 100-000 | 0.110  | 00 | 113-000 | 0.110  | 00 | 114-000 | 0.110  | 00 | 115-000 | 0.110  | 00 | 116-000 | 0.110  | 00 | 117-000 | 0.110  |
| 12          | 100-000 | 0.110  | 00 | 114-000 | 0.110  | 00 | 115-000 | 0.110  | 00 | 116-000 | 0.110  | 00 | 117-000 | 0.110  | 00 | 118-000 | 0.110  |
| 13          | 100-000 | 0.110  | 00 | 115-000 | 0.110  | 00 | 116-000 | 0.110  | 00 | 117-000 | 0.110  | 00 | 118-000 | 0.110  | 00 | 119-000 | 0.110  |
| 14          | 100-000 | 0.110  | 00 | 116-000 | 0.110  | 00 | 117-000 | 0.110  | 00 | 118-000 | 0.110  | 00 | 119-000 | 0.110  | 00 | 120-000 | 0.110  |
| 15          | 100-000 | 0.110  | 00 | 117-000 | 0.110  | 00 | 118-000 | 0.110  | 00 | 119-000 | 0.110  | 00 | 120-000 | 0.110  | 00 | 121-000 | 0.110  |
| 16          | 100-000 | 0.110  | 00 | 118-000 | 0.110  | 00 | 119-000 | 0.110  | 00 | 120-000 | 0.110  | 00 | 121-000 | 0.110  | 00 | 122-000 | 0.110  |
| 17          | 100-000 | 0.110  | 00 | 119-000 | 0.110  | 00 | 120-000 | 0.110  | 00 | 121-000 | 0.110  | 00 | 122-000 | 0.110  | 00 | 123-000 | 0.110  |
| 18          | 100-000 | 0.110  | 00 | 120-000 | 0.110  | 00 | 121-000 | 0.110  | 00 | 122-000 | 0.110  | 00 | 123-000 | 0.110  | 00 | 124-000 | 0.110  |
| 19          | 100-000 | 0.110  | 00 | 121-000 | 0.110  | 00 | 122-000 | 0.110  | 00 | 123-000 | 0.110  | 00 | 124-000 | 0.110  | 00 | 125-000 | 0.110  |
| 20          | 100-000 | 0.110  | 00 | 122-000 | 0.110  | 00 | 123-000 | 0.110  | 00 | 124-000 | 0.110  | 00 | 125-000 | 0.110  | 00 | 126-000 | 0.110  |
| 21          | 100-000 | 0.110  | 00 | 123-000 | 0.110  | 00 | 124-000 | 0.110  | 00 | 125-000 | 0.110  | 00 | 126-000 | 0.110  | 00 | 127-000 | 0.110  |
| 22          | 100-000 | 0.110  | 00 | 124-000 | 0.110  | 00 | 125-000 | 0.110  | 00 | 126-000 | 0.110  | 00 | 127-000 | 0.110  | 00 | 128-000 | 0.110  |
| 23          | 100-000 | 0.110  | 00 | 125-000 | 0.110  | 00 | 126-000 | 0.110  | 00 | 127-000 | 0.110  | 00 | 128-000 | 0.110  | 00 | 129-000 | 0.110  |
| 24          | 100-000 | 0.110  | 00 | 126-000 | 0.110  | 00 | 127-000 | 0.110  | 00 | 128-000 | 0.110  | 00 | 129-000 | 0.110  | 00 | 130-000 | 0.110  |
| 25          | 100-000 | 0.110  | 00 | 127-000 | 0.110  | 00 | 128-000 | 0.110  | 00 | 129-000 | 0.110  | 00 | 130-000 | 0.110  | 00 | 131-000 | 0.110  |
| 26          | 100-000 | 0.110  | 00 | 128-000 | 0.110  | 00 | 129-000 | 0.110  | 00 | 130-000 | 0.110  | 00 | 131-000 | 0.110  | 00 | 132-000 | 0.110  |
| 27          | 100-000 | 0.110  | 00 | 129-000 | 0.110  | 00 | 130-000 | 0.110  | 00 | 131-000 | 0.110  | 00 | 132-000 | 0.110  | 00 | 133-000 | 0.110  |
| 28          | 100-000 | 0.110  | 00 | 130-000 | 0.110  | 00 | 131-000 | 0.110  | 00 | 132-000 | 0.110  | 00 | 133-000 | 0.110  | 00 | 134-000 | 0.110  |
| 29          | 100-000 | 0.110  | 00 | 131-000 | 0.110  | 00 | 132-000 | 0.110  | 00 | 133-000 | 0.110  | 00 | 134-000 | 0.110  | 00 | 135-000 | 0.110  |
| 30          | 100-000 | 0.110  | 00 | 132-000 | 0.110  | 00 | 133-000 | 0.110  | 00 | 134-000 | 0.110  | 00 | 135-000 | 0.110  | 00 | 136-000 | 0.110  |

Figure 3. Table saving List

Figure (3), table saving list show results recapitulation with code color. The meaning of the color code for the color red that is route Which will aim No own connection, color black show has done consolidation, color green indicates the selected route A, in blue show route B Which selected, color yellow indicates the selected route C and the pink color indicates route D which selected. Based on evaluation saving list , determination route A, B, C And D with respectively – respectively mark cubication as following:

- a. Route A : Warehouse, S1 Pharmacy, S2 Pharmacy, S15 Pharmacy, S18 Pharmacy, S19 Pharmacy → cubication = 2,451 cbm < 8.93 cbm / Heavy = 1944 kg < 2000 kg.
- b. Route B : Warehouse, S3 Pharmacy, S8 Pharmacy, Pharmacy S9, Pharmacy S11, Pharmacy S13, Aptek S14 cubication = 2,409 cbm < 8.93 cbm / Heavy = 1908 kg < 2000 kg.
- c. C Route : Warehouse, S4 Pharmacy, S5 Pharmacy, S7 Pharmacy, S10 Pharmacy, S16 Pharmacy cubication = 2,300 cbm < 8.93 cbm / Heavy = 1836 kg < 2000 kg.
- d. route D : Warehouse, Pharmacy S6, Pharmacy S12, S17 Pharmacy, S20 Pharmacy, S21 Pharmacy cubication = 2,393 cbm < 8.93 cbm / Heavy = 1920 kg < 2000 kg.

Determination of routes A, B, C and D which has determined will next For determine mark nearest inserts And nearest neighbors

Table 3. Nearest Insert And Nearest neighbors

| Track   | Nearest Insert                       |  | Nearest neighbors                      |                | Difference |
|---------|--------------------------------------|--|--|----------------|------------|
|         | Order route                          | Total Distance                         | Order route                            | Total Distance |            |
| routeA  | : G - S1 - S2 - S15 - S18 - S19      | G - S1 - S18 - S2 - S19 - S15 - G      | G - S1 - S18 - S19 - S2 - G            | 0.426          | 0.025      |
| route B | : G - S3 - S8 - S9 - S11 - S13 - S14 | G - S13 - S11 - S3 - S8 - S9 - S14 - G | G - S13 - S11 - S3 - S8 - S9 - S14 - G | 0.456          | 0.000      |
| route C | : G - S4 - S5 - S7 - S10 - S16       | G - S7 - S16 - S4 - S5 - S10 - G       | G - S7 - S16 - S4 - S5 - S10 - G       | 0.299          | 0.000      |
| route D | : G - S6 - S12 - S17 - S20 - S21     | G - S21 - S6 - S17 - S20 - S12 - G     | G - S21 - S6 - S17 - S20 - S12 - G     | 0.324          | 0.000      |

Table 3, show that comparison 2 algorithm between Nearest Insert with Nearest Neighbor , there are route differences And distance travel different on route A with difference 0.025. Whereas route B, C And D get the order of the route and the total distance of that equal to a difference of 0.000. Deep modeling visual google maps on table (4) as following:

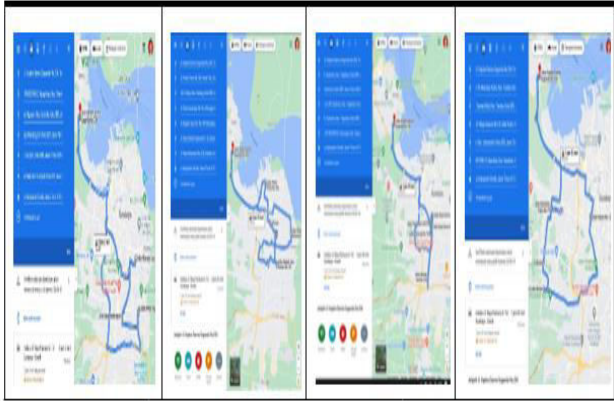


Figure 4. Visual saving Matrix Google Maps

Evaluation saving matrix with algorithm Nearest Insert with Nearest neighbors based on mark smallest is nearest neighbor . Selection of nearest neighbor Because mark route A more small. Activity maintain consistency of routes A, B, and C D uses the next nearest neighbor integrated with fishbone diagrams .

The purpose of the fishbone diagram is identification nearest neighbor when there are internal problems distribution product salt. Problems Which arise will done repair in a manner sustainable as consistency in the distribution routes of salt products.

Route B is G - S13 - S11 - S3 - S8 - S9 - S14 – G with distance 0.456. Route C is G - S7 - S16 - S4 - S5 - S10 – G with a distance of 0.299. Route D is G - S21 - S6 - S17 - S20 - S12 – G with a distance of 0.324. There are 3 problem factors that have been solved identification in order to support the nearest neighbor algorithm in the activity of saving matrix. First, the proposed addition of 4 units of hand pallets and forklifts to minimize vehicle queues. Second, the suggestion of a loading dock yard with SOP support within the scope of the estimated standard time for cargo activity. Third, measurement of the standard loading time in order to reduce delays in the distribution schedule. The assessment of the saving matrix with the nearest neighbor algorithm has been supported by more complex consistency identification. This identification will become monitoring in the continuity of the distribution of dietary salt products.

Suggestion study that is has identify activities that function as monitoring activity distribution. Activity distribution using saving matrix with nearest neighbor algorithm has been identified factor consistency. So that, If happen error can refer in factor Which has identified use fishbone diagrams . Superiority Which has achieved is integration saving matrix with fishbone diagrams . Weakness Which can repaired on period future First, that is need compare condition exist with evaluation saving matrix . Second, can planning more scheduling activities effective with refer analysis pert And CPM.

**Table 4.** Root Problem Consistency Optimization Distribution

| Attribute Fishbone Diagram | Possible Obstacles Consistency in Route Optimization Distribution   | Brainstorming   | Is this become root problem ? |
|----------------------------|---|---|-------------------------------|
| Machine                    | 2 handpallet, 2 forklifts And queue vehicle as a problem that can be refers on decline consistency In Distribution Route Optimization. Moment more than a queue of vehicles limit, will cause queue long And timetable distribution late. | Addition facility For lower incident time queue.  | Yes                           |
| Man                        | Competency and contract system push cost activity. Reason Which arise If going on in a manner long will harm company in a manner No direct.   | Competence improvement according to the training schedule with division Which involved. Possible to make alternative For condition daily And wholesale. | No                            |
| Material                   | Packing Which damaged on activity Which currently walk Not yet experience complain.   | Although Not yet experience complaint, need action to repair in activity distribution   | No                            |
| Methods                    | Not yet done loading dock, SOUP leads time, timetable fit Which Still unconditioned and energized dominant wasted.  | Consideration with period time certain For carry out loading dock, SOUP leads time, timetable fit And waste necessary power reduced.                    | Yes                           |
| measurement                | Process fit done by power wholesale. This difficult For identification measurement standard time load, And No found SOUP Which arrange about standard process fit.  | Importance measurement standard time fit And SOUP Which arrange about standard process fit.   | Yes                           |
| Environment                | Environment warehouse Which tend own humidity Which tend become factor reason damage from packaging product   | Although Not yet experience complaint, need action to repair in activity distribution   | No                            |

**Table 5.** Distribution Optimization Consistency Improvements

| No. | Factor Root Problem  | Distribution Optimization Consistency Improvements   |
|-----|--|--|
| 1   | Addition facility For lower incident time queue  | Planning Which will done with addition facility respectively – respectively 4 units. Addition 4 units based on condition exist. Condition exist Which arise that in one vehicle it is more effective to use 4 units handpallet And 4 units forklifts. Condition exist dominant there was a queue when there was a queue of 3 vehicles. Because of That, addition amount the as alternative solution beginning. |
| 2   | Consider the term time certain For carry out loading dock, SOP lead time, loading schedule And waste power need reduced. | The proposed loading dock yard facility is in accordance with the achievements optimization distribution use type loading dock bumper. Proposal loading dock Also need SOUP For plan standard time for each vehicle and can be suppressed waste power for worker.  |
| 3   | The importance of measurement standard loading times and SOPs Which arrange about standard process fit.                  | Measurement time For standardization payload very important. Proposed load time measurements to provide estimates related queue vehicle And activity For reduce lateness in activity distribution.   |

Based on the research results, the value of the saving matrix that has been determined by routes A, B, C and D uses the nearest neighbor. Route A is G - S1 - S18 - S19 - S15 - S2 – G with a distance of 0.426.

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