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Supplier Selection With Gray Based Rough Set Theory Method (A Case Study: Pharmaceutical Installation Of RSU Grand Medica Tanjung Anom, Medan)

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Abstract. Based on the preliminary study and interviews to the Grand Medica Hospital Tanjung Anom Medan there are several problems, including the frequent delays of drugs and an increase in the percentage of disability drugs supplied by suppliers. Where the supplier is a top priority exactly shows the highest percentage of disability in the delivery period. From these problems, it is necessary to select the medicinal supplier of Grand Medica General Hospital by evaluating the criteria and subcriteria in the supplier assessment and will produce the output of more than one supplier that has been in accordance with the criteria. The purpose of this study is to assist the Hospital for making the right supplier selection decisions. Supplier selection is a matter of Multi Criteria Decision Making (MCDM) because in the selection process is done by evaluating each supplier which is seen some common criterion in supplier selection to fulfill requirement of raw material. The method used in this study is the method of Gray Based Rough Set Theory, where this m ethod will involve some decision makers who are considered to have an important role in this hospital. Gray Based Rough Set Theory is a combination of fuzzy or gray methods and rough sets. The selection of suppliers by this method also considers the importance of the decision maker by assigning weight to each decision maker. By providing the upper and lower limits of each calculation, this method is considered capable of producing better decisions, with the output of more than one selected supplier. Where the RSU Grand Medica currently needs suppliers to supply medicines to meet medical supplies at the Hospital. Based on the calculation of the value of the Gray Values factor, the results obtained for each supplier, namely supplier 1 (0.26), supplier 2 (0.31), supplier 3 (0.60), supplier 4 (0.60), supplier 5 (0.39), and supplier 6 (0.34). By analyzing the value of Gray Value factor, obtained the order of choosing the chosen supplier based on the weight of the biggest is supplier 4 (0,60), supplier 3 (0.60), supplier 5 (0.39), supplier 6 (0.34), supplier 2 (0.31), and the last supplier 1 (0.26).

1. Introduction

The hospital has a variety of clinical practices and is quite complex. Various kinds of practices can be found in hospitals such as emergency departments (IGD), Intensive Care Units (ICU), Intensive Cardiac Care Units (ICCU), Perina, childbirth services, operations, laboratories, radiology, polyclinic services, pharmaceutical installations, and various other services. One of the services found in a hospital is a pharmaceutical installation. Pharmacy or also known as a pharmacy is one of the most important parts of a hospital. A pharmacist has a role to provide medical counseling, prescription drug screening, giving drugs, and other managerial work related to drug stocks. According to [1] stated that errors related to

medicines exceed 2% of the entire medical process in the hospital. Therefore, Pharmacists must be able to select suppliers of quality medicines to improve services to patients in the Hospital.

The selection of suppliers in the Hospital is based on the availability of medicines by the supplier and the prices offered by the supplier. In this case the Hospital will choose suppliers who provide medicines needed by the Hospital and at competitive prices to fulfill the order. In practice, hospitals are required not only to consider prices, but also to consider other criteria, such as quality, service, location, supplier inventory policies, and flexibility. So far, the selection of drug suppliers in the Hospital does not use a specific method, the selection of suppliers or suppliers carried out by the Hospital is based solely consider the price criteria only. This study is intended to bring up a number of criteria in selecting suppliers, testing the weight and priority of the relevant criteria by taking a study at the Pharmacy Installation of Grand Medica Hospital, Tanjung Anom, Medan. Grand Medica Hospital Tanjung Anom, Medan is one type of General Hospital which is classified in the class C Hospital which is led by Director Dr. Margan RP Sibarani, M. Kes. Private Hospital is located at 9 Snakma street, Tanjung Anom, Pancur Batu, Deli Serdang, Medan. Grand Medica Hospital Pharmacy Installation provides various kinds of medicines that are suitable for the needs of patients. In carrying out its operational activities, Pharmacy Installation obtains supplies of medicines from several suppliers. The drugs needed by the hospital are: first, consumable medical supplies or *BMHP (Bahan Medis Habis Pakai)* such as cotton, plaster, *hypatix*, gauze, nasal, infuset; second, generic drugs like *ambroxol, amlodipine*, mefenamic acid; and third, patent drugs such as *pronicy, neuralgin, metinal, glurem,* and etc. The supplier selection at the Hospital does not use any kinds of method, in other words, the supplier selection done by the hospital party does not base on any considerations or selection criteria.

Based on the research result in the form of a direct interview with the hospital pharmacist, it could be known that in administering medical supplying, the occurred networking between the hospital and some medical supplier did not satisfy RSU Grand Medica. In the drugs procurement, the hospital cooperated with some supplier to fulfill the medical supplies. Recently, RSU Grand Medica has six suppliers in drugs procurement in which the six suppliers were obtained by the recommendation of other hospitals so that RSU Grand Medica believed them to be the supplier. However, in fact, the supplier who worked with the hospital had problems in supplying the drugs. The problem was the late sending time from the appointment time. Although the supplier had known that the hospital had planned the drugs arriving time and had tolerated the time arriving for 10 days, the supplier still did not obey the hospital policy. For instance, the consumable medical supplies that were ordered by the hospital to the A supplier on December 10th 2017 was supplied by the A supplier on 23 October 2017 (attached data), and also the same drugs had been ordered to the B supplier on October 5^{th,} 2017 but it was supplied on October 18^{th,} 2017. In the other hand, the hospital also ordered the generic drugs to the C supplier on July 12nd 2017 and was supplied by the supplier on August 21^{st,} 2017, and the generic drugs was also ordered to the supplier D on January 23, 2018, but they supplied on February 3^{rd,} 2018. The late of the drugs affected the hospital inventory and caused a loss for the hospital party.

The second problem was the increase of defective drugs that was supplied by the supplier. The hospital had a standard in the contract with the supplier in which less than 0.5 % defect could be accepted from the supplies. The result of the interview the A supplier supplied *BMHP* with 0.7% defect in January, and it increased 1% in March. Whereas, the C supplier that supplied generic drugs in January has 0.6% defect and it increased 0.8% defect on March. The patent drugs supplied by the E supplier in January had 0.7% defect and it became 0.5% in March. This showed that the work and performance of the supplier decreased.

From the problems above, this research aimed at helping the hospital in making the decision to select the appropriate supplier. The supplier selection was *Multi-Criteria Decision Making* or *MCDM* due to the process of the selection that was done by evaluating every supplier who fulfilled the general criteria on supplier selection to fulfill the needs of the raw materials. There were many methods to select the supplier, such as *Analytical Hierarchy Process* (AHP), *Analytic Network Process* (ANP), *Techniques for Order Preference by Similarity to an Ideal Solution* (TOPSIS), *Data Envelopment Analysis* (DEA),

Case- Based Reasoning (CBR), *Decision Matrix Method*, *Multi-Criteria Decision Making* (MCDM), dan *Grey Based Rough Set Theory*.

This research used Grey Based Rough Set Theory in which this method involved some *decision makers* who were assumed to have an important role in the hospital. *Grey Based Rough Set Theory* was the combination of *fuzzy* or *grey* and *rough set*. The supplier selection by using this method also considered the level of the decision maker by giving quality in every *decision making*. By giving the upper limit and lower limit of every calculation, this method assumed to get a better decision with more than one output of the selected supplier. RSU Grand Medica, nowadays, needs some suppliers to supply and fulfill the medical supplies in the hospital.

2. Theoretical Framework

2.1. Grey System theory

Fuzzy Set theory is the development of the common *set* theory or known as *crisp set*. The difference between the *fuzzy set* and *crisp set* relies on the particular object membership. In the *crisp set*, an object has only two possibilities that are a set member (1) or not a set member (0), while in *fuzzy set,* the level of element membership takes place in an interval [0,1]. *Fuzzy* set and its membership function are defined as follows: "if X is the collection of objects notated as x, therefore a particular *fuzzy* A set in X is the set from value pair.

$$A = \{ (x, \mu_A(x)) | x \in X \} \quad (1)$$

With m_A (x) is the membership function for *fuzzy* A set. The membership function maps every element of x in *fuzzy set* A.

Grey system theory can be used to solve the uncertain problem in case with discrete data and less information. The main advantage of this method is that it may result in good output by using only the limited data information or high variability in factor. The application of *grey* system has been successful in some disciplines such as economics, agriculture, pharmacy, geography, industry, and etc[2]. The qualification of every criterion is obtained by looking at the *positive trapezoidal fuzzy*.

2.2. Rough Set Theory

The rough set theory is not the alternative to solve the classic set theory, but this theory is a theory that included within it. *The fuzzy* and *rough sets* are not the tools that substitute each other but the tools that complement each other. The early objective of the *rough set* theory is to introduce the approximation concept. The approximation concept consists of two concepts that are *lower approximation* and *upper approximation*. Intuitively, a *lower approximation* consists of all elements that exactly included within the set, while the *upper approximation* consists of all elements that might be included within the set. The basic difference between the *lower approximation* and *upper approximation* relies on the limitation of the area [3].

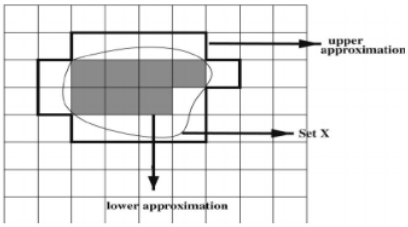

Figure 1. *Set Approximation*
Source:[4]

The rough set theory is based on the terminology that includes in the approximation room, that is the couple of <X, R> value where X is not an empty set (universal set) and R is an equivalence relation on X, it means that R is a reflective, symmetric, and transitive relation. The R relation decomposes X into

some separated classes so that the elements of x and y included in the same class if only (x,y) e R or equivalent with xRy. X/R defined as a result set for X on R relation[4].

The rough set theory is commonly used to represent the set in which the limitation is less clear by giving lower approach and upper approach from the set. T set can be characterized as the couple of approximation set [2]. *The rough fuzzy set* theory is the combination of *rough set* and *fuzzy set*. Therefore, it has lower and upper approaches and also has the level of element membership from 0 to 1.

The Calculation of Criteria and sub criteria Quality

$$\tilde{w}_j^k = w_j^k x d^k$$
$$= \left[\min\left(\underline{w}_j^k \underline{d}^k, \underline{w}_j^k \overline{d}^k, \overline{w}_j^k \underline{d}^k, \overline{w}_j^k \overline{d}^k\right), \max\left(\underline{w}_j^k \underline{d}^k, \underline{w}_j^k \overline{d}^k, \overline{w}_j^k \underline{d}^k, \overline{w}_j^k \overline{d}^k\right)\right] \quad (2)$$

j = *supplier* selection criteria; k = *decision maker*; w = criteria quality; d = *decision maker;* $\underline{w}$ = criteria quality lower limit; ϖ = criteria quality upper limit; $\underline{d}$ = *decision maker* quality lower limit; d = *decision maker* quality upper limit

The Calculation of *grey values* Factor

$$v_{ij} = \frac{1}{k} [\, v_{ij}^1 + v_{ij}^2 + \ldots + v_{ij}^k \,] \quad (3)$$

i = supplier; j = supplier selection criteria and sub criteria*; k = decision maker*

The Calculation of *grey values* for the Criteria and sub criteria

$$v_{ij} = \varpi_j x\, v_{ij}$$
$$= [\, \min(\underline{w}_j x\, \underline{v}_{ij}, \underline{w}_j x\, \tilde{v}_{ij}, \varpi_j x\, \underline{v}_{ij}, \varpi_j x\, \tilde{v}_{ij}), \max(\underline{w}_j x\, \underline{v}_{ij}, \underline{w}_j x\, \tilde{v}_{ij}, \varpi_j x\, \underline{v}_{ij}, \varpi_j x\, \tilde{v}_{ij})] \quad (4)$$

The Calculation of The best *Supplier* set

$$\underline{RS}_* = \{(\, S_i \in U \mid [S_i]_R \subseteq S_* \,\} \quad (5)$$
$$\text{Where, } S_*^x = \{\, S_i^x \mid D_i^x \; i = 2 \,\} \quad (6)$$

3. Research Methods

3.1. Research Objects

The object of this research was RSU Grand Medica Tanjung Anom, Medan. RSU Grand Medica Tanjung Anom, Medan is one of the hospitals which is categorized as Hospital C located in Snakma street no.9 Tanjung Anom Pancur Batu district, Deli Serdang, Medan. The research object focused on one of the services in the hospital that was pharmacy installation. The pharmacy or was known as drugstore has an essential role to provide medical counseling, drugs prescription screening, drugs giving, and other managerial related to the medical supplies. According to[1], the mistake related to the drug prescription is more than 2% from all the medical processes in the hospital. Therefore, the pharmacist should select the qualified drugs supplier to improve the hospital services.

3.2. The Identification of Supplier Selection Criteria

The criteria and sub-criteria that would be used in the process of supplier selection had been matched with the RSU Grand Medica Tanjung Anom Medan requirements[5].

Table 1. The Criteria and Subcriteria

Criteria	**Subcriteria**
Quality	CD (*Consistent Delivery)*
	CQ (*Conformance Quality)*
Cost	LIP (*Low Initial Price)*
	CRA (*Cost Reduction Activities*)
Time	DS (*Delivery Speed)*
	OTR (*On Time Rate*)
Relationship	LTR (*Long Term Relationship)*
	CO (*Communication Openness)*

3.3. Data Collection Methods

The primary data used in this research were obtained from the results of interview and questionnaire from the hospital *decision maker*. The interview was conducted to know the real condition and challenge of the hospital, whereas the questionnaire was done to collect the *decision maker* opinions about the criteria and sub-criteria in selecting the *supplier*.

The supporting data of this research was the data obtained indirectly from the literature to support the problem solving about *supplier* selection in the hospital, they were as follows.

1. The data related to the result of the questionnaire to assess each *decision maker* criteria and sub-criteria on the level of criteria and subcriteria importance in selecting the *supplier*.
2. The data from calculation result of criteria and sub-criteria quality by using the second formula.
3. The data from the result of *grey values* factor calculation of the supplier.
4. The data from the result of *grey* values calculation for the criteria and sub-criteria. This data was obtained by combining the w and v values obtained from the previous step.

4. Results and Discussion

Recap of Supplier Assessment Criteria and Sub-Criteria for Supplier Selection below (Tabel 2) is the result of an assessment of the importance of criteria and sub-criteria by each decision maker.

Table 2. The Recap of Criteria and Sub Criteria Criteria Questionnaire

	Quality		Cost		Time		Relationship	
	CD	CQ	LIP	CRA	DS	OTR	LTR	CO
Decision Maker 1	VH	H	VH	M	H	H	VH	H
Decision Maker 2	H	M	VH	H	H	H	M	M
Decision Maker 3	VH	VH	M	M	H	H	H	H
Decision Maker 4	VH	VH	M	M	H	H	VH	H

CD : Consistent Delivery	DS : Delivery Speed
CQ : Conformance Quality	OTR : On Time Rate
LIP : Low Initial Price	LTR : Long Term Relaionship
CRA : Cost Reduction Activities	CO : Communication Openness

4.1. Recap of Supplier Performance Assessment Questionnaire

Table 3 is the result of the performance assessment of the supplier of medicines made by each decision maker. There are four criteria with eight supplier selection criteria.

Table 3. The Recap of Supplier Performance Assessment Questionnaire

	Supplier 1								Supplier 2							
DM	Quality		Cost		Time		Relationship		Quality		Cost		Time		Relationship	
	CD	CQ	LIP	CRA	DS	OTR	LTR	CO	CD	CQ	LIP	CRA	DS	OTR	LTR	CO
1	P	P	VG	G	VP	F	F	G	F	P	G	G	VP	G	P	G
2	P	P	VG	G	VP	F	P	F	P	P	G	G	VP	F	F	F
3	P	VP	VG	G	VP	F	P	F	F	P	G	G	VP	F	F	F
4	P	VP	VG	G	VP	F	P	F	P	P	G	G	VP	F	F	F

DM : Decision Maker

4.2. Calculation of Criteria and Sub-Criteria Weights

At this stage the calculation of criteria and sub-criteria will be calculated. The following are examples of calculations performed for quality criteria and Consistent Delivery sub-criteria by decision maker 1:

$$\tilde{w}_j^k = w_j^k x d^k = \left[\min\left(\underline{w}_j^k \underline{d}^k, \underline{w}_j^k \overline{d}^k, \overline{w}_j^k \underline{d}^k, \overline{w}_j^k \overline{d}^k\right), \max\left(\underline{w}_j^k \underline{d}^k, \underline{w}_j^k \overline{d}^k, \overline{w}_j^k \underline{d}^k, \overline{w}_j^k \overline{d}^k\right)\right]$$

$w_1^l = w_1^l \; x \; d^l$

$[\min(0{,}9 \; x \; 0{,}7; 0{,}9 \; x \; 0{,}9; 1{,}0 \; x \; 0{,}7; 1{,}0 \; x \; 0{,}9), \max(0{,}9 \; x \; 0{,}7; 0{,}9 \; x \; 0{,}9; 1{,}0 \; x \; 0{,}7; 1{,}0 \; x \; 0{,}9)]$

$w_1^l = [0{,}63 \; ; \; 0{,}9]$

After going through the same calculation, the results are obtained:

Table 4. The Recap Subcriteria Weight Calculation Results

		Decision Maker 1	*Decision Maker* 2	*Decision Maker* 3	*Decision Maker* 4
Criteria	Subcriteria	Weight	Weight	Weight	Weight
Quality	CD	[0,63 ; 0,9]	[0,35 ; 0,63]	[0,81 ; 1]	[0,45 ; 0,7]
	CQ	[0,49 ; 0,8]	[0,2 ; 0,42]	[0,81 ; 1]	[0,45 ; 0,7]
Cost	LIP	[0,63 ; 0,9]	[0,45 ; 0,7]	[0,36 ; 0,6]	[0,2 ; 0,42]
	CRA	[0,28 ; 0,54]	[0,35 ; 0,63]	[0,36 ; 0,6]	[0,2 ; 0,42]
Time	DS	[0,49 ; 0,81]	[0,35 ; 0,63]	[0,63 ; 0,9]	[0,35 ; 0,63]
	OTR	[0,49 ; 0,81]	[0,35 ; 0,63]	[0,63 ; 0,9]	[0,35 ; 0,63]
Relationship	LTR	[0,63 ; 0,9]	[0,2 ; 0,42]	[0,63 ; 0,9]	[0,45 ; 0,7]
	CO	[0,49 ; 0,81]	[0,2 ; 0,42]	[0,63 ; 0,9]	[0,35 ; 0,63]

After calculating the weight of the subcriteria by each supplier, the next step to be taken is to calculate the average value from the fourth decision maker's assessment of each subcriteria. For example, the final weight of the Consistent Delivery (DC) sub-criteria is

$W_j = \frac{1}{k} [\underline{w}_1^1 + \underline{w}_1^2 + \underline{w}_1^3 + \underline{w}_1^4], [\varpi_1^1 + \varpi_1^2 + \varpi_1^3 + \varpi_1^4]$

$= \frac{1}{4} [0{,}63 + 0{,}35 + 0{,}81 + 0{,}45], [0{,}9 + 0{,}63 + 1{,}0 + 0{,}7] = [0{,}56 \; ; 0{,}80]$

Example Calculation above is an assessment of all four decision makers against one of the sub-criteria, namely Consistent Delivery (DC) is [0.56; 0.80], 0.56 for the lower limit, and 0.80 for the upper limit. The Table 4 is recap the average weight of each sub-criteria.

Table 5. The Recap the average weight of each sub-criteria

Criteria	Subcriteria	Weight
Quality	CD (*Consistent Delivery)*	[0,56 ; 0,80]
	CQ (*Conformace Quality)*	[0,48 ; 0,73]
Cost	LIP (*Low Initial Price)*	[0,41 ; 0,65]
	CRA (*Cost Reduction Activities*)	[0,29 ; 0,54]
Time	DS (*Delivery Speed)*	[0,45 ; 0,74]
	OTR (*On Time Rate*)	[0,45 ; 0,74]
Relationship	LTR (*Long Term Relationship)*	[0,47 ; 0,73]
	CO (*Communication Openness)*	[0,41 ; 0,69]

4.3. The Priority Determination of Selected Supplier

The value of $[S_1]_R$ obtained from table 4.6 counting 4.3.5. The result of *grey* values *factor* calculation for all suppliers, there was none that got the same value for all criteria, therefore $[S_1]_R$ = [{S1},{S2},{S3},{S4},{S5},{S6}]. The last step was to seek RS value. In this step, the supplier selection would be conducted by seeking the highest last quality of each supplier.

4.4. The Determination of Selected Supplier

The determination of selected supplier was done in this stage. To get the selected supplier, the value of S_0 was firstly counted, in which $S_0 = S^{max}$. This value was obtained from the maximum upper limit and lower limit qualities from each sub criteria on table 4.6. therefore the value of S_0 = [0,33; 0,65], [0,28; 0,65], [0,36; 0,65], [0,21; 0,51], [0,20; 0,44], [0,24; 0,59], [0,25; 0,58], [0,20; 0,48].

$\Delta_{max} = maxmaxL(x_0(k), x_i(k))$

$= \text{maxmax } [(\underline{x}_0 - \underline{x}_i{}^k)^2 + \ddot{x}_0 - \ddot{x}_i{}^k)^2]^{1/2}$

$= [(0,36 - 0,16)^2 + (0,65 - 0,26)^2]^{1/2} = 0,43$

On the calculation above, the Δ_{max} value was the highest value from S_0 value. The highest value was found in sub criteria *low initial price* (LIP), therefore the value of $x_0(k)$ = [0,36; 0,65]. Then, the calculation of the lowest value of sub criteria *low initial price* was conducted from all the suppliers. The lowest score was obtained from the supplier 4. Therefore, the value of $x_i(k)$ = [0,16; 0,26].

Next, the calculation of Δ_{min} in which obtained from the result of calculation by using the following formula:

$\Delta_{min} = minminL(x_0(k), x_i(k) = \text{minmin } [(\underline{x}_0 - \underline{x}_i{}^k)^2 + \ddot{x}_0 - \ddot{x}_i{}^k)^2]^{1/2} = [(0,20 - 0,20)^2 + (0,44 - 0,44)^2]^{1/2} = 0,43 = 0$

On the above calculation, the value of Δ_{min} *was the lowest value of* S_0. The lowest value was found in sub criteria *Delivery Speed (DS)*, therefore, the value of $x_0(k)$ = [0,20; 0,44]. Then, the highest value of *delivery speed* criteria was counted from all suppliers. The value was obtained from supplier 4. Therefore, the value of $x_i(k)$ = [0,20; 0,44].

After calculating the value of Δ_{max} and Δ_{min}, the calculation of $\Delta_{0i}(k)$ was conducted for every priority of supplier. The following are the example of $\Delta_{0i}(k)$ value calculation to supplier 1 on subcriteria CD.

$\Delta_{0i}(1) = L(x_0(1), x_1(1)) = [(\underline{x}_0 - \underline{x}_i{}^k)^2 + (\ddot{x}_0 - \ddot{x}_i{}^k)^2]^{1/2} = [(0,33\text{-}0,05)^2 + (0,65\text{-}0,24)^2]^{1/2} = 0,49$

The last step in determining the selected supplier priority was done by using the following formula:

$$T_{0i} = \sum_{k=1}^{n} \frac{1}{n} \left(\frac{\Delta \max - \Delta oi\,(k)}{\Delta max - \Delta min} \right)$$

The following calculation example was the quality priority of supplier 1.

$$T_{01} = \sum^{11}{}_{k=1} \frac{1}{11} \left(\frac{\Delta \max - \Delta oi\,(k)}{\Delta max - \Delta min} \right) = \sum^{11}{}_{k=1} \frac{1}{11} \left[\left(\frac{0,43-0,49}{0,43-0} \right) + \left(\frac{0,43-0,57}{0,43-0} \right) + \left(\frac{0,43-0}{0,43-0} \right) + \left(\frac{0,43-0,05}{0,43-0} \right) + \left(\frac{0,43-0,42}{0,43-0} \right) + \left(\frac{0,43-0,22}{0,43-0} \right) + \left(\frac{0,43-0,37}{0,43-0} \right) + \left(\frac{0,43-0,07}{0,43-0} \right) \right] = 0,26$$

The following are the recap of $\Delta_{0i}(k)$ value calculation for six suppliers as can be seen on Table 6.

Table 6. The Recap of $\Delta_{0i}(k)$ Value Calculation

Subcriteria	Supplier 1	Supplier 2	Supplier 3	Supplier 4	Supplier 5	Supplier 6
CD	0,49	0,38	0,03	0	0,40	0,40
CQ	0,57	0,50	0	0	0,35	0,38
LIP	0	0,13	0,31	0,43	0,10	0,03
CRA	0,05	0,05	0	0,14	0,05	0,05
DS	0,42	0,42	0,07	0	0,12	0,34
OTR	0,22	0,15	0,08	0	0,15	0,22
LTR	0,37	0,27	0	0	0,27	0,24
CO	0,07	0,07	0,07	0	0,14	0,14

Through the same calculation, there got the result $T_{02} = 0,31$, $T_{03} = 0,60$, $T_{04} = 0,60$, $T_{05} = 0,39$, and the last $T_{06} = 0,34$. Thus, the sequence selection of the selected supplier based on the highest to the lowest quality was *supplier* 4, *supplier* 3, *supplier* 5, *supplier* 6, *supplier* 2, and *supplier* 1.

5. Conclusions

Through the calculation and the result obtained from the previous chapter, the conclusions were as follows. This research used four criteria with eight subcriteria. The criteria were the quality with sub criteria *conformance quality* and *consistent delivery*. The *cost* criteria were *low initial price and cost reduction activities,* time criteria with *delivery speed and on time rate* sub-criteria. The relationship criteria were *long-term relationship and communication openness* sub-criteria.

- In conducting the qualification calculation of each supplier criteria, there needed quality for each *decision maker* that decision based on the level of position important of each decision maker in doing supplier selection at RSU Grand Medica Tanjung Anom Medan. The highest quality of the decision maker at the hospital was the head of the pharmacy installation. This part was important so that it took the *important* level. Then, the part that has an important role in selecting the supplier was the director of the hospital. The director has an important role and took *important level.* Besides the head of the pharmacy installation and the hospital director, the head of medical support was also believed to participate in supplier selection in the hospital and took the *moderately important* level. The last, co-pharmacist has a role in supplier selection and took *moderately important* level the same as the head of medical support. The qualifying of each criterion and sub-criteria was done previously by changing the assessment scale into a *fuzzy* number.
- There were two stages in conducting the *grey values* factor calculation. First, calculation the *grey values* based on the quality supplier performance assessment without considering the sub-criteria quality that has been counted previously. Second, calculation the *grey values* factor by considering quality sub-criteria that have been counted previously. After conducting the calculation, the sequence of selected supplier determination started to form the highest quality that was *supplier 4, supplier 3, supplier 5, supplier 6, supplier 2,* and *supplier 1.*

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