

Decision Support System in Determining Call Center Staff Using VIKOR Method

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Abstract

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Call center staff is a staff who works in providing repair services or service by telephone. This staff is in charge of explaining the solutions that will be carried out by the company in getting answers. Call center staff must have good manners and be smart. In getting good staff, companies can use a decision support system with the VIKOR method in determining and selecting these staff. Five criteria will be tested in determining the staff. The results of the VIKOR method can help companies in getting call center staff according to company expectations. The ranking results can determine the level of results from the VIKOR method test on call center staff who are used as candidates or alternatives. By applying this method, the search for call center staff will be better.

Keywords : Staff, VIKOR, DSS, Criteria, Weights, Preferences

1. Introduction

In this sophisticated era, many equipment or facilities can assist humans in carrying out their daily activities. These facilities can be in the form of electronic devices, food, and other services. Each facility can be obtained easily by looking at references on the internet or by going directly to the store that sells the facilities. But sometimes, a person must experience problems or obstacles in using or enjoying the facilities that have been purchased or obtained. In solving the problems encountered, each company providing these facilities must be responsible for providing aftersales service. This service is a service for complaints about problems faced by customers. But in reality, buyers find it difficult to contact companies that have collaborated. Service by telephone or voice is required in providing solutions for customers. A call center is a place where customers can contact the party on duty to help solve the problems. But not all call center staff can provide information or solutions properly. There are some of them who are still less accurate in providing solutions and some have less patience so that customers feel dissatisfied with the solutions that have been provided. This happens due to the lack of selectivity in choosing call center staff.

This research examines how to determine call center staff with the assistance of a decision support system. The VIšekriterijumsko KOMpromisno Rangiranje (VIKOR) method is the method used in this research. The VIKOR method is a Multi-Criteria Decision Making (MCDM) method that can be used to select more than one criterion. The VIKOR method works by calculating the value of utility measures and regret measures in determining which staff candidates are selected to occupy the call center position.

2. Method

2.1 Call Center

Call Center is a centralized office that is used to receive or send a large number of inquiries by telephone. An inbound call center is operated by the company to manage product or service incoming

support or information inquiries from consumers. The outbound call center is operated for telemarketing, soliciting charitable or political donations, debt collection, market research, emergency notification, and urgent/critical need blood banking. The contact center, a further extension to the call center manages the centralized handling of individual communications, including mail, fax, live support software, social media, instant messaging and email. A call center has an open workspace for the call center agent, with a workstation that includes a computer and display for each agent and is connected to an incoming/outgoing call management system, and one or more monitoring stations. It can be operated independently or connected to additional centers, often connected to a company computer network, including mainframes, microcomputers/servers and LANs. Voice and data lines to the center are increasingly connected through a new set of technologies called computer telephony integration (Rafaeli et al., 2008).

The contact center is the central point from which all customer contacts are managed. Through the contact center, valuable information about the company is forwarded to the right people, contacts to track and data to collect. It is generally part of a company's customer relationship management infrastructure. The majority of big companies use contact centers as a means to manage their customer interactions. These centers can be operated by the responsible internal department or outsource customer interactions to third- party agents (known as Outsourcing Call Centers).

2.2 Decision Support System

A decision support system (DSS) is a computerized program used to support determination, assessment, and action courses in an organization or business. DSS filters and analyzes large amounts of data, gathering comprehensive information that can be used to solve problems and in decision making (Supiyandi et al., 2020). Typical information used by DSS includes target or projected revenues, sales figures or past data from different periods, and other inventory or operating related data (Turban et al., 2017). A decision support system collects and analyzes data, synthesizing it to produce comprehensive information reports. In this way, as an informational application, a DSS differs from a typical operating application, whose function is only to collect data. DSS can be fully computerized or supported by humans. In some cases, it may combine the two. The ideal system analyzes the information and makes decisions for the users. At least, they enable human users to make more informed decisions more quickly (Keen & Scott-Morton, 2018).

2.3 VIKOR

The VIKOR method is a multi-criteria or multi-criteria decision-making (MCDM) method. It was originally developed by Serafim Opricovic to solve decision problems with conflicting and incommensurable criteria (different units), assuming that compromises are acceptable for conflict resolution, decision makers want the closest-ideal solution, and alternatives are evaluated according to all criteria set. VIKOR ranks the alternatives and determines a solution named a compromise that is closest to the ideal. S. Opricovic has developed the basic ideas of VIKOR in his Ph.D. dissertation in 1979, and his application was published in 1980. The VIKOR name appeared in 1990 from Serbian: ViseKriterijumska Optimizacija I Kompromisno Resenje, means: Multi-criteria Optimization and Compromised Solutions, with pronunciation: VIKOR. Real applications were presented in 1998. Papers in 2004 contributed to international recognition of the VIKOR method (Primadasa & Juliansa, 2019). The MCDM problem is stated as follows: Determining the best (compromise) solution in terms of multiple criteria from the set of J feasible alternatives A1, A2, ... AJ, evaluated according to the set of n criteria functions. The input data is the f_{ij} element from the performance (decision) matrix, where f_{ij} is the value of the i-th criterion function for alternative A_j.

The following is the initial data for a decision support system using the VIKOR method in obtaining computer technicians.

Table 1. Alternative Initial Data

Code	Name	Verbal Benefit	Intonation Benefit	English Benefit	Memorization Benefit	Test Benefit
		K1	K2	K4	K4	K5
A1	Beybi Triana Halim	63	64	87	60	64
A2	Husnul Khatimah	98	95	61	73	88
A3	Nelly Handayani	63	82	84	65	89
A4	Elmira Deviana	90	76	91	60	79
A5	Bungarim Hasibuan	93	61	86	73	97
A6	Nova Lindawati Sembiring	81	75	97	89	74
A7	Sri Wahyu	80	96	94	80	96
A8	Nurmawati	92	76	95	85	87
A9	Yustina Marlina Br. Lubis	71	68	71	88	62
A10	Saodah	74	100	87	68	68

3. Results And Discussion

Giving weight to the initial data is done by assigning a number 1 to 5 according to the assessment used as a sample as shown in table 2.

Table 2. The Calculation Result Of Preference Weights

W1	W2	W3	W4	W5	Total
5	3	4	4	4	20
0,25	0,15	0,20	0,20	0,20	1

Calculation of Preference weight

$$\begin{aligned}
 W1 &= \frac{\text{Weight}}{\text{Total Weight}} \\
 &= \frac{5}{20} \\
 &= 0,25
 \end{aligned}$$

$$\begin{aligned}
 W2 &= \frac{\text{Weight}}{\text{Total Weight}} \\
 &= \frac{3}{20} \\
 &= 0,15
 \end{aligned}$$

$$\begin{aligned}
 W3 &= \frac{\text{Weight}}{\text{Total Weight}} \\
 &= \frac{4}{20} \\
 &= 0,20
 \end{aligned}$$

$$\begin{aligned}
 W4 &= \frac{\text{Weight}}{\text{Total Weight}} \\
 &= \frac{4}{20} \\
 &= 0,20
 \end{aligned}$$

$$\begin{aligned}
 W5 &= \frac{\text{Weight}}{\text{Total Weight}} \\
 &= \frac{4}{20} \\
 &= 0,20
 \end{aligned}$$

Table 3. The Calculation Results of Positive and negative Values

F1+	F2+	F3+	F4+	F5+
98	100	97	89	97
F1-	F2-	F3-	F4-	F5-
63	61	61	60	62

The calculation of F1+ and F1- values is obtained from the maximum and minimum values of the first alternative. The calculation can be seen as follows:

$$\begin{aligned}
 F1+ &= \max(63, 98, 63, 90, 93, 81, 80, 92, 71, 74) \\
 &= 98 \\
 F1- &= \min(63, 98, 63, 90, 93, 81, 80, 92, 71, 74) \\
 &= 63 \\
 F2+ &= \max(64, 95, 82, 76, 61, 75, 96, 76, 68, 100) \\
 &= 100 \\
 F2- &= \min(64, 95, 82, 76, 61, 75, 96, 76, 68, 100) \\
 &= 61 \\
 F3+ &= \max(87, 61, 84, 91, 86, 97, 94, 95, 71, 87) \\
 &= 97 \\
 F3- &= \min(87, 61, 84, 91, 86, 97, 94, 95, 71, 87) \\
 &= 61 \\
 F4+ &= \max(60, 73, 65, 60, 73, 89, 80, 85, 88, 68) \\
 &= 89 \\
 F4- &= \min(60, 73, 65, 60, 73, 89, 80, 85, 88, 68) \\
 &= 60 \\
 F5+ &= \max(64, 88, 89, 79, 97, 74, 96, 87, 62, 68) \\
 &= 97 \\
 F6- &= \min(64, 88, 89, 79, 97, 74, 96, 87, 62, 68) \\
 &= 62
 \end{aligned}$$

Table 4. Result of Normalization Calculation

Code	Name	K1	K2	K4	K4	K5
A1	Beybi Triana Halim	1,000	0,923	0,278	1,000	0,943
A2	Husnul Khatimah	0,000	0,128	1,000	0,552	0,257
A3	Nelly Handayani	1,000	0,462	0,361	0,828	0,229
A4	Elmira Deviana	0,229	0,615	0,167	1,000	0,514
A5	Bungarim Hasibuan	0,143	1,000	0,306	0,552	0,000
A6	Nova Lindawati Sembiring	0,486	0,641	0,000	0,000	0,657
A7	Sri Wahyu	0,514	0,103	0,083	0,310	0,029
A8	Nurmawati	0,171	0,615	0,056	0,138	0,286
A9	Yustina Marlina Br. Lubis	0,771	0,821	0,722	0,034	1,000
A10	Saodah	0,686	0,000	0,278	0,724	0,829

The normalization calculation is obtained by dividing the positive value minus the criteria with the positive value minus the negative value. The calculation can be seen as follows:

$$\begin{aligned}
 N1_{\text{verbal}} &= \frac{F(\text{positive}) - \text{Criterion Value}}{F(\text{positive}) - F(\text{negative})} \\
 &= \frac{98 - 63}{98 - 63} \\
 &= 1,000 \\
 N1_{\text{intonation}} &= \frac{F(\text{positive}) - \text{Criterion Value}}{F(\text{positive}) - F(\text{negative})} \\
 &= \frac{100 - 64}{100 - 61} \\
 &= 0,923 \\
 N1_{\text{English}} &= \frac{F(\text{positive}) - \text{Criterion Value}}{F(\text{positive}) - F(\text{negative})} \\
 &= \frac{97 - 87}{97 - 61} \\
 &= 0,278 \\
 N1_{\text{memorization}} &= \frac{F(\text{positive}) - \text{Criterion Value}}{F(\text{positive}) - F(\text{negative})} \\
 &= \frac{89 - 60}{89 - 60} \\
 &= 1,000 \\
 N1_{\text{test result}} &= \frac{F(\text{positive}) - \text{Criterion Value}}{F(\text{positive}) - F(\text{negative})} \\
 &= \frac{97 - 64}{97 - 62} \\
 &= 0,943
 \end{aligned}$$

Table 5. The Calculation Result of The Decision Matrix

Code	Name	K1	K2	K4	K4	K5
A1	Beybi Triana Halim	0,250	0,138	0,056	0,200	0,189
A2	Husnul Khatimah	0,000	0,019	0,200	0,110	0,051
A3	Nelly Handayani	0,250	0,069	0,072	0,166	0,046
A4	Elmira Deviana	0,057	0,092	0,033	0,200	0,103
A5	Bungarim Hasibuan	0,036	0,150	0,061	0,110	0,000
A6	Nova Lindawati Sembiring	0,122	0,096	0,000	0,000	0,131
A7	Sri Wahyu	0,129	0,015	0,017	0,062	0,006
A8	Nurmawati	0,043	0,092	0,011	0,028	0,057
A9	Yustina Marlina Br. Lubis	0,193	0,123	0,144	0,007	0,200
A10	Saodah	0,172	0,000	0,056	0,145	0,166

The calculation of the decision matrix is obtained by multiplying the normalization value by the preference weight, the calculation can be seen as follows:

$$\begin{aligned}
 MK1_{\text{verbal}} &= 1,000 * 0,25 \\
 &= 0,250 \\
 MK1_{\text{intonation}} &= 0,923 * 0,15 \\
 &= 0,138 \\
 MK1_{\text{English}} &= 0,278 * 0,20 \\
 &= 0,056
 \end{aligned}$$

$$\begin{aligned} MK1_{\text{memorization}} &= 1,000 * 0,20 \\ &= 0,200 \end{aligned}$$

$$\begin{aligned} MK1_{\text{test result}} &= 0,943 * 0,20 \\ &= 0,189 \end{aligned}$$

Table 6. Calculation Results of Utility Measures

Code	Name	S
A1	Beybi Triana Halim	0,833
A2	Husnul Khatimah	0,380
A3	Nelly Handayani	0,603
A4	Elmira Deviana	0,485
A5	Bungarim Hasibuan	0,357
A6	Nova Lindawati Sembiring	0,349
A7	Sri Wahyu	0,229
A8	Nurmawati	0,231
A9	Yustina Marlina Br. Lubis	0,667
A10	Saodah	0,539

The calculation of the utility measures value is obtained by adding up all the value of the decision matrix on the same alternative. The calculation can be seen as follows:

$$\begin{aligned} S1 &= 0,250 + 0,138 + 0,056 + 0,200 + 0,189 \\ &= 0,833 \\ S2 &= 0,000 + 0,019 + 0,200 + 0,110 + 0,051 \\ &= 0,380 \\ S3 &= 0,250 + 0,069 + 0,072 + 0,166 + 0,046 \\ &= 0,603 \\ S4 &= 0,057 + 0,092 + 0,033 + 0,200 + 0,103 \\ &= 0,485 \\ S5 &= 0,036 + 0,150 + 0,061 + 0,110 + 0,000 \\ &= 0,357 \\ S6 &= 0,122 + 0,096 + 0,000 + 0,000 + 0,131 \\ &= 0,349 \\ S7 &= 0,129 + 0,015 + 0,017 + 0,062 + 0,006 \\ &= 0,229 \\ S8 &= 0,043 + 0,092 + 0,011 + 0,028 + 0,057 \\ &= 0,231 \\ S9 &= 0,193 + 0,123 + 0,144 + 0,007 + 0,200 \\ &= 0,667 \\ S10 &= 0,172 + 0,000 + 0,056 + 0,145 + 0,166 \\ &= 0,539 \end{aligned}$$

Table 7. Calculation Results of Regret Measures

Code	Name	R
A1	Beybi Triana Halim	0,250
A2	Husnul Khatimah	0,200
A3	Nelly Handayani	0,250

A4	Elmira Deviana	0,200
A5	Bungarim Hasibuan	0,150
A6	Nova Lindawati Sembiring	0,131
A7	Sri Wahyu	0,129
A8	Nurmawati	0,092
A9	Yustina Marlina Br. Lubis	0,200
A10	Saodah	0,172

The calculation of regret measures value is obtained by calculating the maximum value of all decision matrix values on the same alternative. The calculation can be seen as follows:

$$\begin{aligned}
 R1 &= \max (0,250, 0,138, 0,056, 0,200, 0,189) \\
 &= 0,250 \\
 R2 &= \max (0,000, 0,019, 0,200, 0,110, 0,051) \\
 &= 0,200 \\
 R3 &= \max (0,250, 0,069, 0,072, 0,166, 0,046) \\
 &= 0,250 \\
 R4 &= \max (0,057, 0,092, 0,033, 0,200, 0,103) \\
 &= 0,200 \\
 R5 &= \max (0,036, 0,150, 0,061, 0,110, 0,000) \\
 &= 0,150 \\
 R6 &= \max (0,122, 0,096, 0,000, 0,000, 0,131) \\
 &= 0,131 \\
 R7 &= \max (0,129, 0,015, 0,017, 0,062, 0,006) \\
 &= 0,129 \\
 R8 &= \max (0,043, 0,092, 0,011, 0,028, 0,057) \\
 &= 0,092 \\
 R9 &= \max (0,193, 0,123, 0,144, 0,007, 0,200) \\
 &= 0,200 \\
 R10 &= \max (0,172, 0,000, 0,056, 0,145, 0,166) \\
 &= 0,172
 \end{aligned}$$

The next step is to determine the VIKOR index value, the calculation results can be seen as follows:

$$\begin{aligned}
 S+ &= \max (0,833, 0,380, 0,603, 0,485, 0,357, 0,349, 0,229, 0,231, 0,667, 0,539) \\
 &= 0,833 \\
 S- &= \min (0,833, 0,380, 0,603, 0,485, 0,357, 0,349, 0,229, 0,231, 0,667, 0,539) \\
 &= 0,229 \\
 R+ &= \max (0,250, 0,200, 0,250, 0,200, 0,150, 0,131, 0,129, 0,092, 0,200, 0,172) \\
 &= 0,250 \\
 R- &= \min (0,250, 0,200, 0,250, 0,200, 0,150, 0,131, 0,129, 0,092, 0,200, 0,172) \\
 &= 0,092
 \end{aligned}$$

Table 8. Result of Rank Calculation

Code	Name	Q
A1	Beybi Triana Halim	1,000
A2	Husnul Khatimah	0,467
A3	Nelly Handayani	0,810

A4	Elmira Deviana	0,554
A5	Bungarim Hasibuan	0,290
A6	Nova Lindawati Sembiring	0,223
A7	Sri Wahyu	0,117
A8	Nurmawati	0,002
A9	Yustina Marlina Br. Lubis	0,704
A10	Saodah	0,510

The following is an example of the ranking value calculation for all alternatives with codes A1 to A10.

$$\begin{aligned}
 Q1 &= \left(0,5 * \frac{(0,833-0,229)}{(0,833-0,229)} \right) + \left(0,5 * \frac{0,250-0,092}{0,250-0,092} \right) \\
 &= 1,000 \\
 Q2 &= \left(0,5 * \frac{(0,380-0,229)}{(0,833-0,229)} \right) + \left(0,5 * \frac{0,200-0,092}{0,250-0,092} \right) \\
 &= 0,467 \\
 Q3 &= \left(0,5 * \frac{(0,603-0,229)}{(0,833-0,229)} \right) + \left(0,5 * \frac{0,250-0,092}{0,250-0,092} \right) \\
 &= 0,810 \\
 Q4 &= \left(0,5 * \frac{(0,485-0,229)}{(0,833-0,229)} \right) + \left(0,5 * \frac{0,200-0,092}{0,250-0,092} \right) \\
 &= 0,554 \\
 Q5 &= \left(0,5 * \frac{(0,357-0,229)}{(0,833-0,229)} \right) + \left(0,5 * \frac{0,150-0,092}{0,250-0,092} \right) \\
 &= 0,290 \\
 Q6 &= \left(0,5 * \frac{(0,349-0,229)}{(0,833-0,229)} \right) + \left(0,5 * \frac{0,131-0,092}{0,250-0,092} \right) \\
 &= 0,223 \\
 Q7 &= \left(0,5 * \frac{(0,229-0,229)}{(0,833-0,229)} \right) + \left(0,5 * \frac{0,129-0,092}{0,250-0,092} \right) \\
 &= 0,117 \\
 Q8 &= \left(0,5 * \frac{(0,231-0,229)}{(0,833-0,229)} \right) + \left(0,5 * \frac{0,092-0,092}{0,250-0,092} \right) \\
 &= 0,002 \\
 Q9 &= \left(0,5 * \frac{(0,667-0,229)}{(0,833-0,229)} \right) + \left(0,5 * \frac{0,200-0,092}{0,250-0,092} \right) \\
 &= 0,704 \\
 Q10 &= \left(0,5 * \frac{(0,539-0,229)}{(0,833-0,229)} \right) + \left(0,5 * \frac{0,172-0,092}{0,250-0,092} \right) \\
 &= 0,510
 \end{aligned}$$

The ranking calculation result finds that the highest ranking value is obtained by alternative A8 with a value of 0.002 and the lowest ranking value is obtained by alternative A1 with a value of 1,000. The highest value is obtained by getting the lowest calculation value.

4. Conclusion

There are several conclusions obtained after conducting this research. The VIKOR method can determine prospective employees who are eligible to become call center staff. The criteria were obtained based on observations made by the researcher at PT. Telkom Akses Medan. The preference

weights were obtained based on the comparison of the criteria components used in the call center staff selection process. If the highest weight preference criterion obtains the highest score and the lowest weight preference criterion obtains the highest score, the employee passes. If the highest weight preference criterion obtains the highest score and the lowest weight preference criterion obtains the lowest score, the employee passes. If the highest weight preference criterion obtains the lowest score and the lowest weight preference criterion obtains the highest score, the employee does not pass. If the highest weight preference criterion obtains the lowest score and the lowest weight preference criterion obtains the lowest score, the employee does not pass

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