Redesigning Customer Satisfaction Measurement Instrument Using Multi-Criteria Decision Making Perspective

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Abstract. As an oil fuel distributor, Malang Oil Fuel Terminal should have some strategies in carrying out service activities to customers (gas stations / SPBU). Customer satisfaction is one of the goals of company to increase customer loyalty by fulfilling customer expectations. This study aims to re-design the instrument to measure customer satisfaction of Malang Oil Fuel Terminal. Re-designing the questionnaire conducted because the previous questionnaire was no longer relevant to the expectations of this company. The aims of this improvement to make the questions in the questionnaire more effective to evaluate customer satisfaction. The importance of questionnaire redesigning because the previous questionnaires did not accommodate system changes and consumer aspirations. A new questionnaire was created based on the aspirations of customer regarding important factors related to service quality at Malang Oil Fuel Terminal. From these factors can be used by Malang Oil Fuel Terminal to evaluate customer satisfaction regularly. This research was conducted by integrating the Delphi method and the Analytical Hierarchy Process (AHP). The criteria resulted in this study are factors that affect customer satisfaction and its importance level. The level of importance of these criteria are Tank Car 0.163; Tank Car Crew is 0.065; Oil Fuel (BBM) Delivery 0.559; and Malang Oil Fuel Terminal Services 0.212.

Introduction

Oil fuel has a significant value for the industrial and transportation sector in Indonesia. This condition shows the role of oil fuel as an important factor determining the basic needs price fluctuation. Seeing the important role of BBM in the life of the society, the government finally intervened in pricing and guarantee in availability to the community. Based on, [1] service quality can be defined as how far the difference between reality and customer expectations for the services they receive. Based on the description, it can be concluded that the quality of services is a focal point that is sought in a product or service to be able to fulfill customer desires and satisfaction in meeting their needs. In this study, the customer is defined as SPBU customer that purchase oil fuel BBM from Malang Oil Fuel Terminal. Malang Oil Fuel Terminal supply area encompasses 89 SPBU, 1 SPDN, and 2 TNI/POLRI gas station, include Kota Malang, Kabupaten Malang, Kota Batu, Blitar, Tulungagung. Malang Oil Fuel Terminal must have some strategies in carrying out its service activities to customers (SPBU), the existence of satisfaction from customers is the expectation of each company in order to increase customer loyalty and meet specification desired by customers.

This study aimed to redesign the customer satisfaction questionnaire that had been carried out by Malang Oil Fuel Terminal. Redesigning the customer satisfaction questionnaire was conducted because the questions in the previous questionnaire were less relevant to the expectations of Malang Oil Fuel Terminal. Less relevant in this case is based on the time the questionnaire was made for

overlong. The last improvement was carried out in 2015 while every year at PT Pertamina (Persero) development program was held for each Oil Fuel Terminal. This redesign process appears that Malang Oil Fuel Terminal wanted to accommodate customer aspirations. This reason was conveyed by the Supervisor of the Quality & Quantity Department of Malang Oil Fuel Terminal. In addition, the requirement for this questionnaire redesigned because the old questionnaire had not accommodated system changes and customer aspirations. Therefore, a new questionnaire based on the customers' urge will be made regarding what factors are important assessments related to the quality of service at Malang Oil Fuel Terminal. From these factors, it can then be used by Malang Oil Fuel Terminal regularly to evaluate customer satisfaction. The improvement of this questionnaire aims to make the questions in the questionnaire more effective in evaluating customer satisfaction.

This research was conducted at PT Pertamina (Persero) Malang Oil Fuel Terminal with the integration of the Delphi method and the Analytical hierarchy process (AHP). According to [2] Delphi method is defined as a structured method, interactive discussion groups, and decision-making processes with the aim of providing facilities for information exchange between expert panels to reach consensus on a topic. This method can be used as a means of brainstorming or exchanging information individually to get a group opinion. The reason for using the AHP method is to decompose complex decision problems and then classify the subject matter into an element in a particular hierarchy. At the same level of the hierarchy, paired matrix elements are compared (pairwise comparison) by including consideration of qualitative and quantitative factors [3]. Every year a customer satisfaction survey has been conducted on service performance in Malang Oil Fuel Terminal and to get the voice of customers who are more targeted and in accordance with customer expectations for service performance to customers in Malang Oil Fuel Terminal which can be a reference as a basis for improving customer service methods if needed. The researcher wanted to make improvements to the questionnaire that was already in use at PT Pertamina where the basis for its manufacture was based on ISO 9001.

Research Methodology
This study uses the integration of the Delphi and AHP methods, where the Delphi method is used to capture new criteria in accordance with consumer aspirations (SPBU). From the new criteria, synchronization with the existing criteria was carried out from the questionnaire measuring customer satisfaction belonging to the previous Malang Oil Fuel Terminal.

Delphi Method
Delphi method described by [3] as the method that generally used to solicit opinions from participants who are considered competent in their field. [4] used this method to collect the aspiration from hospital stakeholder in order to manage performance tools on the maintenance provider.

This Delphi method consists of two round on collecting data. In the first round of the Delphi questionnaire, it contains an empty table that aims to capture the customer aspirations regarding new criteria that are considered important. [4] These criteria will be analyze compared to the previous Malang Oil Fuel Terminal questionnaire in assessing customer satisfaction on the performance of PT Pertamina (Persero) Malang Oil Fuel Terminal in service to gas stations that purchase BBM / BBK products in Malang Oil Fuel Terminal. On the data collection stage, researchers used Google form as a questionnaire media where the link filling in questionnaires was distributed through WhatsApp groups that were coordinated by the supervisor of the company to facilitate the data retrieval process. As the criteria were collected, facilitator conducts a data analysis process to manage the new criteria. In the data processing, what is done is to reconcile the input criteria of the respondents included in the table to facilitate the identification of new criteria, then the elaboration process is carried out in this case where the process makes one input criteria from respondents who have the same understanding [5].

In the second round of Delphi questionnaire, it contains new criteria derived from the voices of respondents in the first round of Delphi which have gone through an elaboration stage which is then entered to get an assessment of the importance of these criteria for respondents where the assessment

uses a scale of numbers 1 to 10 and then criteria who have a score below 7.5 will be degraded and then for criteria that have a 7.5 and above will be included in the 3rd Delphi round.

Analytical Hierarchy Process (AHP) Method

After obtaining the total criteria for measuring customer satisfaction, then we determined the importance of each criteria using the AHP method. The software used to process AHP is Expert Choice 11. The basis for using the AHP method is to decompose complex decision problems and then classify the subject matter into an element in a particular hierarchy. At the same level of the hierarchy, paired matrix elements are compared (pairwise comparison) by including consideration of qualitative and quantitative factors.

The process of evaluating comparisons between elements and criteria bases the subjective considerations of decision-makers or evaluators. In this study, the person who in charge of decision making is the supervisor of Quality and Quantity in Malang Oil Fuel Terminal. This process can be documented and can be tested again for the consistency of the assessment. This evaluation process utilizes numbers/scales developed by [7] in [3]. This weighting scale reflects the level of preference/comparison of a decision element in its contribution to the achievement of a goal in the upper hierarchy [8].

Results and Analysis

This section describes the result of each step in data processing. The first method used in this study was Delphi method.

Delphi Method

The first round Delphi conducted by distributing the open answer question of the questionnaire [4]. The expected result of Delphi first round is the criteria suggested by each SPBU supervisor as respondent. The criteria collected from this process are 24 criteria. The result from the first round Delphi was elaborated into 10 criteria and its meaning. This elaboration was conducted in order to find similar meaning between each criteria suggested by respondents [6]. The result of elaborated criteria is shown in Table 1.

Table 1. Elaborated Criteria of Delphi 1st Round

No	Criteria	Description
1	Sociability	The sociability of Malang Oil Fuel Terminal when the problem occurred between Oil Fuel Terminal and SPBU
2	Tank Car Crew Service	Sociability and service of the Tank Car Crew is very necessary to be able to work together during the dismantling of BBM and no errors occur
3	Loses	The amount of lost BBM / BBK that exceeds the reasonable limit in the course of the distribution process from Oil Fuel Terminal to SPBU
4	Timeliness of delivery	Scheduling the oil fuel (BBM) delivery time to SPBU according to the request from the gas station (SPBU)
5	Administration of tank cars and crews	The valid status of tera letter and the identity of the crew clearly informed.
6	Variation of tank cars and crews	Variations in tank cars and tank crews sending to gas stations are more varied
7	The physical condition of tank cars	Rejuvenation of old tank cars
8	Tank car dose	The location of T1 and T2 corresponds to ijk bout and tera book (T1 = size of empty space on the tanker, T2 = size of the exact volume in the tanker).
9	Tank car safety	The top cover of the tank car (manhole) is given a seal to give more security to the BBM / BBK sent
10	Tank car crew attribute	Tank car crew wear the standard uniform.

In the second round Delphi, the respondents of this step were supervisors in the supply area Malang Oil Fuel Terminal who had filled out the criteria in the first round of Delphi. The questions in Delphi second round from suggested criteria from respondents that have been processed in the elaboration stage [4]. From these criteria a revision was made by the Malang Oil Fuel Terminal so that the criteria would be neutral without taking sides both Malang Oil Fuel Terminal and gas stations (SPBU). The purpose of this Delphi second round is to provide values from a scale of 1-10. A score of 1 means that it is very insignificant and 10 means very important to be included in the improvement of the upcoming questionnaire. The scoring result of Delphi second round is shown in Table 2.

Table 2. Criteria Score of Delphi Second Round

No	Criteria	Description	Average Score
1	Sociability	The sociability of Malang Oil Fuel Terminal when the problem occurred between Oil Fuel Terminal and SPBU	8,1
2	Tank Car Crew Service	Sociability and service of the Tank Car Crew is very necessary to be able to work together during the dismantling of BBM and no errors occur	8,10
3	Loses	The amount of lost BBM / BBK that exceeds the reasonable limit in the course of the distribution process from Oil Fuel Terminal to SPBU	8,05
4	Timeliness of delivery	Scheduling the oil fuel (BBM) delivery time to SPBU according to the request from the gas station (SPBU)	8,05
5	Administration of tank cars and crews	The valid status of tera letter and the identity of the crew clearly informed.	8,86
6	Variation of tank cars and crews	Variations in tank cars and tank crews sending to gas stations are more varied	8,10
7	The physical condition of tank cars	Rejuvenation of old tank cars	8,24
8	Tank car dose	The location of T1 and T2 corresponds to ijk bout and tera book (T1 = size of empty space on the tanker, T2 = size of the exact volume in the tanker).	8,43
9	Tank car safety	The top cover of the tank car (manhole) is given a seal to give more security to the BBM / BBK sent	9,14
10	Tank car crew attribute	Tank car crew wear the standard uniform.	7,81

From the data in Table2, the average score for each criterion is more than 7.5 or 75% of the forum. This 75% value is considered to represent the forum quota. So the criteria used as an additional reference to redesign the customer satisfaction questionnaire are 10 criteria. [3]

Criteria Synchronization

The synchronization stage is the step where comparing the criteria contained in the existing questionnaire with the new criteria derived from the customer aspiration in the first round of Delphi and has passed the assessment of importance on the second round of Delphi. This synchronization conducted in order to that the criteria have similarities between the questionnaires existing and new criteria will be taken that have a more general understanding and for new criteria that are not in the existing questionnaire will be included directly in improving the questionnaire. The criteria of existing criteria are shown in Table 3.

From the results of synchronization between existing criteria and new criteria that combine similar criteria with a more general understanding, two similar criteria can be obtained which can be combined. These criteria include the suitability of delivery time with Odi and friendliness in

overcoming problems that occur either on Oil Fuel Terminal or gas stations. Both of these criteria were previously listed in the existing Malang Oil Fuel Terminal questionnaire. After all, criteria are gathered, Malang Oil Fuel Terminal request some additional criteria in order to accommodate the improvement in ordering oil fuel (BBM). The additional criteria are shown in Table 4.

Table 3. Criteria in Existing Questionnaire

No.	Criteria
1	Tank car appearance
2	The convenience in operating equipment in a tank car
3	The readiness of equipment in tank car
4	The equipment accuracy in the tank car.
5	The tidiness of tank car crew
6	The attitude of the tank car crew
7	Tank car crew performing SOP on oil fuel (BBM) dismantling.
8	The tank car crew didn't ask for tips
9	The tank car crew did not sell the excess fuel in the tank car
10	Responsibility for tank car crew to solve the problem
11	Timeliness of fuel delivery to gas stations (SPBU)
12	The accuracy of the amount of fuel sent to gas stations
13	The accuracy of the quality of fuel sent to gas stations
14	Safety and security in the delivery of fuel to gas stations
15	Speed of response to complaints/complaints from gas stations
16	Customer satisfaction with the services provided by Malang Oil Fuel Terminal
17	The ease of making fuel delivery requests
18	Service of officers at Malang Oil Fuel Terminal
19	The sociability of officers at Malang Oil Fuel Terminal
20	Response to complaints from the gas station
21	The effectiveness of BBM delivery requests using the SMS system

Table 4. Additional Criteria

No	Criteria	Description
1	Application for BBM requests	Satisfaction with the fuel demand system using SMS
		The need for changes in the fuel demand system is more relevant to current developments and technology

Criteria Classification

This classification is the process of classifying criteria that have the same object of assessment. Each criterion is grouped into 4 main criteria, namely Tank Cars, Tank Car Crew, BBM Delivery, Malang Oil Fuel Terminal Services. The classification is described in Table 5.

Table 5. Criteria Classification

	Tank Car	Tank Car Crew
1	Tank car appearance	The tidiness of tank car crew
2	The convenience in operating equipment in a tank car	The attitude of the tank car crew
3	The readiness of equipment in tank car	Tank car crew performing SOP on oil fuel (BBM) dismantling
4	The equipment accuracy in the tank car.	The tank car crew didn't ask for tips
5	The valid status of tera letter and the identity of the crew clearly informed.	The tank car crew did not sell the excess fuel in the tank car
6	The physical condition of tank cars	Responsibility for tank car crew to solve the problem on oil fuel (BBM) dismantling
7	The volume of tank fill matches between the ijk bout and the T2	Tank car crew wear the standard uniform
8	Variation of tank cars and crews	Tank Car Crew Service
	Oil Fuel (BBM) Delivery	**Malang Oil Fuel Terminal Services**
1	Timeliness of fuel delivery to gas stations (SPBU) with Odi	Speed of response to complaints/complaints from gas stations
2	The accuracy of the amount of fuel sent to gas stations	Response to complaints from the gas station
3	The accuracy of the quality of fuel sent to gas stations	The sociability of Malang Oil Fuel Terminal when the problem occurred between TBBM and SPBU
4	Safety and security in the delivery of fuel to gas stations	Service of officers at Malang Oil Fuel Terminal
5	Transport loss that does not exceed the tolerance limit of 0.15%	Customer satisfaction with the services provided by Malang Oil Fuel Terminal
6	The condition of manhole seals and manifolds in MT is in good condition	The ease of making fuel delivery requests
7		Satisfaction with the fuel demand system using SMS
8		Effectiveness with the fuel demand system using SMS
9		The need for changes in the fuel demand system is more relevant to current developments and technology

Criteria Importance

Analytical Hierarchy Process (AHP) is used to perform determining the criteria importance of the customer satisfaction of services model. The tools that perform this method is Expert Choice 11. The steps in performing the AHP method are listed below :

1. Defining goals at the beginning of steps.
2. Input all criteria and sub-criteria.
3. Perform a pairwise comparison between each criterion and sub-criteria.
4. Calculate to define each criteria weight.
5. Check and analyze inconsistency ratio.

The result of criteria importance is shown in Table 6.

Table 6. Criteria Weight

No.	Criteria	Weight
	Tank Car	0,163
1	Tank car appearance	0,043
2	The convenience in operating equipment in a tank car	0.089
3	The readiness of equipment in tank car	0,067
4	The equipment accuracy in the tank car.	0,158
5	The valid status of tera letter and the identity of the crew clearly informed.	0,210
6	The physical condition of tank cars	0,076
7	The volume of tank fill matches between the ijk bout and the T2	0,327
8	Variation of tank cars and crews	0,030
	Tank Car Crew	0,065
9	The tidiness of tank car crew	0,035
10	The attitude of the tank car crew	0,074
11	Tank car crew performing SOP on oil fuel (BBM) dismantling	0,252
12	The tank car crew didn't ask for tips	0,083
13	The tank car crew did not sell the excess fuel in the tank car	0,109
14	Responsibility for tank car crew to solve the problem on oil fuel (BBM) dismantling	0,252
15	Tank car crew wear the standard uniform	0,037
16	The tidiness of tank car crew	0,158
	Oil Fuel (BBM) Delivery	0,559
17	Timeliness of fuel delivery to gas stations (SPBU) with Odi	0,163
18	The accuracy of the amount of fuel sent to gas stations	0,134
19	The accuracy of the quality of fuel sent to gas stations	0,091
20	Safety and security in the delivery of fuel to gas stations	0,163
21	Transport loss that does not exceed the tolerance limit of 0.15%	0,399
22	The condition of manhole seals and manifolds in MT is in good condition	0,50
	Malang Oil Fuel Terminal Services	0,212
23	Speed of response to complaints/complaints from gas stations	0,154
24	Response to complaints from the gas station	0,223
25	The sociability of Malang Oil Fuel Terminal when the problem occurred between TBBM and SPBU	0,081
26	Service of officers at Malang Oil Fuel Terminal	0,092
27	Customer satisfaction with the services provided by Malang Oil Fuel Terminal	0,092
28	The ease of making fuel delivery requests	0,200
29	Satisfaction with the fuel demand system using SMS	0,038
30	Effectiveness with the fuel demand system using SMS	0,038
31	The need for changes in the fuel demand system is more relevant to current developments and technology	0,80

From the criteria on the customer satisfaction questionnaire, the overall value of inconsistency ratio is 0.07. If the inconsistency value is below 0.1 then the criteria are reliable. From the criteria of the Tank Car determined inconsistency value of 0.08, from the criteria of Tank Car Crew obtained inconsistency values of the 0.05, from the criteria Oil Fuel Delivery obtained inconsistency value of the 0.04, from the criteria for Malang Oil Fuel Terminal Services obtained inconsistency value 0.09. Which means here all the criteria and sub-criteria are reliable.

Conclusions

From this research carried out the results of factors that influence customer satisfaction PT Pertamina (Persero) Malang Oil Fuel Terminal are Tank Car with the importance level of 0,163, Tank Car Crew with the importance level of 0,065, Oil Fuel (BBM) Delivery with the importance level of 0,559 and Malang Oil Fuel Terminal Services with the importance level of 0,212. After verification and validation process, the proposed redesign of the questionnaire is valid and relevant to be applied to the Malang Oil Fuel Terminal with changes accommodating the interests of the customer and the importance of the form of weight.

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