Analysis of Digitalization Service Quality of Fuel Petrol Station in Indonesia Using SERVQUAL Integrated BWM

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Abstract

Currently, the competition in the oil and gas retail industry especially fuel petrol station is very competitive and all of them improve the quality of service. This paper discusses research findings to analyze service quality at fuel petrol stations in Indonesia using the SERVQUAL integrated BWM. The aim is to determine the quality of service especially digitalization service at fuel petrol station in Jakarta, Indonesia. SERVQUAL dimension data were collected from several sources such as expertise, literature, corporate rules, and pertamina way. Data collection was carried out by distributing questionnaires according to the SERVQUAL rules and using the BWM approach. This study examines state-owned fuel petrol station companies located in Jakarta. In the first stage, service quality analysis was carried out with 5 dimensions of Servqual (Service Quality), after each value was obtained on servqual, the quality dimension was weighted using BWM (Best Worst Method). In addition, the weighting must be combine of criteria and subcriteria to be global. The results depends on score of consistency ratio. This study findings that dimension of "Mobile Application", "Network Speed", and "Interface Mobile App user friendly" require improvement so that service to the digitalization of fuel petrol stations increases. Although there are limitations in this study, the future study can be adopted in several service company and with others method such as AHP, WASPAS, etc.

Keywords
Oil and Gas Company, Fuel Petrol Station, SERVQUAL, BWM

1. Introduction
In the service sector, customer satisfaction is more subjective because it is more important than the production sector For this reason, customer satisfaction is an expression of feelings that arise due to differences between the customer's real experience and customer expectations from the service (Tumsekcali et al., 2021). Quality is the level of customer satisfaction and is explained through service quality indicators (Stefano et al., 2015). Measuring the level of service quality is measured through assessing customer perceptions. Providing the best quality of service and prioritizing the best customer satisfaction is the goal of the Company (Awasthi et al., 2011). One of the industries in the service sector is fuel petrol station services. In the current era of digitalization, one of the improvements in service at fuel petrol stations is by digitizing fuel petrol stations.

Referring to BPH Migas Regulation Number 06 of 2013 concerning the Use of Information Technology in the Distribution of Fuel Oil. Through the Minister of Energy and Mineral Resources Letter No. 2548/10/MEM.S/2018 dated March 22 2018, the Minister of Energy and Mineral Resources asked the Minister of BUMN to instruct Oil and Gas Company state owned to immediately implement the provisions of Presidential Decree No. 191 through digitization. As a follow-up on August 31, 2018, Oil and Gas Company state owned with ICT Company state owned joining BPH Migas also explained that the implementation of digitizing fuel petrol stations has three stages, namely installing ATG (Automatic Tank Gauge) for storage tanks, installing EDC (Electronic Data Capture) to change payments from previously cash to cashless and the last is installing video analytics or CCTV. (Closed Circuit Television) whose purpose is to record and record police vehicle numbers, so that it is hoped that subsidized fuel will be properly monitored.

Currently, digital transformation is one of the most important changes in a rapidly developing world, and the impact of changes in technology can be seen in almost all sectors (Buyukozkan et al., 2019). In managing fuel petrol station digitization services, it can have a direct impact on customer experience as well as operations. Research with the theme of service at fuel petrol stations generally discusses evaluating or improving the quality of fuel petrol station services which aims to improve service quality both the facilities provided, cleanliness, operator friendliness, and others. However, research on service quality specifically discussing the digitization of fuel petrol stations for customers has not been found to date. To avoid errors or gaps between perceptions, expectations, and reality between customers and companies, it is necessary to know the appropriate dimensions of digitalization service dimensions in the Analysis of evaluating the quality of digitalization services at fuel petrol stations.

As the newest MCDM method, the best-worst multi-criteria decision-making method (BWM) was proposed by Rezaei in 2015, which can obtain criteria and alternative weights against different criteria based on pairwise comparisons with fewer needs. compared data. Meanwhile, BWM can effectively correct inconsistencies originating from pairwise comparisons. In contrast to AHP, BWM uses a scale of 1-9 to perform pairwise comparisons. In addition, quite different from AHP, BWM only performs reference comparisons, meaning that it only needs to determine the preference of the best criterion over all other criteria and the preference of all criteria over the worst criterion by using a number between 1 and 9. This procedure is much easier, more accurate, and not excessive because it does not carry out secondary comparisons. However, qualitative human judgments (such as pairwise comparisons based on 1-9 scales by decision makers at BWM) are usually characterized by ambiguity and intangibility, and criterion information in the real world has the disadvantage of being unclear and uncertain. Therefore, BWM reference comparison can be carried out using fuzzy numbers other than sharp values in some practical problems, which may be more in line with the actual situation and can obtain more convincing ranking results. In this paper, BWM is extended to a fuzzy environment, and a fuzzy-based BWM is proposed where reference comparisons are executed using fuzzy comparison judgments.

1.1 Objectives
In the management of fuel petrol station digitization services, it can directly affect customer experience and operations. Research with the theme of service at fuel petrol stations generally discusses evaluating or improving the quality of fuel petrol station services which aims to improve service quality both the facilities provided, cleanliness, operator friendliness, and others. However, research on service quality specifically discussing the digitization of fuel petrol stations for customers has not been found to date. To improve and to finding out the quality of service to digitalization in fuel petrol stations using Service Quality (SERVQUAL) dimension integrated BWM.

2. Literature Review
Service Quality (SERVQUAL) is a research method discovered by Parasuraman, et al (1990) and is the the most commonly used method to be used as a research foundation. The Servqual model is to compare consumer perceptions of the actual service received (perceived service) to the actual service expected (expected service). If the reality is more than expected, then the service is said to be of good quality, and vice versa.

If when reality is the same as expectations, then the service is satisfactory. One of the most well-known, important, and widely used test methods for evaluating service quality is SERVQUAL (Pawitra & Tan, 2001). SERVQUAL is a valuable test method for determining and analyzing and measuring the gap between customer expectations and customer perceptions. SERVQUAL consists of various criteria and diagnostic methods that can determine the strengths and weaknesses of service providers and determine service quality by measuring the difference between expectations and perceived performance (Berry et al, 1988).

On the other hand, the SERVQUAL model is used in aviation to assess perceived service quality for baggage handling systems. The literature review provides a list of criteria per dimension of the SERVQUAL model. The best worst method (BWM) is used to calculate the weight of the criteria. The data for BWM is collected through a sample of passengers from different countries. It was found that 'reliability' was considered as the most important dimension followed by 'responsiveness'. The 'certainty' criterion is the third followed by 'real' and finally 'empathy' (Rezaei et al, 2018). In shipping company, BWM is used to identify that operational cost, navigation system, and environmental are important criterion in deploying autonomous vessels on the Arctic route and the priority for autonomous ships is the shore control center (SCC) (Munim et al, 2021). In education, performance measurement in higher education institutions (HEIs) using semi-structured interviews, expert panels, and questionnaires. The proposed method consists

of the Delphi fuzzy method (FDM) and the Best-Worst Method (BWM). FDM filters criteria taken from the literature, and BWM finds the relative weight of criteria and indicators. The findings show that "education" and "human capital" are the most important criteria. Furthermore, "number of patents and inventions", "teacher/student ratio", and "student satisfaction with teaching quality" are the most critical performance indicators (Petrudi et al, 2022). In Research and Development, measure R&D performance by considering various levels of importance of R&D actions, using a multi-criteria decision-making method called the Best Worst Method (BWM) to identify the weight (importance) of R&D actions and measures. the R&D performance of 50 high-tech SMEs in the Netherlands using data collected in a survey among SMEs and from R&D experts. The results show how to assign different weights (Salimi and Rezaei, 2018)

3. Methods and Data Collection

3.1 Respondents Relationship

To obtain a credible dimension from interviews, ideally 10 experts with good knowledge of the topic of discussion are needed (Blumberg, Cooper, & Schindler, 2005; Cohen & Crabtree, 2006). In addition, those who have at least 10 years of experience in the field. Respondents in this study are experts and practitioners in the fuel petrol station with at least 10 years experience in fuel petrol station operations and ICT (Information and Communication Technology). In this case, the respondent is influential in providing information and evaluating the research object so that this research can be carried out according to the best-worst method. The list of respondents involved in this study can be seen in the following Table 1.

Table 1. List of Respondents

Respondents	Organization	Division	Experience
1	*Fuel Retail Industry Area*	*Sales Area Manager II*	>15 years
2	*ICT Commercial*	*ICT Commercial Manager*	>15 years
3	*Commercial Fuel Retail*	*Sales Business Manager Wil. Pusat*	>10 years
4	*Commercial*	*VP Commercial*	>20 years
5	*Fuel Retail Industry Area*	*Sales Area Manager III*	>15 years
6	*Commercial Fuel Retail*	*Sales Business Manager Wil. Barat*	>10 years
7	*Commercial Fuel Retail*	*Sales Business Manager Wil. Selatan*	>10 years
8	*Marketing*	*Marketing Manager*	>10 years
9	*ICT Development*	*ICT Development Manager*	>10 years
10	*Marketing & Operation*	*VP M&O*	>20 years

3.2 Determination of Decision Criteria

The servqual scale consists of 2 (two) levels of criteria, namely level 1 criteria is the main criteria and level 2 criteria is a sub-criteria of supporting main criteria. Servqual which includes 5 (five) quality dimensions but there are several new sub-criteria dimension which contain Digitalization. Each dimension has a number of questions and levels of questions). The following is an explanation of the main dimensions above, namely:

1. Tangibles (measurable evidence), describes the physical facilities, equipment, and appearance of personnel and the presence of users.
2. Reliability, refers to the ability to provide the promised service accurately and reliably.
3. Responsiveness, namely the willingness to help customers and provide appropriate attention.
4. Assurance, is a polite and knowledgeable employee who gives a sense of trust and confidence.
5. Empathy, includes care and individual attention to users (Table 2).

Table 2. Servqual Dimension

Criteria	Sub-Criteria	Source
1. Tangible	1.1 The Physical Appearance of a Modern Fuel petrol station	(Pertamina Way, 2021)
	1.2 Fuel petrol station technology	*Expertise*
	1.3 Signs & service signs are clear & visually appealing	*Expertise*
	1.4 Important facilities (Toilet, Musholla, & Wind Water) are well maintained	(Pertamina Way, 2021).
	1.5 Supporting facilities (Store, Autocare, Tenant) are maintained	(Pertamina Way, 2021)
	1.6 Appearance of Working Staff	(Pertamina Way, 2021)
	1.7 Politeness / Friendliness	(Pertamina Way, 2021)
	1.8 Mobile Applications	*Expertise*
	1.9 Appearance of user-friendly applications	*Expertise*
2. Reliability	2.1 Availability of Fuel Products	(Pertamina Way, 2021)
	2.2 Important & supporting facilities can be used properly and there is no damage	(Pertamina Way, 2021)
	2.3 The worker shows & ensures that the fuel that is filled is appropriate and that the meter reading starts from 'zero'	(Pertamina Way, 2021)
	2.4 HSSE and Service certified workers	(Pertamina Way, 2021)
	2.5 Network Speed	*Expertise*
	2.6 Integrated Fuel & Non-Fuel Purchases in one application	*Expertise*
	2.7 Cashless / EDC / QRis tools	*Expertise*
3. Responsiveness	3.1 Service Speed	*Expertise*
	3.2 Always ready to help customers	*Expertise*
	3.3 The worker confirms the total price and the amount received to the customer	(Pertamina Way, 2021)
4. Assurance	4.1 Guarantee of Accuracy of Dosing and Quality of Fuel in accordance with the provisions of the relevant agency	(Pertamina Way, 2021)
	4.2 Customer Complaint available	(Pertamina Way, 2021)
	4.3 Handling customer complaints a maximum of 1x24 hours	(Pertamina Way, 2021)
	4.4 Ease of transaction	*Expertise*
5. Empathy	5.1 Smile. Regards. Say hello and offer the highest product BBM	(Pertamina Way, 2021)
	5.2 Refueling is carried out carefully to prevent spillage of fuel which can damage the vehicle	(Pertamina Way, 2021)
	5.3 Operates 24 hours	*Expertise*

3.3 Methods

The BWM method is a multi-criteria decision making method (Rezaei, 2015). The BWM method seeks and identifies the selection of the best and worst criteria and compares these criteria with other criteria (Mou et al., 2016). The results of the weighting of the BWM method are stated to be better and consistent than those obtained by the AHP method (Rezaei, 2015). Several researchers (Kumar et al., 2020; Omrani et al., 2020;Yadav et al., 2020) have recently studied this method for calculating weights in various fields. Kavus et al (2022) evaluated service quality with three new servqual levels (Table 3).

Table 3. Score of BWM

Score	Information
1	Equally important/according to
2	Being between equally important and quite important
3	Pretty important than
4	Between quite important and important

5	Important than
6	Between important and very important
7	Very important than
8	Being in between is very important and very important
9	Very very important / very appropriate than

Here are the steps to get the weight of the criteria with BWM :
1. Determine the criteria ((1.1, 1.2, …, Cn) to be analyzed through a literature review or discussion with experts
2. Determine the best/most important criteria (best) and the worst/least important criteria (worst)
3. Determine the preference value of the best criteria against other criteria using a scale of 1 to 9. In vector form, the results of giving the best criteria preference values against other criteria are as follows: $A_B = (a_{B1}, a_{B2}, ..., a_{Bn})$ where a_{Bj} represents the preference value criterion best B against criterion j
4. Determine the preference value of the other criteria against the worst criterion using a scale of 1 to 9. In vector form, the result of assigning this preference value is as $A_W = (a_{1W}, a_{2W}, ..., a_{nW})^T$, where a_{jW} represents the preference value of criterion j against worst W criterion
5. Find the weight for each criterion $(w_1^*, w_2^*, ..., w_n^*)$

After that, there are equation to get weighted $(w_1^*, w_2^*, ..., w_n^*)$ and consistency ratio (ξ^{L^*})

4. Results and Discussion

The results show that points 8, 14, and 9 have the highest weight, namely the criteria for "Mobile Application", "Network Speed", and "Interface Mobile App user friendly". This shows that these three criteria require improvement so that service to the digitalization of fuel petrol stations increases (Table 4 – Table 9).

Table 4. Ranking Score of Best Criteria to other

Respondents	Best Criteria	1	2	3	4	5
1	1	1	7	5	7	3
2	5	8	5	4	2	1
3	2	2	1	7	9	4
4	4	2	3	9	1	6
5	3	9	2	1	8	3
6	3	4	3	1	2	9
7	3	8	7	1	5	6
8	2	2	1	4	7	5
9	1	1	8	7	3	2
10	2	2	3	4	3	6
11	5	4	5	7	7	1
12	5	8	9	6	4	1
13	4	6	8	5	1	3
14	2	7	1	5	6	9
15	3	2	3	1	6	8

Table 5. Ranking Score of Worst Criteria to other

Respondents	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Worst Criteria	5	2	1	3	5	1	4	1	5	1	4	2	3	1	1
1	7	2	1	3	7	1	8	1	2	1	3	8	7	1	1
2	5	1	3	9	8	4	2	8	2	2	4	1	8	2	2
3	3	6	2	1	9	9	7	7	3	3	9	7	1	8	3

4	5	8	4	4	2	8	1	6	4	7	1	3	6	4	7
5	1	4	9	8	1	2	8	5	1	2	2	8	5	5	2

Because the total criteria and sub-criteria exceed 9 or multi-criteria and sub-criteria, it is necessary to calculate global weighting (Rezaei, 2016).

Table 6. Criteria Ranking of First Respondent (Sample)

Weights	Tangible	Reliability	Responsiveness	Assurance	Empathy
	0,1294	0,0506	0,1109	0,1941	0,5148

Ksi*	0,2616

Table 7. Sub-Criteria Ranking of First Respondent (Sample)

Weights	Well-Maintained Physical Appearance and Modern	Technology	Service promotion signs and materials are clear and attractive	Important facilities (Toilet and Musholla) Well maintained	Supporting facilities (Store, Autocare, Tenant) Well maintained	Appearance of Worker Staff	Politeness/ Friendliness	Mobile Application	Interface Mobile App user friendly
	0,0983	0,0702	0,0983	0,2988	0,1639	0,0546	0,0819	0,0983	0,0353

Ksi*	0,1928

Consisteny Ratio (CR) : $\dfrac{\xi}{Consistency\ Index}$

CR values close to 0 are more consistent and reliable.
By using the best worst method software, the weighting results and CR values are obtained as follows:
Provisions for the maximum limit of CR values (Liang et al, 2020)
From the results of the weighting of each criterion, the global CR for the first respondent is attached:

Table 8. Global CR First Respondent (Sample)

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
CR	0,157	0,071	0,057	0,099	0,071	0,150	0,134	0,293	0,232	0,155	0,089	0,071	0,150
Batas CR	0,475	0,475	0,475	0,475	0,475	0,475	0,475	0,475	0,456	0,423	0,475	0,475	0,475

Table 9. Continuous Global CR First Respondent (Sample)

14	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**Average**
0,257	0,180	0,099	0,150	0,089	0,184	0,193	0,057	0,180	0,071	0,150	0,099	0,180	**0,137**

0,475	0,456	0,475	0,475	0,475	0,475	0,475	0,475	0,456	0,475	0,475	0,475	0,456	**0,468**

5. Conclusion

After doing all the calculations on the Global CR and global weighting for all respondents, it was found that the Verification and weighting were still below the CR threshold. The results show that points 8, 14, and 9 have the highest weight, namely the criteria for "Mobile Application", "Network Speed", and "Interface Mobile App user friendly". This shows that these three criteria require improvement so that service to the digitalization of fuel petrol stations increases.

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