

Design and Development of a Service Quality Measurement System Using the SERVQUAL Method : A Case Study of PT Karya Mandiri Engineering

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Abstract

Service quality plays a critical role in shaping corporate image, operational sustainability, and customer satisfaction. This study examines service quality management at PT. Karya Mandiri Engineering, an engineering services and mechanical contracting company that has experienced notable fluctuations in operational activities over recent years, indicating instability in service performance. The study adopts the SERVQUAL method to measure gaps between customer expectations and perceptions across key service quality dimensions. The results show negative gap values in the dimensions of Reliability, Empathy, and Responsiveness, which are generally categorized as satisfactory. However, several service attributes remain in the fairly satisfied category, with one attribute showing a significantly large gap that indicates a priority area for improvement. These findings suggest that while certain service dimensions have met customer expectations, others require structured corrective actions. Based on the analysis, the study proposes the design of a web-based information system to monitor service performance and systematically evaluate service quality gaps. The proposed system is expected to support managerial decision-making, enhance service consistency, and contribute to more sustainable service quality management.

Keywords: Service Quality; Gap Analysis; Customer Satisfaction

1. Introduction

Service quality is a strategic factor that determines the sustainability of service-based companies in an increasingly competitive and dynamic business environment. High-quality service not only fulfills customer needs but also serves as a source of sustainable competitive advantage. Numerous empirical studies confirm that service quality has a significant relationship with customer satisfaction, loyalty, and long-term business performance [1].

Conceptually, service quality is defined as the degree of conformity between customer expectations prior to receiving a service and customer perceptions of the actual service performance. When perceived service falls below expectations, dissatisfaction occurs; conversely, when perceptions meet or exceed expectations, customer satisfaction is achieved [2]. Service quality is commonly measured using the SERVQUAL model, which consists of five dimensions: tangibles, reliability, responsiveness, assurance, and empathy.

In practice, many service companies face challenges in conducting objective and continuous service quality assessments. Manual and non-integrated measurement processes often result in poorly documented evaluations, limited longitudinal analysis, and weak support for strategic decision-making. Recent studies emphasize that information technology-based service quality measurement systems can enhance evaluation accuracy and support continuous service improvement [3].

PT. Karya Mandiri Engineering is an engineering services and mechanical contracting company specializing in industrial boiler maintenance. Internal data from 2020 to 2024 indicate significant fluctuations in service activities, suggesting instability in service performance and potential weaknesses in service quality management. This condition is further exacerbated in the post-pandemic period, where customer expectations regarding reliability, responsiveness, and assurance have increased.

To address these challenges, a structured service quality information system is required to systematically measure, analyze, and monitor service performance. The SERVQUAL method is adopted due to its strong theoretical foundation, extensive empirical validation across service sectors, and its ability to identify service quality gaps at the attribute level, thereby facilitating improvement prioritization [4]. Integrating SERVQUAL into a web-based information system is expected to support data-driven decision-making and enhance sustainable service quality management.

2. Literature Review

2.1. Service Quality

Service quality is defined as the level of excellence delivered by a company to meet or exceed customer expectations. It reflects the firm's ability to satisfy customer needs and align service performance with customer expectations [1]. Service quality is perceived as high when the service performance matches or surpasses what customers expect, while service quality is considered low when performance falls below expectations, leading to customer dissatisfaction [5].

2.2. SERVQUAL Method

The SERVQUAL method was developed by Parasuraman, Zeithaml, and Berry to measure service quality by identifying the gap between customer expectations and perceptions of service performance. This method emphasizes that service quality is determined by comparing perceived service (performance) with expected service. The SERVQUAL gap model consists of five gaps that help organizations identify weaknesses in service delivery and improve service quality systematically.

Reducing this gap enables companies to improve service quality, enhance customer satisfaction, and strengthen competitiveness [7]. Initially, service quality was measured using ten dimensions; however, these were later refined into five core dimensions: Tangibles, Reliability, Responsiveness, Assurance, and Empathy [2]. These dimensions provide a comprehensive framework for evaluating service performance and understanding customer perceptions.

2.3. Validity, Reliability, and Likert Scale

To ensure data accuracy, validity testing is commonly conducted using Pearson Product Moment correlation, while reliability is measured using Cronbach's Alpha to confirm internal consistency. Data collection in service quality research frequently employs the Likert scale, which allows respondents to express levels of satisfaction ranging from very satisfied to very dissatisfied. This scale is widely applied in customer satisfaction and service performance studies due to its simplicity and reliability [2].

2.4. Supporting Systems and Testing

Web-based service quality evaluation systems are commonly developed using tools such as XAMPP, Composer, and the Laravel framework. Laravel's MVC architecture improves system maintainability by separating business logic, presentation, and data management [7]. System functionality is typically validated using black-box testing to ensure that system features operate according to functional requirements without analyzing internal code structures [8].

3. Methodology

3.1. Research Design

This study employed a quantitative research approach using the SERVQUAL method to measure the gap between customer expectations and perceptions of service quality. In addition, system development employs a linear SDLC approach, in which each phase must be completed sequentially without returning to previous stages. The model representing this approach is the Waterfall Model, as illustrated in Figure 1.

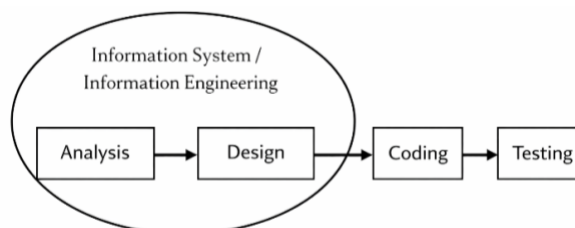


Fig. 1: SDLC Waterfall Model

3.2. Data Collection

Primary data were obtained through questionnaires and interviews. Interviews with company management were conducted to identify service quality issues and operational conditions. Customer perceptions and expectations were collected using a structured questionnaire based on the five SERVQUAL dimensions [2]. All questionnaire items were measured using a five-point Likert scale. In Table 1 the researcher lists statements from the Expectation Questionnaire and Perception Questionnaire for each of the 5 dimensions of service quality using the ServQual method. Each dimension will be given 4 statements.

Table 1: Expectation Questionnaire

No	Questions	r _{count}	No Attribute	Point
1	Employees are expected to use safe equipment while working		P1	
2	Employees are expected to always be present and ready when needed		P2	
3	Work equipment is expected to be complete and always ready to use	Tangibles	P3	
4	Employees are expected to always pay attention to the cleanliness and comfort of the work environment		P4	
5	Company is expected to provide services that meet customer requests	Reability	P5	
6	Employees are expected to be reliable in carrying out the tasks assigned		P6	

7	Employees are expected to be able to complete work on time		P7
8	Employees are expected to be able to complete tasks without making mistakes		P8
9	Employees are expected to be responsive to work issues		P9
10	Company is expected to convey important information quickly	Responsiveness	P10
11	Employees are expected to be responsive in providing assistance when requested		P11
12	Employees are able to provide solution quickly		P12
13	Employees are expected not to be careless at work		P13
14	Employees are expected to have the required knowledge and skills	Assurance	P14
15	Company is expected to provide information on the results of their work		P15
16	Company is expected to evaluate every job		P16
17	Company is expected to give total attention to customers		P17
18	Company is expected to care about feedback given by customers	Empathy	P18
19	Employees are expected to leave a good impression on customers		P19
20	The company and employees uphold the values of politeness and good manners		P20

Table 2: Perception Questionnaire

No	Questions	r _{count}	No Attribute	Point
1	Employees use safe equipment while working		P1	
2	Employees are always be present and ready when needed	Tangibles	P2	
3	Completeness and readiness of work equipment		P3	
4	Employees always pay attention to the cleanliness and comfort of the work environment		P4	
5	The company provides services according to customer requests		P5	
6	Employees reliability to carry out assigned tasks	Reability	P6	
7	Employees complete work on time		P7	
8	Employees complete the tasks without making mistakes		P8	
9	Employees responsiveness to work issues		P9	
10	Company convey important information quickly	Responsiveness	P10	
11	Employees responsive in providing assistance when requested		P11	
12	Employees able to provide solution quickly		P12	
13	Employees not careless at work		P13	
14	Employees have the required knowledge and skills	Assurance	P14	
15	Company provides information on the results of their work		P15	
16	Company evaluates every job		P16	
17	Company gives total attention to customers		P17	
18	Company cares about feedback given by customers	Empathy	P18	
19	Employees are expected to leave a good impression on customers		P19	
20	The company and employees uphold the values of politeness and good manners		P20	

3.3. Population and Sample

The population in this research is all customers of the companies listed in the data. This includes all respondents who provided feedback regarding their expectations and perceptions of PT services or products. Karya Mandiri Engineering. A sample is a subset of a population taken for further analysis. In this research, samples were determined using the Slovin formula with a 10% margin of error, resulting in 100 respondents, which were selected from multiple client companies.

The Likert scale is a measurement tool that is often used in surveys or questionnaires to measure respondents' attitudes, opinions or perceptions of a particular statement by providing tiered answer choices from very negative to very positive. Response levels to use:

Table 3: Response Levels

Value	Description
1	Very Dissatisfied
2	Dissatisfied
3	Neutral
4	Satisfied
5	Very Satisfied

3.4. Instrument Testing

The questionnaire instruments were tested for validity and reliability using the Pearson Product Moment correlation and Cronbach's Alpha. Only valid and reliable items were used for further analysis to ensure data consistency and accuracy [3]

3.5. Service Quality Analysis

After collecting data through questionnaire distribution, customer expectations and perceptions of service quality at PT. Karya Mandiri Engineering were identified. The SERVQUAL analysis was conducted by summing the perception scores (X) and expectation scores (Y) for each service attribute across all respondents, followed by calculating their average values. The SERVQUAL calculation procedure is described as follows:

1. Calculating the total perception scores (Xi) and expectation scores (Yi) for each service attribute.
2. Calculating the average perception score (\bar{X}) and average expectation score (\bar{Y}), obtained from the total perception and expectation scores of all respondents.
3. Calculating the GAP score between the average perception and expectation scores.
Calculating the average GAP score for each variable.

4. Summing the GAP scores for each SERVQUAL dimension to determine the difference between customer perceptions and expectations, which serves as the basis for evaluating service quality and identifying improvement priorities. The interpretation criteria are as follows:
 Perception > Expectation → Maintain
 Perception < Expectation → Improve
 Perception = Expectation → Enhance
5. Based on the calculated GAP between perception and expectation scores, the overall service quality level is measured to determine customer satisfaction at PT. Karya Mandiri Engineering. Referring to expert perspectives on service quality assessment, the service quality index is calculated using the following formula:

$$Q = \frac{P}{E} \tag{1}$$

Table 4: Service Quality Levels

Category	Score
Very Dissatisfied	$Q < 0.20$
Dissatisfied	$0.20 \leq Q < 0.40$
Neutral	$0.40 \leq Q < 0.60$
Satisfied	$0.60 \leq Q < 0.80$
Very Satisfied	$0.80 \leq Q \leq 1.00$

3.6. Flowchart System

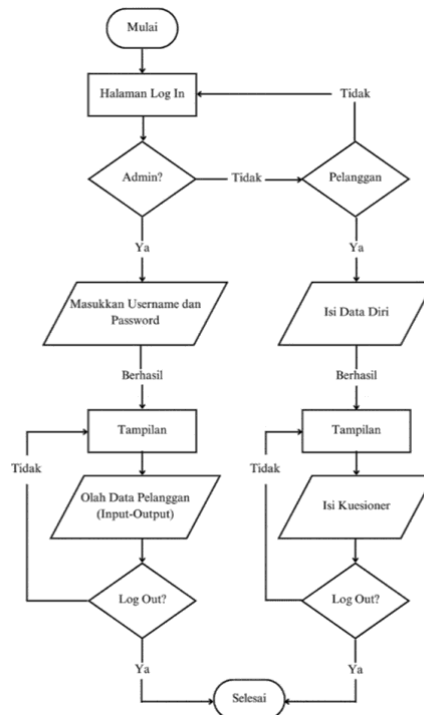


Fig. 2: System Flowchart

4. Analysis

4.1. System Analysis

At this stage, the GAP between customer perceptions and expectations is identified to determine the level of customer satisfaction and to establish service improvement priorities. Each questionnaire item was subjected to a validity test to determine whether the item was valid or invalid. The validity testing was conducted based on the following decision criteria:

1. The calculated correlation coefficient (r_{count}) is compared with the critical value determined using the degrees of freedom formula $df = (n - 2)$ at a significance level of 5% (0.05), where $df = (100-2) = 98$
2. If $r_{count} > r_{table}$, the questionnaire item is considered valid.
3. If $r_{count} < r_{table}$, the questionnaire item is considered invalid.

To determine the value of r_{table} , the first step is to identify the critical value of the t-distribution with $df = 98$. Based on this distribution, the obtained t-table value is 1.966. Then the results of Expectation and Perception Validity for each attribute are presented in below:

Table 5: Validity Result

No	No Attribute	r_{count}		r_{table}	Validity
		Expectation	Perception		
1	P1	0,2978	0,4432	0,1966	Valid
2	P2	0,2830	0,3345	0,1966	Valid
3	P3	0,3699	0,3891	0,1966	Valid

4	P4	0,5798	0,4467	0,1966	Valid
5	P5	0,2527	0,4592	0,1966	Valid
6	P6	0,3497	0,2052	0,1966	Valid
7	P7	0,7041	0,5766	0,1966	Valid
8	P8	0,4585	0,3841	0,1966	Valid
9	P9	0,3453	0,5233	0,1966	Valid
10	P10	0,4296	0,6439	0,1966	Valid
11	P11	0,5698	0,5812	0,1966	Valid
12	P12	0,5934	0,5777	0,1966	Valid
13	P13	0,5078	0,5564	0,1966	Valid
14	P14	0,4991	0,6268	0,1966	Valid
15	P15	0,5340	0,2712	0,1966	Valid
16	P16	0,3513	0,4035	0,1966	Valid
17	P17	0,2696	0,3634	0,1966	Valid
18	P18	0,4158	0,5039	0,1966	Valid
19	P19	0,4972	0,4741	0,1966	Valid
20	P20	0,4209	0,1992	0,1966	Valid

The results of the validity and reliability tests on the Expectation and Perception data are valid because $r_{count} > r_{table}$ so that all values are declared to have a correlation with all question items.

Reliability testing is testing carried out to determine the level of consistency or reliability of a research instrument (such as a questionnaire). This means whether the questionnaire will give the same results if used repeatedly under the same conditions. If the Cronbach's Alpha value obtained is greater than 0.60, then the research instrument or question items can be said to be reliable or have a good level of consistency.

The reliability test results indicate that the Perception and Expectation data are reliable when calculated using the same formula.

Table 6: Reliability Result

No	Variables	Cronbach's Alpha	r _{critical}	Category
1	Expectation	0,7907	0,60	Reliable
2	Perception	0,7745	0,60	Reliable

5. Result

The results of the validity and reliability tests on the Expectation and Perception data are valid because $r_{count} > r_{table}$ so that all values are declared to have a correlation with all question items.

Reliability testing is testing carried out to determine the level of consistency or reliability of a research instrument (such as a questionnaire).

Table 7: Service Quality Levels

No	No Attribute	Result				Category
		Expectation	Perception	GAP	Q = P/E	
1	P1	3.28	3.85	0.57	1,17	Very Satisfied
2	P2	3.92	3.53	-0.39	0,90	Satisfied
3	P3	3.86	3.33	-0.53	1,11	Very Satisfied
4	P4	3.63	4.03	0.4	0,86	Satisfied
5	P5	3.87	2.91	-0.96	1,17	Very Satisfied
6	P6	3.86	3.11	-0.75	0,78	Neutral
7	P7	3.96	3.08	-0.88	0,81	Satisfied
8	P8	3.22	3.76	0.54	0,75	Neutral
9	P9	3.14	3.65	0.51	1,16	Very Satisfied
10	P10	3.83	3.14	-0.69	1,16	Very Satisfied
11	P11	3.77	2.94	-0.83	0,78	Neutral
12	P12	3.34	3.86	0.52	0,82	Satisfied
13	P13	3.31	3.94	0.63	1,19	Very Satisfied
14	P14	3.4	3.98	0.58	1,17	Very Satisfied
15	P15	3.88	3.01	-0.87	0,78	Neutral
16	P16	3.08	3.75	0.67	1,22	Very Satisfied
17	P17	3.26	3.85	0.59	1,18	Very Satisfied
18	P18	3.7	2.98	-0.72	0,81	Satisfied
19	P19	3.77	3.03	-0.74	0,80	Satisfied
20	P20	3.7	2.83	-0.87	0,76	Neutral

Based on the calculation results in Table 4.8, category values were obtained using the formula $Q = P/E$, which describes the respondent's level of satisfaction with each attribute of questions P1 to P20. Based on the results of this analysis, it can be concluded that the attributes P1, P3, P5, P9, P10, P13, P14, P16, and P17 have a value of ≥ 1 , which indicates that customers are very satisfied with the quality of service in the "Very Satisfied" category. Thus, the quality of service for these attributes is good and needs to be maintained or continuously improved to maintain consistent customer satisfaction. Furthermore, attributes P2, P4, P7, P12, P18, and P19 obtained a value of ≥ 0.80 ,

which is included in the "Satisfied" category. This indicates that customers are satisfied with the quality of service provided, but it is still recommended that continuous evaluation and improvement be carried out to maintain this level of satisfaction. Meanwhile, attributes P6, P8, P11, P15, and P20 have a value of ≥ 0.60 , which is categorized in the "Quite Satisfied" category. This condition shows that there are still aspects of service that need to be improved in order to be able to meet customer expectations optimally. Therefore, it is necessary to improve service quality, especially to provide a better, more comfortable experience and in line with customer expectations.

Table 8: Service Quality GAP Result

No	Dimensions	Result				
		Expectation	Perception	GAP	Q = P/E	Category
1	Tangibles	3,67	3,69	0.01	1,00	Very Satisfied
2	Reability	3,73	3,22	-0.51	0,86	Satisfied
3	Responsiveness	3,52	3,40	-0.12	0,97	Satisfied
4	Assurance	3,42	3,67	0.25	1,07	Very Satisfied
5	Empathy	3,61	3,17	-0.44	0,88	Satisfied

The results of the analysis show that the level of customer satisfaction with service quality at PT. Mandiri Engineering's work varies in each dimension. The Tangibles and Assurance dimensions are included in the "Very Satisfied" category with a service quality calculation value of ≥ 1 , which indicates that customers are very satisfied with the services provided so they need to be maintained. Furthermore, the dimensions of Reability, Responsiveness and Empathy are in the "Satisfied" category, with a service quality calculation value of ≥ 0.80 . This shows that customers are satisfied with the service they receive, so quality in this dimension also needs to be maintained but it is still recommended that continuous evaluation and improvement be carried out.



Fig. 3: Log In Page

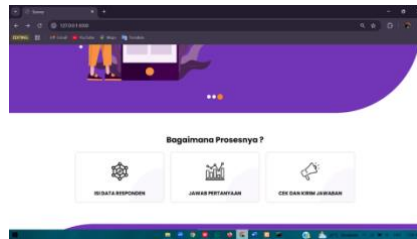


Fig. 4: Main Page

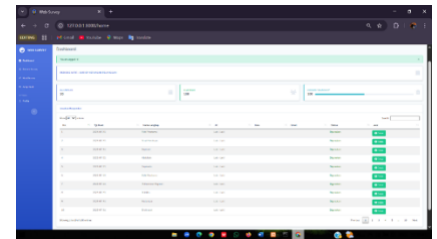


Fig. 5: Dashboard Page

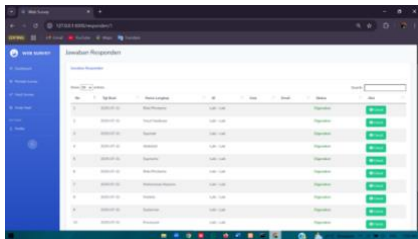


Fig. 6: Survey Period Page

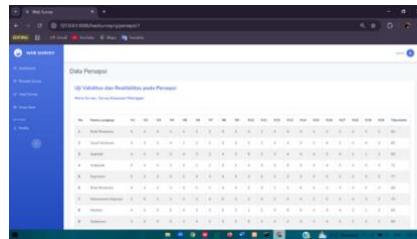


Fig. 7: Calculation Result

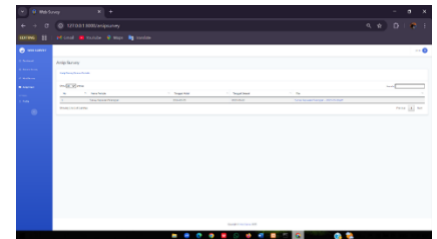


Fig. 8: Result Archive

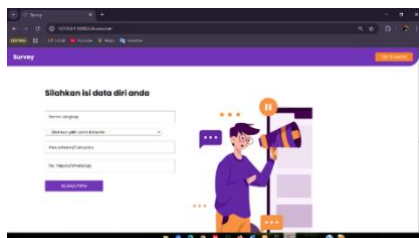


Fig. 9: Customer Login Page

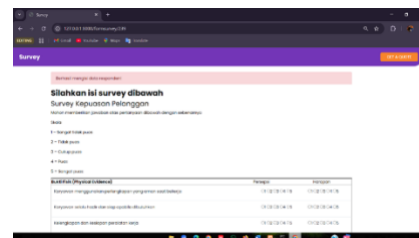


Fig. 10: Survey Page

6. Conclusion

The Reliability dimension with a GAP value of -0.5125 , the Empathy dimension with a GAP value of -0.435 , and the Responsiveness dimension with a GAP value of -0.1225 —fall within the "Satisfied" category. Nevertheless, several attributes within these dimensions are classified as "Fairly Satisfied", indicating the need for significant improvement. One notable example is attribute P8, which has a GAP value of -0.96 , approaching the critical threshold of -1 , along with other attributes prioritized for improvement. These findings suggest that PT. Karya Mandiri Engineering should maintain its strengths in dimensions that already demonstrate strong performance while implementing improvements in aspects that still require enhancement. Such efforts are expected to align service delivery more closely with customer expectations, thereby increasing overall customer satisfaction and comfort with the service quality provided. This study

demonstrates that the application of the Service Quality (SERVQUAL) method is valid and effective for evaluating customer satisfaction levels at PT. Karya Mandiri Engineering. The analysis of customer satisfaction using this method is capable of producing accurate and reliable data, making it a suitable tool for assessing service quality performance.

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