Available online at: http://publikasi.mercubuana.ac.id/index.php/ijiem

IJIEM (Indonesian Journal of Industrial Engineering & Management)

ISSN (Print) : 2614-7327 ISSN (Online) : 2745-9063

Improving Citizen Satisfaction in Dukuh Menanggal: A Six Sigma-Based Quality Enchancehement Strategy

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ARTICLE INFORMATION

Article history:

Received: 31 August 2023
Revised: 11 September 2023
Accepted: 13 December 2023

Category: Research paper

Keywords:
Quality of services
Six sigma
Public services
Quality improvements

DOI: 10.22441/ijiem.v5i2.22872

A B S T R A C T

This study aims to identify the service quality in Dukuh Menanggal Subdistrict, Surabaya City, explicitly focusing on population registration, correspondence, and social assistance management. The Six Sigma method is employed to initiate improvements in public services. Six Sigma is a quality management system that emphasizes customer satisfaction by measuring the Sigma Quality Level. The analysis is conducted through the DMAIC framework (define, measure, analyze, improve, and control). Data is collected by distributing questionnaires to members of the community who are users of public services in the Subdistrict. The research findings are expected to assist Dukuh Menanggal Subdistrict in considering the proposed improvements put forth by the researchers as initial steps toward better service provision. By implementing the Six Sigma approach, the Subdistrict can enhance service quality, resulting in increased satisfaction and trust among the public regarding the provided public services. This study provides valuable insights into applying the Six Sigma methodology in local governance and its potential to improve service quality, ultimately benefiting the community and the local administration.

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1. INTRODUCTION

The quality of service an institution provides is considered highly important in delivering services to customers (the public). Government officials carry out public service about population administration. According to the Decree of the Minister of Administrative and Bureaucratic Reform No. 63/KEP/M.PAN/7/2003 Regarding the General Guidelines for Public Service Management, public service aims to fulfill the needs of service recipients and ensure compliance with applicable laws and regulations (Kementerian Pendayagunaan Aparatur Negara, 2017). Considering the diverse nature of public service units, conducting public satisfaction surveys is necessary to obtain a national public service index. Customer satisfaction is a crucial indicator in determining the success of public service provision. Based on the Minister of Administrative and Bureaucratic Reform Decree No. 63 of 2003 regarding the general guidelines for public service management, including service procedures, service

requirements, the capability of service personnel, and service schedule certainty, the government has the responsibility to enhance services in the public service sector (Kementerian Pendayagunaan Aparatur Negara, 2017). Dukuh Menanggal Sub-district has taken various steps to improve the performance of its employees, one of which is through the implementation of Standard Operating Procedures aimed at replacing the old system that was deemed to hinder service to the community (Pemerintah Kota Surabaya, 2019).

2. LITERATURE REVIEW

Six Sigma is a quality management system focusing on customer satisfaction by measuring Sigma quality levels (Linderman et al., 2003). This method employs an analytical framework called DMAIC, which stands for Define, Measure, Analyze, Improve, and Control. This method aims to minimize variations toward perfection and zero defects (Basjir et al., 2024). Previous research on service quality using the Servqual-Six Sigma method stated that utilizing the Six Sigma method can enhance or measure service quality (Azizah & Rinaldi, 2022; Sutrisno et al., 2022). After identifying the core issues, improvements are made to enhance services to meet and exceed established standards (Herlambang, 2020). Several studies that utilize the Servqual and Six Sigma methods to enhance service quality in public services, suggest that the Servqual method will be integrated with the Six Sigma method to identify priority improvement attributes. Meanwhile, QFD provides improvement recommendations (Trimarjoko et al., 2020). Efforts for improvement to enhance the level of service quality in Dukuh Menanggal Sub-district, in this study, utilize the Six Sigma method. This research is expected to provide recommendations for Dukuh Menanggal Sub-district to improve its service quality, allowing the community to feel satisfied by receiving the expected value. Six Sigma is an approach that has gained popularity across various organizations for eliminating deviations and reducing waste (Utomo, 2020). The Six Sigma method has been widely applied to enhance manufacturing, healthcare and safety, and environmental management systems performance (Linderman et al., 2003). Six Sigma is a structured methodology for process improvement that concentrates on reducing process variations and minimizing defects (products or services that fall outside specifications) through intensive utilization of statistics and problem-solving tools (Gaspersz, 2022). Six Sigma has five stages, known as DMAIC, which stands for Define, Measure, Analyze, Improve, and Control. DMAIC is used as a problem-solving approach for making improvements (Willyo, 2021). Each stage can be explained as follows: (1) Define: In this stage, the problem or opportunity for improvement is clearly defined. The project's scope, goals, and objectives are set, and the key stakeholders' requirements and expectations are identified (Widyarto et al., 2019). (2) Measure: During this stage, relevant data is collected and measured to provide a baseline for the process performance. The team identifies key metrics, gathers data, and analyzes it to understand the current state of the process (Hairiyah & Amalia, 2020). (3) Analyze: In this phase, the data collected is analyzed to identify the root causes of problems or deviations from the desired outcome. The team uses various tools and techniques to uncover patterns and relationships in the data (Rimantho & Mariani, 2017). (4) Improve: In the Improve stage, potential solutions are developed based on the insights gained from the analysis. These solutions are tested and implemented to address the identified issues and improve the process (Lim Sanny et al., 2016). (5) Control: The Control phase involves putting mechanisms in place to sustain the improvements achieved in the previous stages (Aufi et al., 2014). This includes establishing monitoring systems, setting performance standards, and implementing controls to prevent the recurrence of issues (Muhammad et al., 2023).

3. RESEARCH METHOD

Each of these stages within DMAIC plays a crucial role in identifying, addressing, and resolving issues to enhance the process's overall performance. The research uses several stages to analyze service quality using the Six Sigma method. The first thing the researchers did in this study was determine the object, identify the problem, and conduct a literature study. The research object for the Dukuh sub-district, Surabaya City, was chosen because there are problems that are felt by some people related to

the services provided in Kelurahan. The level of consumer loss reflects the failure of agencies or institutions to fulfill their customer satisfaction. The next step is condition measurement. The research method used for measurement is Service Quality, or called servqual. From several Service Quality variables, several criteria can be found that can be used to determine and analyze service quality. These criteria include five quality dimensions: Tangibles, Reliability, Responsiveness, Assurance, and Empathy (Parasuraman et al., 1988). The data collected to complete this research used a questionnaire distributed to service users in the Dukuh Menanggal Village. This test requires a minimum of 30 respondent data related to the questionnaire that has been designed. A questionnaire can be declared valid if it has validity test results with a significance value of less than 0.05 (Hair et al., 2010). Moreover, it can be declared reliable if it has a Cronbach's Alpha value of more than 0.6 (Hair et al., 2010). If the validity and reliability test results do not meet the specified value, another check will be carried out on the designed questionnaire (Hair et al., 2010). The results of distributing the questionnaires were then collected into data and used to determine the services provided in the Dukuh Menanggal sub-district. The data owned in this study is questionnaire data. Sampling in this study was taken from the Regulation of the Minister of Administrative Reform and Bureaucratic Reform of the Republic of Indonesia Number 14 of 2017 (Kementerian Pendayagunaan Aparatur Negara, 2017). The total population size of the Dukuh Menanggal Village, based on data from the Surabaya City Central Statistics Agency for 2020, is 9,156 people (Pemerintah Kota Surabaya, 2019). The questionnaire was conducted using a Likert scale. The scoring system will use a 4-point rating scale (Sugiyono, 2014).

4. RESULT AND DISCUSSION

At this research stage, data collection was carried out for one month, namely March 2023. Data was collected by distributing questionnaires about expectations and evaluation of services in Dukuh Menanggal Village. Researchers obtained data from 300 respondents. The survey data obtained was processed by researchers and analyzed using descriptive statistics. Calculation of the sample size in this study shows that the number of respondents obtained during the distribution of the required questionnaire in data collection, as many as 300 respondent data, is considered sufficient. Based on the gender of the 300 respondents, there were 154 males sex and 146 females. Respondent data in filling out research questionnaires was dominated by men, with 51.3 percent compared to 48.7 percent for women. Based on the age of 300 respondents, the majority of respondents aged 33-40 years were 75 people with a presentation of 25 percent, and the least number of respondents were respondents aged 28-32 years with 50 people with a percentage of 16.7 percent. Based on the work of 300 respondents, most respondents have jobs as traders, namely as many as 66 people, with a ratio of 22 percent, and the number of respondents with minor other jobs, namely as many as 33 people, with a percentage of 11 percent. The data processing approach used is Servqual and Six Sigma (Define, Measure, Analyze, Improve) for population administration services in Dukuh Menanggal Village. To obtain good research results, a measuring instrument was tested to determine whether the instrument used in this study was appropriate.

Define Stage

At the Define stage, identification of At the Define stage, identification of potential problems that occur in the service process is carried out (Wisnubroto & Anggoro, 2012). The service flow process diagram has the elements used shown in Figure 5. The variables in the previous sub-chapter are still in the form of brief explanations, so operationalization tables need to be carried out to facilitate understanding and measuring the variables in the research. The following is a schematic of the Dukuh Menanggal Village service flow procedure that the applicant must take: (a) Customer: in this service flow process, the customer is file registration and file equipment verification. (b) Service Employee: this service flow consists of verifying data validity, appropriate documents, initials, and service ACC, data entry and printing of documents, and verification of field heads and administration. (c) Archiving Officer: after all the service flow processes, namely producing, archiving, and submitting documents.

Measure Stage

In the measure stage of this study, questionnaires were distributed to 300 respondents to test whether the questionnaires were valid and reliable. The questionnaire is valid if the question attributes reveal what will be measured (Willyo, 2021). Reliability is the consistency of respondents in answering questions in answering respondents. Data processing at this Measure stage uses the Servqual and Six Sigma methods. The Servqual method uses levels (reality) and levels of importance (expectations) (Erlina Purnamawati, 2016). The validity test determines the similarity between the data collected and the data that occurs in the object under study so that valid research results are obtained (Erika & Muhlisoh, 2019). Validity and Reliability Testing is a process for testing the questions in a questionnaire. This test begins with a questionnaire to 30 respondents tested. The significance level corresponds to the average of studies with a 5% error rate (Herlambang, 2020). Measurement of the DPMO value (defects per million opportunity) using the formula (Parasuraman et al., 1988):

DPMO=[1-(perception/(Target Satisfaction))x 1.000.000]

Measurement of the Sigma value using the formula (Vincent Gaspersz, 2002):

Value Sigma = NORMSINV ├ (1- (DPMO)/1.000.000┤)+SHIFT

Based on the results of the validity test, the data for all dimension attributes related to the expectations and reality of the respondents in the questionnaire show that they have met the requirements so that the attributes are declared valid. The measuring instrument is stated to be valid and concluded based on the significance value of each measuring instrument, getting a value of less than 0.05 (Trimarjoko et al., 2020). The reliability test is used to test whether the research instrument can show its ability to measure without error and the results are always consistent. In this test, the method used is Cronbach's Alpha Method. Cronbach's Alpha measures the reliability of indicators used in research questionnaires (Hair et al., 2010). Based on the results of the reliable test, it can be seen that the data for the questionnaire is declared reliable for each attribute. The alpha value results have been described in the table above. Cronbach's Alpha value above 0.6 meets the requirements needed in the reliability test. The next stage is measuring the level of importance of service quality. The measurement stage includes the average level of reality, the average level of expectation, the Gap value, the satisfaction target to be achieved, the satisfaction level, defects per million opportunities (DPMO), and the sigma value level (Gaspersz, 2022). In this study, the satisfaction target to be achieved is a score of 4, which is very good, which comes from the answers of respondents based on the Likert scale of satisfaction from number 1, which is not good, to number 4, which is very good.

Table 1. Measure table

Atribute	Gap	Level of satisfaction	DPMO	Sigma value
T1	-1,13	63,00%	370.000	1,83
T2	-0,99	65,00%	350.000	1,89
T3	-1,07	61,25%	387.500	1,79
R1	-1,39	54,75%	452.500	1,62
R2	-0,95	66,75%	332.500	1,93
R3	-0,96	65,50%	345.000	1,90
R4	-1,40	55,25%	447.500	1,63
R5	-1,08	65,50%	345.000	1,90
D1	-1,38	55,00%	450.000	1,63
D2	-0,91	67,00%	330.000	1,94
D3	-1,02	64,75%	352.500	1,88
A1	-1,19	63,50%	365.000	1,85
A2	-1,80	54,25%	457.500	1,61
A3	-1,32	67,00%	330.000	1,94
A4	-1,51	62,25%	377.500	1,81
E1	-0,78	67,00%	330.000	1,94
E2	-0,92	65,25%	347.500	1,89
E3	-1,08	65,00%	350.000	1,89
Average	**-1,16**	**62,67%**	**373.333**	**1,83**

Based on the calculation of the table above, the calculation of the Measure stage for the 18 attribute dimensions of service quality in Dukuh Menanggal Village shows that the performance of Dukuh Menanggal Village is currently at the 1,83 sigma level, and the DPMO value is 373,333, This explains that if the service is provided 1,000,000 times, 373,333 services are not by the procedure and trigger dissatisfaction among service users (Walpole et al., 2012), Then, based on the sigma value, the performance of the Dukuh Menanggal Village is good in providing services because the 1,83 sigma value is close to the average industrial sigma value in Indonesia, However, these results are still far from the sigma target of 6,00 sigma and a defect per million opportunity value of 3,7.

Analyze Stage

The next step is to Analyze using Pareto Diagram tools and Fishbone diagrams to find the root causes of problems in the service process, to focus on one or more problems, a Pareto diagram will be used before the Fishbone diagram (Gaspersz, 2022), After going through the measurement stage, the next stage is the analysis stage, which follows up on analyzing the factors that cause failure/defects using Pareto diagrams and fishbone diagrams. Next, the root of the problem is suspected as a causative factor using the fishbone diagram tool (Press, 2003), Cause and effect diagrams are used to determine the effect of a problem, which will then be taken as a corrective action.

Table 1. Dimensional grouping

Dimension	GAP	Percentage	Cumulative
Assurance	-1,46	25,57%	25,57%
Reliability	-1,16	20,32%	45,88%
Responsiveness	-1,10	19,26%	65,15%
Tangible	-1,06	18,56%	83,71%
Emphaty	-0,93	16,29%	100,00 %

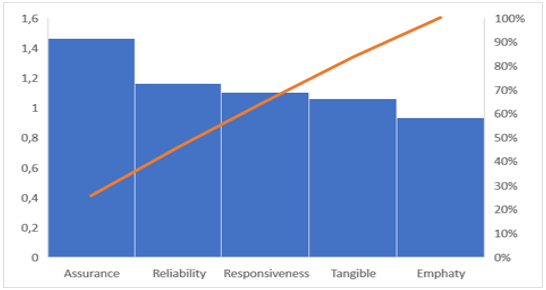

Figure 2. Pareto diagram

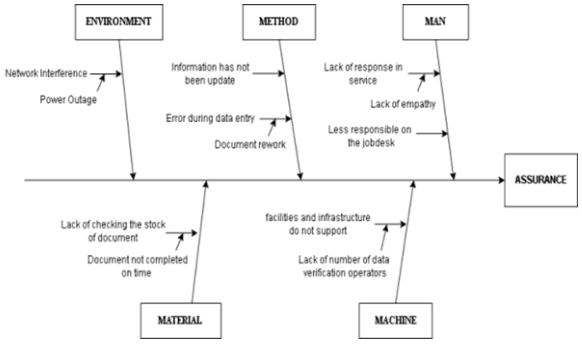

Figure 3. Analyse's fishbone diagram

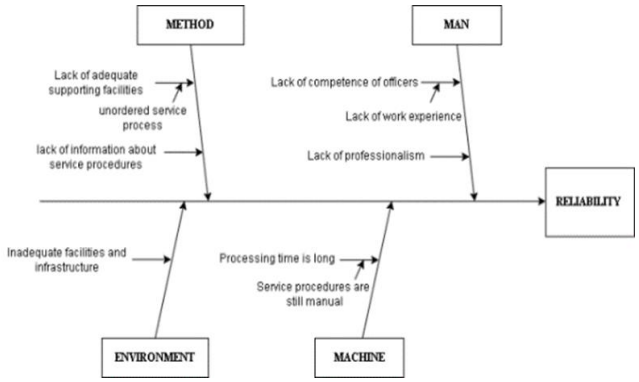

Figure 4. Reliability's fishbone diagram

Assurance dimension, from the analysis using a fishbone diagram, things that affect these attributes come from man, method, environment, machine, and material, In the man factor, three causes cause the services provided to be less responsive: three causes for the method factor, two causes for the environment factor, two causes for the machine factor, and two causes for the material factor. The Reliability Dimension, from the analysis using a fishbone diagram, things that affect these attributes come from man, method, environment, and machine, In the man factor, four causes cause the services provided to be less competent; there are three causes in the method factor, one cause in the environment factor, and two causes in the machine factor.

Improve Stage

In the improve stage, it is the improvement stage by providing a design in the form of a solution that will be given to the Dukuh Menanggal Village as a design to improve service quality.

Table 2. Assurance's RPN table

Dimension	Highest RPN	RPN	Improvement Recommendations
Assurance	Document Reworking	210	Create a check sheet to make checking easier
	Lack of Verification Operators	105	Adding HR services or open recruitment for administration
	The information used is not updated yet	84	Conduct regular population censuses so that the information used is updated

Table 3. Reliability's RPN table

Dimension	Highest RPN	RPN	Improvement recommendations
Reliability	Lack of information about service procedures	240	- Make information regarding document requirements in writing using x-banners - Create information on agency web portals
	The number of spectators is uncontrollable	224	Provide SOP quota limits for receiving registration files
	There is still a manual service process	140	Performing system improvements to facilitate service and improve service time efficiency

At this stage of improvement is carried out to analyze the results of data processing using the Servqual and Six Sigma concepts as well as providing suggestions for improving service quality using FMEA in the form of priorities that have been linked to customer needs so that the target or priority results can then be used as a step initial proposal for improving the quality of service by the Dukuh Menanggal Sub-District, Surabaya City. The last stage, namely the improvement stage, providing a design in the form of a solution that will be given to the Dukuh Village, is considered a design to improve service quality. The repair plan that will be made uses the failure Mode Analysis method, The dimensions that will become improvement attributes using the FMEA method come from the fishbone diagram factors that cause problems in service. The improvement plan that will be given is based on the highest RPN value so that it focuses more on problems that have high priority.

Control Stage

At the control stage, control and supervision are carried out on the suggestions for improvement given at the improvement stage. With clear and easy-to-understand knowledge of customer service procedures, customer satisfaction can be met with a Six Sigma value. Dukuh Menanggal Village regularly conducts surveys of service users to measure the community satisfaction index, this has become the first step to improve and improve the quality of services provided so far. In addition, Dukuh Menanggal Village can maintain and improve services by service SOPs by conducting training, and repairs are reviewed every three months for improvement efforts that lead to successful service improvement for Dukuh Menanggal Village. In the control stage, improvements are made based on the results obtained from the pareto diagram and fishbone diagram which are explained in the improve stage. Based on the Six Sigma analysis through the DMAIC stages, several conclusions can be drawn about the quality of public service performance in Dukuh Menanggal Village. This can be seen from the sigma value which is quite low, some effects are also caused, as a result of the lack of appropriate services implemented in the cause and effect diagram. Thus, in order to create appropriate public services, it is necessary to make improvements to the service process and control so that the process runs even better and the quality of public service performance can be further improved: (1) Document rework. The proposed improvements to this failure are based on an analysis of the causes of FMEA, namely rework on documents that are input incorrectly or documents that use incorrect information so that a check sheet will be proposed, In the failure dimension, this causes a document to be reworked because there are errors in data entry, writing typos, and a lack of checking before the document is printed, (2) Complaint counter. Complaint counters are generally needed by companies/agencies to get feedback from customers so that companies/agencies can always provide the best for customers. The current control recommendation is that all administrative officers must be ready to respond to the needs of service users. These counters also assist the administration in collecting service users who experience document errors so that these counters can collect data on a regular basis, (3) Service queue. Proposed improvements to this failure are based on an analysis of the causes of FMEA which include; Queuing is done manually, there is no queuing system, so it will be proposed to make a registration sheet

regarding service queues. The cause of this failure is the absence of a queuing system so the system used is registration by piling up registration files, too many piles of documents cause the documents to be unorganized and mixed with other applicant documents so that sometimes the officer calls the wrong queue.

5. CONCLUSION

Based on the results of the study, it can be concluded that based on results from the collection stage, the data processing stage, and the discussion analysis stage, it can be concluded that the quality of public services provided in Dukuh Menanggal Village is still not optimal. Efforts to improve service performance are carried out by applying the Servqual dimension and the Six Sigma method through service user assessments. This is based on the average of 18 attribute DPMO values and level values, namely DPMO 373,333 and sigma value 1,83 sigma. The sigma level achieved still needs to reach the desired target, namely Six Sigma, then, the highest negative gap shows a value of -1,46, namely the assurance dimension, based on the Gap value shows negative satisfaction, which means there is a gap between reality and service user expectations. This explains that the service user wants the performance of the Dukuh Menanggal Kelurahan to be further improved to be closer to the expectations of service users. Based on the analysis of the Pareto diagram, the most dominant causes of defects are in the assurance, reliability, and responsiveness dimensions. In the fishbone diagram analysis, there are several causes of defects, namely human factors, methods, machines, materials, and the environment. Proposed improvements that can be made to reduce these defects are to make written information regarding document requirements using x-banners, conduct training on SOPs for service time, and perform system improvements to facilitate service and improve service time efficiency.

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