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The Influence of Cleanliness, Water Flow, Complaint Response, and Network Maintenance on Customer Satisfaction Levels at PDAM Tirta Makmur, Sukoharjo Regency

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Abstract: The purpose of this study was to examine how water cleanliness, flow continuity, complaint response, and network maintenance affect customer satisfaction at PDAM Tirta Makmur in Sukoharjo Regency. This study employed an explanatory quantitative approach and conducted a survey involving 380 participants. Data were collected through questionnaires and tested using multiple linear regression analysis. The results indicated that all independent variables influenced customer satisfaction both collectively and individually. The variable that most significantly affected customer satisfaction was complaint response, followed by network maintenance, water cleanliness, and flow continuity. According to the regression model used, which had an R Square value of 0.747, these four variables accounted for 74.7% of the variation in customer satisfaction. This study was limited to PDAM customers in Sukoharjo. It offers originality by emphasizing the importance of responsiveness and infrastructure maintenance in improving public services in the clean water sector.

Keywords: customer satisfaction, water cleanliness, flow continuity, complaint response, network maintenance.

INTRODUCTION

A 2009 study by Dwi Setiawan titled "Analysis of the Quantity and Quality of Clean Water for Surakarta City PDAM Customers in Pucang Sawit Village" is a replication of this research. Water is a source of life for living things, especially humans, who continue to evolve to meet their basic needs. Water is essential for daily activities such as drinking, cooking, bathing, and fulfilling industrial needs. Consequently, economic and social aspects are involved in the function of water.

Healthy, clear, and clean water quality is crucial for water's social function. To maintain and improve health and well-being, communities and all stakeholders need this understanding. According to data from the Indonesian Forum for the Environment (Walhi), there are an estimated 1.4 billion km3 of water on Earth.(Stevović et al., 2020), with approximately 97.3% being seawater. Only 2.7% of this total is freshwater found on land. Of this freshwater,

approximately 37.8 million km³, or 77.3%, is found in the form of ice caps on mountain peaks and glaciers. The remainder consists of groundwater and infiltration water (22.4%), lakes and swamps (0.35%), atmospheric water vapor (0.04%), and river water (0.01%).(Nathaniel & Arbaningrum, 2021)

Article 33 paragraph (3) of the Constitution of the Republic of Indonesia states that "The land, water and natural resources contained therein are controlled by the State and used to the greatest extent possible for the prosperity of the people." Based on this article, the land, water and natural resources contained therein are the main elements for the prosperity of the people. Therefore, their management must be under the authority of the state and used to the maximum extent possible for the benefit of the people. Water is very important for increasing the prosperity and welfare of the people because it is a basic need in everyday life.

The social and economic function of water in meeting daily needs is a crucial aspect that must be considered, especially as population growth increases the need for water. To address this, the government operates state-owned enterprises known as Regional Drinking Water Companies (PDAMs). PDAMs can be found in various regions and cities throughout Indonesia, including Sukoharjo Regency. PDAM Tirta Makmur in Sukoharjo Regency is managed by the Sukoharjo Regency government.

The goal of the PDAM program, both in urban and rural areas, is to provide clean, safe, and healthy water to the community. This water is needed for household and industrial needs, to stimulate economic growth, and to improve public health. PDAM is a local public organization that is crucial for the community, including in Sukoharjo Regency. In this region, PDAM Tirta Makmur plays a role in providing clean water services by drawing water from the Bengawan Solo River and groundwater. Currently, PDAM Tirta Makmur has 20 deep wells as raw water sources. New installations, repairs, bill payments, and the provision of clean water to customers are all services offered. In 2022, the number of customers and the volume of water distributed were recorded by each sub-district.

Table1.ShowNumber of Customers and Water Distributed by District, 2022.

	Subdistrict (1)	Customer (2)	Water Distributed (m3) (3)
010.	Weru		
020.	Hair	289	26 488
030.	Tawangsari	3 277	579 171
040.	Sukoharjo	8 092	1 281 933
050.	Nguter	1 205	180 412
060.	Bendosari	1 588	268 009
070.	Polokarto	1 114	219 095
080.	Mojolaban	1 363	193 260
090.	Grogol	13 197	2 612 256
100.	Tray	2 780	475 002
110	Gatak	348	44 823
120	Kartasura	5 996	1 027 668
	2022	39 249	6 908 117
	2021	36 645	6 475 779

Source: Tirta Makmur Drinking Water Company, Sukoharjo Regency

PDAM still has many customers complaining about its service. PDAM has failed to meet the community's needs. PDAM water is often mixed with mud and mosquitoes. One PDAM user who lives in the Grogol Indah and Telukan housing complexes, Grogol, said that due to the poor water conditions, most customers only use the water for bathing and washing, not for cooking and drinking. If they want to cook and drink, they have to buy bottled water or buy water from nearby sources. Furthermore, according to a statement from one customer, Sumanti, who lives in Telukan, Grogol, several days ago. According to Sumanti, a customer who lives

in Telukan, Grogol, PDAM's water service has decreased in recent days. The water discharge is often only a gurgling sound in addition to the murky water. She stated that PDAM's water service has been less than satisfactory lately.

One of the biggest issues is water quality. People in the community complain about dirty, brownish, and smelly water. Clean water is first released from the PDAM wastewater treatment plant (IPAL), according to the PDAM. When water in the pipes is exposed to sunlight and not flowing or circulating, sediment, fluoride gas, and iron settle. Because the levels of these substances are still below the consumption limit, the final water production is also affected. Many people also complain about water that sometimes does not flow or flows very little. Despite this, PDAM Sukoharjo will receive billions of rupiah in funding from an Australian non-profit organization.

With the BUMD's performance continuing to improve, there is a possibility that a grant worth Rp 2 billion will enter its coffers in June 2011. Mat Hasyim ST MSi, Director of PDAM Sukoharjo, stated on Friday (April 5, 2024), that his organization's performance is considered satisfactory, especially in terms of finance and management. He urged his employees to continue to improve their performance and serve the community (results of early 2024 observations). Thus, it is very contrary to the public's perception that employee performance in providing services is not optimal.

PDAM divides complaints into two categories based on the severity of the problem: those that can be handled directly by the PDAM and those that can be deferred, or postponed. A complaint about a leaking customer pipe is one example of a complaint that can be handled directly by the PDAM. It takes several days to conduct an initial inspection to identify the source of the problem, so the complaint must be deferred or postponed. (Source: interview with Commitment Making Officer Mr. Pono Sunarto, SM., MSi)

PDAMs offer public services to meet community needs. They can build good relationships with the community and gain public legitimacy by improving their services. However, many people still believe that PDAMs are solely profit-oriented and ignore the public interest. Therefore, various changes and transparency efforts are needed to ensure the public understands the real conditions faced by PDAMs.

One factor that has exacerbated the crisis to date is public distrust of the government, especially in the public service sector.(Aprilia et al., 2020)This has given rise to various negative attitudes, assumptions and assessments of government performance.(Haurissa & Dewi, 2021). The view that bureaucracy is complicated and makes it difficult to resolve matters(Heru Wahyudi & Zakaria Habib Al-Ra'zie, 2022). Furthermore, practices of nepotism, collusion, and corruption are still frequently found in public services. In fact, offers to simplify processes that should follow certain procedures are not uncommon, leading to unfairness and diminishing the credibility of these services.

In the era of globalization, quality is a crucial aspect that every company must seriously consider to survive amidst business competition. This also applies to PDAMs, which are expected by the public to provide fast service and high-quality water production. If the service and water quality are unsatisfactory, customers may become dissatisfied and choose other alternatives, such as installing their own wells, which ultimately can reduce the number of PDAM customers. PDAMs function as public service agencies and are managed by local governments. As part of the public sector, PDAMs are primarily responsible for meeting community needs through the provision of quality public services and products.

METHOD

Explanatory research is used in this study to explain the causal relationship between the independent variables of water cleanliness, smooth water flow, complaint response, and network maintenance with the dependent variable of customer satisfaction. The purpose of this

study is to determine the extent of influence of each component on the level of customer satisfaction of PDAM Tirta Makmur clean water services. This study looked at 41,091 PDAM customers in Sukoharjo Regency as a whole. Using the Krejcie and Morgan formula, samples were collected from 380 people who responded, which was considered to be representative of the population with the assumption of a certain level of confidence and precision.(Creswell & Clark, 2018).

An explanatory approach was chosen because this study not only seeks to describe the phenomena that occur, but also to explain the causal relationship between the dependent and independent variables (customer service, water quantity and quality) and the dependent variable (consumer satisfaction). An explanatory approach allows researchers to understand "why" and "how" a phenomenon occurs.(Singh et al., 2013)..

Data were collected through a closed-ended questionnaire based on a five-point Likert scale starting with "strongly disagree" and ending with "strongly agree." Five key indicators of water cleanliness (color, odor, taste, and clarity), smoothness of flow (pressure and continuity), speed of response to complaints, quality of service during water meter installation, and network maintenance efforts were the subjects of this survey. Before distribution, the questionnaire was tested for validity and reliability. Validity was tested using Exploratory Factor Analysis, and reliability was tested using Cronbach's Alpha coefficient values. Data collection was conducted throughout the service area of PDAM Sukoharjo. The unit of water volume used was cubic meters, or m3.(Yuliana et al., 2022).

The collected data were analyzed using multiple linear regression to test the simultaneous and partial effects between variables. Prior to data analysis, classical assumptions such as the normality test (Kolmogorov-Smirnov), multicollinearity test (VIF and tolerance), and heteroscedasticity test (scatterplot) were used to examine the data. With a significance level of 5%, the hypothesis was tested using the t-test and F-test ($p < 0.05$). In addition, the coefficient of determination (R2) was calculated to determine how well the independent variables influence the dependent variable. The results of this analysis are used as a basis for drawing conclusions about PDAM service quality based on objective and measurable customer perceptions.

RESULTS AND DISCUSSION

Results

This study involved 380 respondents, all of whom were PDAM customers in Sukoharjo Regency. The results identified the following characteristics of the respondents.

Table 2.Respondent Gender

		Frequency	Percent	Valid Percentage	Cumulative percentage
Valid	Man	189	49.7	49.7	49.7
	Woman	191	50.3	50.3	100.0
	Total	380	100.0	100.0	

Source: Research 2025

This study involved 380 respondents with a nearly balanced gender distribution: 191 women (50.3%) and 189 men (49.7%). This balance provides a good basis for conducting gender-based analysis without any predominance of one group. Previous research has also shown that gender can influence mindsets and behaviors on certain issues. For example, a study by Mamusung et al. (2023) found a relationship between gender and attitudes toward antibiotic use in the community, indicating that gender is a relevant variable in social and health studies.(Mamusung et al., 2023).

Table 3. Respondents' Age

		Frequency	Percent	Valid Percentage	Cumulative percentage
Valid	> 46 years old	126	33.2	33.2	33.2
	26-25 years old	121	31.8	31.8	65.0
	36-45 years old	133	35.0	35.0	100.0
	Total	380	100.0	100.0	

Source: Research 2025

The age distribution of respondents in this study was also quite even, with the largest proportion in the 36–45 age group (35%), followed by those aged >46 (33.2%) and those aged 26–35 (31.8%). This indicates that most respondents are of productive age and socially and economically mature. This age group tends to be more active in professional and social activities, making their opinions highly relevant to the issues studied. Research by Seventeen et al. (2023) supports this by stating that age significantly influences taxpayer compliance, with individuals with older ages showing higher levels of compliance.(Seventeen et al., 2023).

Table 4. Respondents' Marital Status

		Frequency	Percent	Valid Percentage	Cumulative percentage
Valid	Marry	189	49.7	49.7	49.7
	Not Married	191	50.3	50.3	100.0
	Total	380	100.0	100.0	

Source: Research 2025

Respondents' marital status was also evenly distributed, with 191 unmarried (50.3%) and 189 married (49.7%). This balance provides an opportunity to compare differences in perceptions or behavior based on marital status. In many studies, marital status is often associated with aspects of social and economic responsibility that can influence preferences and decision-making. Although no explicit analysis of marital status was found in the reviewed journals, it remains an important variable worth considering in studies of societal behavior.

Table 5. Respondents' Job Types

		Frequency	Percent	Valid Percentage	Cumulative percentage
Valid	Government employees	189	49.7	49.7	49.7
	Private employees	191	50.3	50.3	100.0
	Total	380	100.0	100.0	

Source: Research 2025

Furthermore, in terms of occupation, 191 respondents (50.3%) were private sector employees, while 189 respondents (49.7%) were civil servants. This reflects a fairly balanced representation of the two employment sectors in this study. Occupation type is often an indicator of lifestyle, income level, and access to information. Research by Yudhistira and Nugroho (2023) shows that occupation has a significant influence on community perceptions of environmental services, highlighting the importance of considering occupation type as an independent variable in the analysis.(Yudhistira & Nugroho, 2023).

Table 6. Respondents' Income

		Frequency	Percent	Valid Percentage	Cumulative percentage
Valid	> Rp. 2,000,000	142	37.4	37.4	37.4
	Rp. 1,000,000-Rp. 1,499,999	129	33.9	33.9	71.3
	Rp. 1,500,000-Rp. 1,999,999	109	28.7	28.7	100.0
	Total	380	100.0	100.0	

Source: Research 2025

Based on income, respondents were divided into three groups: 142 people (37.4%) had incomes above Rp 2,000,000, 129 people (33.9%) had incomes between Rp 1,000,000 and Rp 1,499,999, and 109 people (28.7%) had incomes between Rp 1,500,000 and Rp 1,999,999. This study covered mostly people with lower-middle incomes, who are quite vulnerable to changes in policy or economic conditions. Income is very important for consumer behavior. Saputra and Fitriani (2023) found that income has a significant impact on decisions to purchase environmentally friendly products in Metro City. This shows how important it is to consider an individual's economic condition in behavioral analysis.

Table 7.Characteristics of Research Variables

	N	Mean	Median	Standard Deviation	Minimum	Maximum
Customer Satisfaction Y	380	23,8079	24,0000	4,11669	12.00	30.00
Water cleanliness X1	380	19,6132	20,0000	3,26011	10.00	25.00
Water Smoothness X2	380	19,4789	20,0000	3.34113	10.00	25.00
X3 Problem Response	380	23,5053	24,0000	4,13779	12.00	30.00
Network Maintenance X4	380	19,4947	20,0000	3.31503	10.00	25.00

a. Multiple modes exist. The smallest value is shown

Source: Research 2025

The customer satisfaction variable has a mean of 23.81 with a median of 24.00, indicating that most respondents have a satisfaction level above the scale average (maximum = 30). A standard deviation of 4.12 indicates moderate variation in satisfaction levels among respondents. A minimum value of 12 and a maximum of 30 indicates a fairly wide distribution of scores. Most customers feel quite satisfied with the service provided. The variation in scores indicates differences in experience or perception between individuals, which can be influenced by other factors such as service quality, response speed, or network maintenance. A study by Pane et al. (2024) shows that service quality, water rates, and technological innovation have a positive and significant effect on customer satisfaction at PDAM Tirtanadi. (Pane et al., 2024).

Average forproduction qualityis19.61with median20.00**,**shows a relatively symmetrical distribution. The standard deviation is3.26falls into the moderate category, and the scores range between10 to 25Respondents generally rated production quality as moderate to high. Differences of opinion still occurred, but were not extreme. This quality factor likely contributes directly to customer satisfaction. Research by Wahyuni et al. (2023) found that the quality of clean water products haspositive and significant influence on customer satisfaction at PDAM Tirta Jeneberang Gowa (Wahyuni et al., 2023).

This variable has a mean19.48and median20.00**,**and standard deviation3.34**.**Range of valuesis 10 to 25. Assessments of the smoothness of water distribution are quite stable, with general perceptions at a medium level. The relatively small standard deviation indicates consistency of experiences among respondents. A study by Pane et al. (2024) also emphasized that service quality, including smoothness of water distribution, contributes significantly to customer satisfaction. (Pane et al., 2024).

Average value23.51and median24.00show thatRespondents generally rate the service provider's ability to respond to problems highly.. Standard deviation4.14and range12–30reflecting the large variation in these perceptions. Responsiveness to customer issues is one of the most valued aspects. High variability can be caused by inconsistencies in problem handling between locations or staff. Research by Sakawati et al. (2022) highlights the importance of responsiveness inclean water services, which have a direct impact on customer satisfaction(Sakawati et al., 2022).

With mean19.49, median20.00, and standard deviation3.32, this variable has aMedium perception from customers, with a value range of 10 to 25. Customers rated network maintenance as generally adequate, although not particularly outstanding. The low standard deviation indicates a relatively uniform experience among respondents. A study by Fernandes et al. (2024) developed the Water Utility Service Quality Index (WUSQI) that assesses the quality of water utility services, including network maintenance aspects, from the customer perspective.(Fernandes et al., 2024).

Autocorrelation Test

Table 8. Autocorrelation test results

Model	R	R Square	Adjusted R Square	Standard Error of the Estimate	Durbin-Watson
1	0.864(a)	0.747	0.745	2.08068	2,110

a. Predictors: (Constant), Network Maintenance X4, Water Cleanliness X1, Water Flow X2, Problem Response X3

b. Dependent Variable: Customer Satisfaction Y

Source: Research 2025

The Durbin-Watson value of 2.110, close to 2, according to Table 8, indicates that no autocorrelation was found in the regression model used. Consequently, one of the most common assumptions about regression has been proven correct; thus, the regression model can be considered suitable for further analysis. The model's validity in predicting the dependent variable, customer satisfaction, is strengthened by the absence of autocorrelation.

ConditionA situation where two or more independent variables have a significant correlation with each other is known as multicollinearity. This condition can lead to incorrect estimates of regression coefficients, which in turn reduces the validity of the model in multiple linear regression analysis.

Multicollinearity Test

Table 9. Multicollinearity Test Results

Model		Collinearity Statistics	
		Tolerance	VIF
1	(Constant)		
	Water cleanliness X1	0.366	2,730
	Water Smoothness X2	0312	3,205
	X3 Problem Response	0.300	3,331
	Network Maintenance X4	0.327	3,054

a. Dependent Variable: Customer Satisfaction Y

Source: Research 2025

Based on Table 9, each independent variable has a Tolerance value greater than 0.10 and a VIF value less than 10, ranging from 2.730 to 3.331. This indicates that the regression model

does not exhibit multicollinearity problems. Thus, each independent variable can be considered independent of each other in explaining the dependent variable, namely customer satisfaction. The existence of VIF values that are still within reasonable limits indicates that the regression model is suitable for further analysis and interpretation.

Normality Test

Table 10. Normality Test

		Unstandardized Residual
N		380
Normal Parameters(a,b)	Mean	,0000000
	Standard Deviation	2.06967229
Most Extreme Differences	Absolute	0.068
	Positive	0.068
	Negative	-0.030
Kolmogorov-Smirnov Z		1,331
Asymp. Sig. (2-tailed)		0.058

a. Test distribution is Normal.
b. Calculated from data.

Source: Research 2025

MarkThe Kolmogorov-Smirnov cross-asymmetry test is 0.058, higher than the significance limit of 0.05, as shown in Table 10. This indicates that the residual data distribution is normal. Therefore, the assumption of normality of linear regression is met. Because it does not violate basic statistical assumptions about the residual distribution, this regression model can be used for further analysis.

Heteroscedasticity Test

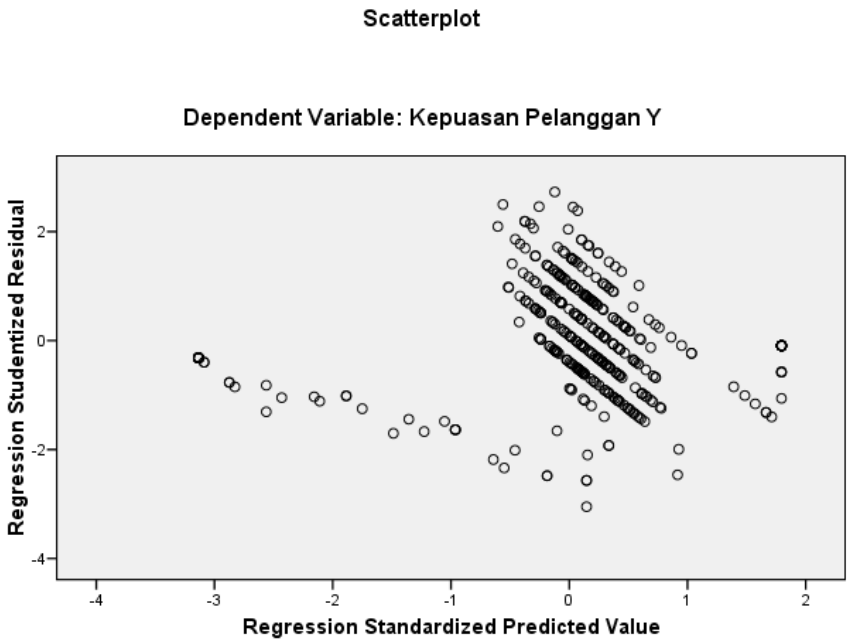

Figure 1. Scatter Heteroscedasticity Test

ResultsThe heteroscedasticity test shown in the figure shows that the data points are spread above and below the number 0, do not cluster only above or below, and do not form a

wavy pattern that widens, narrows, and widens again. Thus, it can be concluded that in general the regression model does not contain symptoms of heteroscedasticity, or that heteroscedasticity in this model is relatively low and insignificant overall. This means that the residual variance can be considered constant, and the classic assumption of homoscedasticity in linear regression analysis is met. The regression model used can be continued for further analysis without the need for special corrections for heteroscedasticity issues.

F test

Table 11. F Test Results

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4799,513	4	1199,878	277,157	,000(a)
	Residual	1623,463	375	4,329		
	Total	6422,976	379			

a. Predictors: (Constant), Network Maintenance X4, Water Cleanliness X1, Water Flow X2, Problem Response X3

b. Dependent Variable: Customer Satisfaction Y

Source: Research 2025

The calculated F value, which is much smaller than the significance limit of 0.05, is 277.157, according toTable 11. This shows that Customer Satisfaction (Y) is significantly influenced by the independent variables consisting of Water Cleanliness (X1), Water Flow (X2), Problem Response (X3), and Network Maintenance (X4).
Therefore, the regression modelThe model used can be considered statistically significant, and all four independent variables make a significant overall contribution to explaining the variation in the dependent variable. This confirms that the model can be used for analysis and decision making.

t-test

Table 12. t-Test Results

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.953	0.707		1,349	0.178
	Water cleanliness X1	0.167	0.054	0.132	3,084	0.002
	Water Smoothness X2	0.297	0.057	0.241	5,185	0,000
	X3 Problem Response	0.326	0.047	0.327	6,909	0,000
	Network Maintenance X4	0.315	0.056	0.254	5,587	0,000

a. Dependent Variable: Customer Satisfaction Y

Source: Research 2025

Based on Table 12, all independent variables have a significance value below 0.05, which means that each variable has a partial significant effect on the dependent variable, namely customer satisfaction (Y). The highest t-valuefound in the Problem Response variable (X3) of 6.909, indicating that this variable has the strongest influence among the other variables.
Thus, it can be concluded that Water Cleanliness (X1), Water Flow (X2), Problem Response (X3), and Network Maintenance (X4) all individually provide significant contributions in explaining variations in customer satisfaction. This regression model is not only simultaneously significant, but also partially strong for each variable.

Coefficient of Determination Test

Table 13. Results of the Determination Coefficient Test

Model	R	R Square	Adjusted R Square	Standard Error of the Estimate
1	,864(a)	,747	,745	2.08068

a. Predictors: (Constant), Network Maintenance X4, Water Cleanliness X1, Water Flow X2, Problem Response X3

Source: Research 2025

According to Table 13, the independent variables used in the model are Water Cleanliness (X1), Water Smoothness (X2), Problem Response (X3), and Network Maintenance (X4), which account for 74.7% of the variation in the customer satisfaction variable (Y). Other external variables, such as customer service, price, or other external factors not included in the model, account for 25.3% of the variation.

Despite having many independent variables, the model still has a good level of adjustment, as indicated by the Adjusted R Square value of 0.745. Thus, this regression model can be said to be quite strong and worthy of use because it is able to explain most of the variations in customer satisfaction.

Discussion

The Effect of Water Cleanliness on Customer Satisfaction of PDAM Tirta Makmur, Sukoharjo Regency

The Water Cleanliness variable has a regression coefficient of 0.167 and a significance value of 0.002. This means that customer satisfaction is significantly influenced by water cleanliness. Customer satisfaction levels are positively correlated with the quality of water supplied by the PDAM. This indicates that customers are highly concerned about the quality of the water they consume for their daily needs and health.

Cleanliness of water isindicatoris a key factor in assessing the quality of service provided by a drinking water provider. Clean, clear, odorless water, free of foreign particles, provides customers with a sense of safety and comfort when using it for drinking, cooking, bathing, and other household purposes. Therefore, if the PDAM (Regional Water Company) is able to maintain high water hygiene standards, customers will be satisfied with the service.

From a customer psychological perspective, perceptions of water cleanliness are closely linked to trust in PDAM as a public service provider. If the water looks dirty or smells, trust will decrease, and complaints will increase, thus affecting overall customer satisfaction scores.Hastiaty et al., (2023; Suseno & Widyastuti, (2017)The physical quality of water, such as clarity, color, and odor, significantly influences customer perceptions and satisfaction levels with PDAM services. The better the perception of water cleanliness, the higher the level of satisfaction experienced.

The Effect of Water Flow on Customer Satisfaction of PDAM Tirta Makmur, Sukoharjo Regency

The Water Flow Variable (X2) has a significant influence on the dependent variable, Customer Satisfaction (Y). The t-test results, presented in Table 4.13, show a t-value of 5.185 with a significance of 0.000, which is smaller than the significance limit of 0.05. In other words, the cleanliness and smoothness of water flow in the customer's environment significantly affect the level of satisfaction felt by the customer.

The influence of water flow on customer satisfaction can be understood in terms of the importance of clean and smooth water access as a fundamental factor in customer comfort and satisfaction. If customers perceive the water quality they receive as poor or inconsistent, they

are likely to be dissatisfied with the service provided. Conversely, if the water provided is clean and flows smoothly, customer satisfaction levels tend to increase, as customers feel their basic needs are being met.(Dalilul Islamy and Widjonarko, 2014; Monita, 2020; Setyowati et al., 2019)

Thus, these results indicate that water flow and cleanliness are significant factors in increasing customer satisfaction, which should be a primary concern for service providers or related companies. Given the significant effect demonstrated by the t-test, improving water quality, both in terms of cleanliness and flow, can be an effective strategy in increasing customer loyalty and creating a better customer experience.

The Influence of Complaint Responses on Customer Satisfaction at PDAM Tirta Makmur, Sukoharjo Regency

This variable has the highest regression coefficient of 0.326, a significance value of 0.000, and a Beta value of 0.327 (the highest of all variables). This means that PDAM's response to customer complaints is the most dominant factor influencing customer satisfaction. Fast, responsive service, and solutions to customer problems significantly determine whether customers are satisfied or not. This underscores the importance of two-way communication between companies and customers.

Responding to customer complaints is a crucial element of customer relationship management. When customers encounter issues such as water interruptions, unreasonable bills, or leaks, they expect a swift and resolute response from the water utility. When a company responds quickly and professionally, it creates a positive experience that strengthens customer trust and loyalty.

The highest regression coefficient (0.326) and the highest Beta value (0.327) indicate that responsiveness to customer issues is the most important factor compared to other variables. A significance value of 0.000 also strengthens the statistical validity of this relationship. This indicates that not only technical quality but also interaction quality determines customer satisfaction levels.

The Problem Response variable (X3) has the highest regression coefficient of 0.326, a significance value of 0.000, and a Beta value of 0.327, making it the most dominant variable in influencing customer satisfaction. This means that PDAM's response to customer complaints is a key factor in shaping customer perceptions and satisfaction. Fast, responsive, and solution-oriented service to various problems such as water supply disruptions or billing complaints provides a sense of appreciation and trust for customers. This demonstrates the importance of effective two-way communication between the company and customers. In line with these findings,Mauludi, and Saroh, (2022; Sari & Oktariyanda, (2023)stated that a quick response to customer complaints is a form of company empathy and is the main key in building loyalty, because customers tend to be more satisfied and continue to use the service when they feel heard and helped promptly.

The Influence of Network Maintenance on Customer Satisfaction of PDAM Tirta Makmur, Sukoharjo Regency

The regression coefficient for the Network Maintenance variable is 0.315, with a significance value of 0.000 and a beta of 0.254. This indicates that routine maintenance of the pipeline infrastructure and water distribution system also significantly impacts customer satisfaction. Technical disruptions due to lack of maintenance can reduce service quality and negatively impact customer perceptions.

The Network Maintenance variable (X4) has a regression coefficient of 0.315, with a significance value of 0.000 and a Beta of 0.254. This indicates that routine maintenance of the pipe network infrastructure and water distribution system has a significant influence on

customer satisfaction. When the water distribution system experiences damage, leaks, or flow disruptions due to lack of maintenance, customers will experience a decrease in service quality, both in terms of continuity and water pressure. Conversely, when maintenance is carried out consistently, service reliability increases and customers feel more satisfied. These results are supported by research byAnsyhari & Hadi, (2021; Asmara, (2021), which emphasizes that good quality infrastructure and maintenance in public services such as PDAM are key factors in building positive perceptions and increasing customer satisfaction sustainably.

CONCLUSION

The analysis and discussion results indicate that water cleanliness has a positive and significant impact on customer satisfaction. This means that customer satisfaction levels are higher when the water is clearer and free from odors and contamination. This demonstrates that physical water quality remains crucial for clean water services.

Smooth water distribution, including continuity of flow and minimal interruptions, also significantly impacts customer satisfaction. Customers tend to be more satisfied when the water supply flows consistently without frequent interruptions. This confirms that distribution reliability is a key element in creating a trusted service.

Responsiveness to customer issues or complaints has the greatest influence in this model. A service provider's ability to respond quickly and resolve customer issues significantly determines customer satisfaction levels. Sensitivity to complaints and the effectiveness of their handling are key indicators influencing positive customer perceptions.

Network maintenance also contributes significantly to customer satisfaction. Efforts to maintain the physical condition of pipes, installations, and other infrastructure minimize service disruptions and extend the operational life of the system. Customers who experience consistent service tend to be more satisfied, and this is closely related to the quality of regular network maintenance.

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