Evaluating the Impact of Installed Capacity and Actual Production Volume on the Operational Efficiency of Regional Water Supply Company

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ABSTRACT

In evaluating the performance of PDAMs in various regions, the government must also look at the problems that occur in a regional drinking water company such as customer water quality, customer growth, profitability, liquidity and financial performance solvency. For this reason, local governments need to evaluate performance in order to improve performance in the company. Generally, companies still use the traditional approach in measuring performance that comes from company financial information, along with the times there is performance measurement using the balanced scorecard method, this method is a measurement method that offers both financial and non-financial measurements. This study aims to determine the effect of installed capacity on opera-tional performance to determine the effect of real production volume on operational performance and to find out which is the most influential between installed capacity and real production volume on the opera-tional performance of PDAMs in West Java, Banten and Jakarta in 2018. In this study the author uses a quantitative approach. This research da-ta collection uses secondary data, which is obtained from the report on the results of the 2018 PDAM performance evaluation issued by BPKP and BPPSPAM. This research uses SPSS multiple regression analysis tool. The results show that the Installed Capacity has a minimum value of 188, the maximum value of Installed Capacity is 20,238. The Real Pro-duction Volume has a minimum value of 146, the maximum value of the Real Production Volume of 19,752 that occurs. Operational perfor-mance has a minimum value of 0.81, the maximum value of Operational Performance is 1.69. The mean value of Operational Performance is 1.2547.

1. INTRODUCTION

PDAM is a regional company as a means of providing clean water which is supervised and monitored by executive and regional legislative officials. Water is a necessity of life for the community whose processing is held by the government. In accordance with the 1945 Constitution Article 33 paragraph (3) which reads "Earth and water and the natural resources contained therein are controlled by the state and used for the greatest prosperity of the people" and Article 10 of Law no. 22 of 1999 concerning regional governments states that regions are authorized to manage regional resources available in their regions and are responsible for maintaining environmental sustainability in accordance with statutory regulations. In evaluating the performance of PDAMs in various regions, the government must also look at the problems that occur in a regional drinking water company such as customer water quality, customer growth, profitability, liquidity and financial performance solvency. For this reason, local governments need to evaluate performance in order to improve performance in the company.

Generally, companies still use the traditional approach in measuring performance that comes from company financial information, along with the times there is performance measurement using the balanced scorecard method, this method is a measurement method that offers both financial and non-financial measurements. For this reason, local governments need to evaluate performance in order to improve performance in the company. Generally, companies still use the traditional approach in measuring performance that comes from company financial information, along with the times there is performance measurement using the balanced scorecard method, this method is a measurement method that offers both financial and non-financial measurements. For this reason, local governments need to evaluate performance in order to improve performance in the company.

Currently, companies still use the traditional approach in measuring performance that comes from company financial information, along with the times there is performance measurement using the balanced scorecard method, this method is a measurement method that offers both financial and non-financial measurements. While traditional methods of evaluating PDAM performance focus largely on financial measures (e.g., profitability, liquidity, and solvency), these alone cannot fully capture the operational efficiency of PDAMs. To provide a more comprehensive evaluation, performance measurement systems like the balanced scorecard (BSC) have been introduced. The BSC includes both financial and non-financial indicators, such as customer satisfaction, operational capacity, and production volume [1]. Prior studies have mostly centered on financial metrics, leaving a gap in understanding how operational factors like installed capacity and real production volume affect performance outcomes.

The BSC, introduced by Kaplan, is a comprehensive performance measurement tool that includes four perspectives: financial, customer, internal business processes, and learning and growth. While traditional performance measurement systems focus primarily on financial indicators, the BSC emphasizes the inclusion of non-financial metrics to give a more holistic view of organizational performance. In the context of PDAMs, operational factors like installed capacity and production volume are part of the internal business processes perspective, which focuses on operational efficiency and the ability to meet customer needs [7].

Installed capacity refers to the maximum volume of water that a PDAM can produce and distribute, while real production volume refers to the actual amount of water produced and distributed. Both factors are essential for evaluating how well a PDAM meets customer demands, maintains system sustainability, and ensures long-term operational success [2].

This study addresses this gap by using the BSC framework to assess the operational performance of PDAMs in West Java, Banten, and Jakarta. Unlike previous research, this study integrates operational metrics, specifically installed capacity and real production volume, into the broader performance measurement system. This approach provides a clearer understanding of how these variables impact the efficiency of water utilities in Indonesia.

2. METHOD

This research uses a quantitative approach [8] to examine the impact of installed capacity and real production volume on PDAM operational performance. Secondary data were gathered from performance evaluations published by BPKP and BPPSPAM for the year 2018. These reports contain performance metrics for PDAMs in West Java, Banten, and Jakarta provinces.

Data were analyzed using SPSS, specifically employing multiple regression analysis [9], [10] to examine the relationships between the independent variables (installed capacity and real production volume) and the dependent variable (operational performance). The regression model quantifies how much variation in operational performance can be explained by the two independent variables. Additionally, hypothesis testing (t-tests) was conducted to evaluate the significance of these relationships.

3. RESULTS AND DISCUSSIONS

3.1. Results

Descriptive Statistics

The descriptive statistics help us understand the distribution of the variables in the study. Here's an overview of each variable:

1) Installed Capacity:
   - Minimum = 188
   - Maximum = 20,238Mean = 1,724.70
   - Standard Deviation = 3,655.553
   - The installed capacity of PDAMs varies significantly, with the lowest value being 188 and the highest being 20,238. The mean of 1,724.70 suggests that, on average, PDAMs in these provinces have an installed capacity of around 1,725 units, but there is considerable variation, as shown by the large standard deviation of 3,655.553. This indicates that while some PDAMs have a relatively small installed capacity, others have much larger capacities, affecting the overall average.

2) Real Production Volume:
   - Minimum = 146
   - Maximum = 19,752
   - Mean = 1,480.57
   - Standard Deviation = 3,606.857

Similar to the installed capacity, real production volume also shows large variation. The mean value is 1,480.57, indicating that, on average, PDAMs in the study regions produced about 1,481 units of water. Again, the wide range and high standard deviation suggest that some PDAMs perform far better than others in terms of actual production, which may be influenced by factors such as infrastructure, demand, and management practices.

3) Operational Performance:
   - Minimum = 0.81
   - Maximum = 1.69
   - Mean = 1.2547
   - Standard Deviation = 0.19901

Operational performance, measured here using a performance score, varies from 0.81 to 1.69, with an average of 1.2547. This suggests that while most PDAMs perform fairly well, there are some that have significantly lower operational performance scores. The lower standard deviation (0.19901) indicates that, compared to installed capacity and production volume, the operational performance scores of PDAMs are more consistent across the sample.

Regression Analysis

Table 1. Determinant Coefficient Test Results

Coefficientsa					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.108a	.012	-.062	.20505	2,382

a. Predictors: (Constant), real production volume, installed capacity

b. Dependent Variable: operational

The results of the regression calculations in Table 4.7, show that the determinant coefficient (Adjusted R Square) obtained is 0.012 or 1.2%. This shows that the value of the independent variable, namely installed capacity and real production volume, can explain the dependent variable, namely operational performance of 1.2%. While the rest is (100% - 1.2%) is 98.8% explained by other variables outside the equation.

Multiple regression analysis was used to explore the relationship between the independent variables (installed capacity and real production volume) and the dependent variable (operational performance).

Adjusted R Square:

- The value of Adjusted $R^2 = 0.012$. This indicates that only 1.2% of the variation in operational performance can be explained by the two independent variables, installed capacity and real production volume.
- This is a relatively low percentage, suggesting that other factors—likely not captured in the model—might be more significant in influencing PDAM performance. These could include factors such as management quality, customer satisfaction, policy interventions, infrastructure conditions, or technology adoption.

Hypothesis Testing (t-Test)

Table 2. Partial Hypothesis Test (t Test)

Coefficientsa							
Model	Unstandardized Coefficients			Standardized Coefficients		T	Sig.
	B	Std. Error	Beta				
1	(Constant)	1,273	.062		20,532	.000	
	installed capacity	.000	.000	-1,840	-.483	.633	
	real production volume	.000	.000	1,894	.497		.623

a. Dependent Variable: operational
Source: SPSS Output Data

1) Installed Capacity:
   - The coefficient for installed capacity is -0.483, with a p-value of 0.633. This suggests that although installed capacity does have an effect on operational performance, this effect is not statistically significant.
   - The negative coefficient might indicate that, in this particular study, an increase in installed capacity may not necessarily lead to an improvement in operational performance. This could be due to factors such as inefficiency in using the available capacity or inadequate infrastructure maintenance.
2) Real Production Volume:
   - The coefficient for real production volume is 0.497, with a p-value of 0.623. Like installed capacity, real production volume also has an effect on operational performance, but the relationship is not statistically significant.
   - A positive coefficient implies that higher production volumes may lead to better operational performance, but the lack of significance means that this effect is not strong enough to draw firm conclusions in the context of this study.

The hypothesis testing results suggest that both installed capacity (X1) and real production volume (X2) have an influence on operational performance, but their effects are not statistically significant. Specifically, for installed capacity (X1), the t-value was -0.483, with a significance level of 0.633. Although installed capacity was found to have an influence on operational performance, this influence was not statistically significant at the 0.05 level, meaning it does not significantly affect the performance. Similarly, for real production volume (X2), the t-value was 0.497, with a significance level of 0.623. Like installed capacity, the real production volume also showed an influence on operational performance, but this effect was not significant either.

Furthermore, when comparing the relative effects of installed capacity and real production volume, it was found that the effect of installed capacity was greater than that of real production volume, as reflected in the significance values. The significance value for installed capacity (0.633) was higher than that for real production volume (0.623), indicating that installed capacity had a somewhat larger, though still statistically insignificant, influence on operational performance.

Based on the hypothesis testing table, it can be described:

1. Installed capacity

   Based on the summary of the results of hypothesis testing, it shows that the first hypothesis, namely installed capacity, has an effect but is not significant. The first hypothesis in this study examines the effect of installed capacity on operational performance. In this study, the results of the first hypothesis showed that there was an effect on operational performance but it was not significant.

2. Real production volume

   Based on the summary of the results of hypothesis testing, it shows that the second hypothesis is that the real production volume has an effect but is not significant. The second hypothesis of this study examines the effect of production volume on operational performance. In this study, the results of the second hypothesis showed that there was an effect but not significant.

3. Installed capacity > real production volume

   Based on the summary of the results of hypothesis testing, it shows that the first hypothesis, namely installed capacity, has a greater effect than the real production volume.

3.2.Discussion

The results from the regression and hypothesis testing show that both installed capacity and real production volume have an impact on operational performance, but neither of these effects is statistically significant. Several potential reasons could explain this lack of significance. First, Infrastructure and Management Practices: The quality of infrastructure and management within PDAMs could play a much larger role in their operational performance than installed capacity and production volume alone. PDAMs with greater installed capacity and higher production volume might still struggle with inefficiencies, such as poor maintenance, management, and customer service. Research by [1] emphasizes that internal business processes, including efficiency in resource utilization, are crucial for achieving operational performance. Similarly, [3] highlights the importance of strategic management and process optimization, suggesting that operational success goes beyond physical capacity and requires robust management practices.

Policy and Regional Factors: Regional factors, including local water policies, government regulations, and economic conditions, might also have a stronger influence on PDAM performance than the physical capacities alone. For instance, regional disparities in water distribution infrastructure, funding, or local governance might contribute to variations in performance that are not captured by installed capacity or real production volume. [4] notes that performance in the public sector, especially in government-controlled utilities like PDAMs, is highly dependent on both local policies and the efficiency of government oversight. [5] further suggests that local governance and regulatory frameworks significantly impact the performance outcomes of public utilities.

The study's model may not account for all possible variables that influence PDAM performance. External variables, such as water quality, environmental factors, customer satisfaction, or even socio-economic conditions of the regions [11], [12][13][14][15], could provide further insights into PDAM operational performance. [2] proposes that performance evaluation models should be comprehensive and integrate a variety of internal and external factors to ensure that all relevant influences are considered. Additionally, [6] mentions that external conditions, including environmental and socio-economic variables, often have a significant impact on operational outcomes that are not captured by traditional performance metrics.

These results suggest that while installed capacity and production volume are important factors, they might not be sufficient indicators for operational performance on their own. Future studies should explore additional variables, such as management effectiveness, customer engagement, or infrastructure investments, to create a more comprehensive model for evaluating PDAM performance. Kaplan and Norton highlight, adopting a balanced scorecard approach allows for a more holistic view of performance, including both financial and non-financial factors [7].

4. CONCLUSION

This study found that installed capacity and real production volume are related to PDAM operational performance but do not significantly influence performance by themselves. To better understand the determinants of operational performance, future research should include a broader set of variables, including management practices, technological innovation, customer service quality, and policy interventions. Furthermore, longitudinal studies could offer insights into how these variables impact long-term performance and the evolution of PDAM services over time.

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