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Research Article

The Effect of Customer Satisfaction on Financial Performance with Digital Service Systems as a Moderating Variable at Perumda Tirtanadi

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Abstract: This research explores the influence of customer satisfaction on the financial performance of Perumda Tirtanadi, with a particular focus on the digital service system as a moderating factor. The study is driven by the growing urgency for digital innovation in public service sectors, particularly in the wake of the COVID-19 pandemic, which significantly altered customer engagement patterns. A quantitative method is adopted, employing Partial Least Squares–Structural Equation Modeling (PLS-SEM) using the SmartPLS 4 software to process the collected data. The analysis demonstrates that both customer satisfaction and digital services have independent and significant positive effects on financial outcomes. However, the interaction between these two variables does not show a statistically significant moderating effect. These findings underline the value of digital infrastructure as a strategic internal resource that supports financial growth. Nevertheless, the minimal moderating impact suggests that a portion of customers either lack access or sufficient skills to effectively utilize the available digital platforms. This study adds to the current body of knowledge by examining the interplay between digital transformation and customer satisfaction in shaping financial performance, framed through the Resource-Based View (RBV) theory. The research suggests that improving digital literacy and promoting better adoption of digital tools among customers is essential to fully capitalize on the benefits of technological advancement. Furthermore, it highlights the need for continuous training and support to ensure that all customers can engage with digital services effectively, thereby enhancing overall satisfaction and financial performance. By addressing these gaps, organizations can foster a more inclusive digital environment that benefits both the customers and the service providers.

Keywords: Customer satisfaction; Digital service system; Financial performance; Moderation; RBV; SEM-PLS.

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1. Introduction

As a regional drinking water company (Perumda), Tirtanadi plays a critical role in delivering clean water to communities across North Sumatra. In fulfilling its mandate to improve service quality, the adoption of technology—particularly digital platforms—has become increasingly essential. Digital services now offer users convenient access to billing information, payment facilities, and complaint channels, all without time constraints.

Clean water is a fundamental need that must be sustainably managed. PerumdaTirtanadi is under pressure not only to enhance service delivery but also to maintain strong financial performance (Siregar&Sembiring, 2020). However, customer complaints related to billing accuracy, service responsiveness, and inconsistent water supply (Ombudsman RI Report, 2022) indicate potential declines in customer satisfaction. This is particularly concerning since

prior research has confirmed that customer satisfaction positively correlates with company profitability.

With rapid technological developments, customers now demand fast, user-friendly, and accessible online services. This growing digital preference is evident across industries, including the public service sector. More and more users now opt for digital interactions to handle tasks such as bill payments, usage tracking, and customer service requests.

In May 2016, during the 111th anniversary of PDAM Tirtanadi, the company officially launched the upgrade of the Sunggal Water Treatment Plant and simultaneously introduced the "Halo Tirtanadi" service at 1500 922, replacing its previous call center. This new hotline aimed to simplify communication and reduce customer burden by offering a toll-free service for reporting issues or checking monthly bills.

The COVID-19 pandemic, beginning in late 2019, significantly disrupted various sectors—including public services. At PerumdaTirtanadi, this global health crisis led to a shift in how customers engaged with available services, driving an accelerated need for digital-based solutions. Physical distancing protocols and restrictions encouraged broader adoption of digital platforms for billing and account management.

Before the pandemic, many companies, including PerumdaTirtanadi, still relied heavily on manual payment systems and in-person interactions. However, with the tightening of health regulations, digital services such as online payments, app-based billing inquiries, and customer support via chat and email became crucial to maintain service continuity and operational efficiency. This shift compelled the company to integrate digital services as a means to improve customer satisfaction.

In recent years, PerumdaTirtanadi has achieved notable improvements in financial and operational governance. In 2023, the company reported an increase in regional income (PAD) to IDR 35 billion, up from IDR 31.5 billion in the previous year. It also received several prestigious awards, including the Golden Trophy Five-Star, in recognition of its excellence in innovation and management.

As a state-owned enterprise managing clean water distribution and wastewater treatment in North Sumatra, the company attributes much of its financial progress to digital innovations—such as mobile apps for bill payment and water usage tracking—that simplify user access and contribute to revenue growth.

The company's financial reports for 2022 showed strong performance, with total assets reaching IDR 1.095 trillion. Of this, current assets accounted for around IDR 422 billion, while non-current assets stood at IDR 673 billion. Net profit also saw a considerable increase, reflecting sound financial management and transparent operations.

Table 1. Income Statement of PerumdaTirtanadi (2020–2023)

Year	Income(IDR)	Expenses (IDR)	Net Income (Loss) (IDR)
2020	9.389.113.846,34	10.765.660.149,34	(1.376.546.303,00)
2021	760.018.545.478,00	695.581.778.987,00	64.436.766.491,00
2022	755.848.442.121,00	689.783.985.766,00	66.064.456.355,00
2023	801.251.841.640,00	734.791.369.363,00	66.460.472.277,00

Source: sumutprov.go.id – Regional Financial Management Index

The financial data in Table 1 highlights a substantial improvement in the financial performance of PerumdaTirtanadi over the four-year period from 2020 to 2023. In 2020, the company experienced a net loss of approximately IDR 1.38 billion. However, starting in 2021, it reported consistent profits, with net income reaching over IDR 64 billion and continuing to grow each subsequent year.

This upward trend coincides with the implementation of the MyTirtanadi application, suggesting that the integration of digital services has played a role in improving operational efficiency and financial results. The consistent rise in revenue and control of expenses has contributed to a steady increase in profitability, with the company recording its highest net income of over IDR 66.46 billion in 2023.

The data clearly indicates that PerumdaTirtanadi has transitioned from a deficit in 2020 to strong financial gains in the following years, reflecting successful adaptation to digital transformation and improved service delivery to customers.

2. Literature Review

2.1 Resource-Based View (RBV)

The Resource-Based View (RBV) is a strategic management theory that emphasizes that a firm's sustainable competitive advantage originates from its internal resources and capabilities. These resources must meet four criteria, often referred to as the VRIO framework: they must be Valuable, Rare, Inimitable, and Organized. According to this theory, internal factors are more critical than external conditions when it comes to creating long-term superior performance.

Resources within this framework include both tangible and intangible assets owned by the firm—such as technology, branding, patents, human resources, and digital systems. Furthermore, the company's capabilities—its ability to effectively deploy these resources—are equally important. These capabilities may include digital innovation, AI-based customer relationship management, internal processes, knowledge, and information systems that are difficult for competitors to replicate.

2.2 Digital-Based Service Systems

Digital service systems refer to the use of internet-based technology platforms to deliver services to customers. These systems facilitate online interaction between service providers and users without the need for physical meetings. Customers can access these services anytime and from anywhere, provided they have a connected digital device.

Essentially, digital service systems enable automation and streamlined service delivery, improving response times, reducing operational costs, and increasing customer satisfaction. They empower companies to better manage their interactions and transactions with clients in a scalable, flexible, and efficient manner.

2.3 Customer Satisfaction

According to Kotler, customer satisfaction is defined as "a person's feeling of pleasure or disappointment resulting from comparing a product's perceived performance (or outcome) to their expectations." Satisfaction occurs when performance meets or exceeds expectations; dissatisfaction arises when expectations are not met.

Westbrook and Reilly define customer satisfaction as an emotional response to a consumption experience associated with a specific product or service. Fundamentally, customer satisfaction reflects the gap between perceived performance and customer expectations, making it a crucial determinant in repeat purchasing, loyalty, and word-of-mouth promotion.

3. Research Methodology

The analytical process used in this research involves examining and interpreting data collected from respondents, following the approach outlined by Sugiyono (2018: 226). After gathering all responses, the data were subjected to statistical analysis to evaluate how customer satisfaction—mediated through digital service platforms—affects the financial performance of PerumdaTirtanadi.

This study employs a quantitative research design, utilizing Partial Least Squares Structural Equation Modeling (PLS-SEM) as the core analytical technique. The analysis was conducted using SmartPLS 4, a software tool well-suited for handling complex models that include moderating variables and work effectively with small to moderate sample sizes.

PLS-SEM allows for the simultaneous assessment of both the measurement model (to verify the validity and reliability of constructs) and the structural model (to evaluate hypothesized relationships among variables). This method is particularly appropriate in this context because it supports both reflective and formative indicators and does not require the data to meet strict normality assumptions.

Through this method, the study aims to identify:

- The direct impact of customer satisfaction on financial performance,
- The influence of digital service systems on financial performance,
- The moderating effect of digital service systems on the relationship between customer satisfaction and financial performance.

These relationships are evaluated using key statistical indicators such as path coefficients, t-values, p-values, R^2 values, and effect size measures, providing insights into the magnitude and significance of the connections within the proposed conceptual model..

4. Results and Discussion

Results

4.1. Reliability Test

Table 2. Reliability Test Results

	Cronbach's Alpha	Composite Reliability	Composite Reliability (Rho_C)	Average Variance Extracte
Customer Satisfaction (X)	0.901	0.901	0.927	0.717
Financial Performance (Y)	0.918	0.924	0.939	0.754
Digital Service	0.918	0.918	0.939	0.752

Based on the results presented in Table 2, it is evident that all constructs in the model have Cronbach's Alpha and Composite Reliability (CR) values above 0.70, which indicates acceptable internal consistency. According to standard statistical criteria, a construct is considered reliable if its Cronbach's Alpha exceeds 0.70.

However, even in cases where Cronbach's Alpha is slightly below the threshold, the construct can still be deemed reliable if its Composite Reliability (CR) ≥ 0.70 and Average Variance Extracted (AVE) ≥ 0.50. In this study, all variables satisfy these criteria, confirming that the constructs used in the model are both reliable and statistically valid.

This means the measurement items used for each construct consistently reflect the underlying theoretical variables, allowing for accurate interpretation in subsequent structural analyses.

4.2 Validity Test

Table 3. Convergent and Discriminant Validity Test Results

	Customer Satisfaction (x)	Financial Performance (Y)	Digital Service (Z)
Customer Satisfaction (X)	0.947		
Financial Performance (Y)	0.699	0.868	
Digital Service (Z)	0.786	0.787	0.868

Based on the findings shown in Table 3, each construct's square root of the Average Variance Extracted (AVE) is greater than the correlations between that construct and others in the model. This satisfies the criteria for discriminant validity, which ensures that each construct is truly distinct from the others.

In simple terms, the indicators that measure a particular variable (e.g., customer satisfaction or digital service system) are more strongly correlated with their own construct than with other variables in the model. This confirms that the instruments used accurately measure what they are intended to measure.

Thus, it can be concluded that all constructs in this study are valid, meeting the threshold for convergent and discriminant validity, and can be confidently used in the structural model evaluation.

4.3 R Square.

Table 4. R-Square Values

	r-square	r-square adjusted
Financial Performance (Y)	0.636	0.628

The R-Square value obtained for the Financial Performance variable is 0.636. This indicates that the combination of Customer Satisfaction and Digital Service Systems explains approximately 63.6% of the variance in financial performance. The remaining 36.4% is influenced by other variables not included in the current research model.

This R-Square value reflects a strong model fit, suggesting that the independent variables used—particularly internal factors as framed by the Resource-Based View (RBV)—are effective in explaining the dependent variable.

Additionally, the Adjusted R-Square value is reported as 0.628, which takes into account the number of predictors in the model and confirms the reliability of the R^2 value.

In the context of RBV theory, this result supports the idea that internal resources—such as customer satisfaction and digital innovation—serve as critical drivers for achieving sustainable financial performance.

4.4 Effect Size

Table 5. Effect Size (f^2) Results

	Variable Relationship
Customer Satisfaction → Financial Performance	0,047
Digital Service System → Financial Performance	0,382
Customer Satisfaction × Digital Service System → Financial Performance	0,001

Based on the table above, the effect size of the relationship between Customer Satisfaction and Financial Performance is 0.047, which falls within the category of small effect. This suggests that although customer satisfaction has a statistically significant impact, its contribution to financial performance is limited in magnitude.

In contrast, the Digital Service System shows a large effect size of 0.382, indicating that this variable plays a substantial role in shaping financial performance. This confirms that digital systems are a critical strategic asset for improving operational outcomes.

The interaction term between Customer Satisfaction and Digital Service System (moderating effect) has an effect size of just 0.001, which is extremely small. This implies that, statistically, the moderating effect of digital services on the relationship between customer satisfaction and financial performance is negligible. In other words, while both variables individually impact financial performance, their combined interaction does not significantly strengthen that relationship.

4.5 Hypothesis Testing

Table 6. Hypothesis Testing Results

	Path Koefisien	T statistics	P Values	F squer
Customer Satisfaction → Financial Performance	0,251	2115	0,034	0,047
Digital Service System → Financial Performance	0,631	6030	0,000	0,382
Customer Satisfaction × Digital Service System → Financial Performance	0,019	1881	0,787	0,001

a) H1: Customer Satisfaction → Financial Performance
The p-value of 0.034 (< 0.05) and t-statistic of 2.115 (> 1.96) confirm that this path is statistically significant. The positive coefficient (0.251) indicates a moderate, positive relationship—meaning greater customer satisfaction leads to improved financial performance. However, the effect size (0.047) suggests that this contribution is statistically small.

b) H2: Digital Service System → Financial Performance
This hypothesis is also supported, with a p-value of 0.000, t-statistic of 6.030, and a strong path coefficient (0.631). These values indicate a highly significant and strong positive influence, meaning digital systems substantially enhance financial performance. The effect size (0.382) reinforces this interpretation.

c) H3: Moderating Role of Digital Service System
The interaction term between customer satisfaction and digital services yields a p-value of 0.787 (> 0.05) and a t-statistic of 1.881 (< 1.96), indicating that this effect is not statistically significant. The very small path coefficient (0.019) and effect size (0.001) show that the digital service system does not meaningfully moderate the relationship between customer satisfaction and financial performance.

In summary, while customer satisfaction and digital services independently influence financial performance, their combined interaction does not provide a significant moderating effect.

Discussion

H1 – The Effect of Customer Satisfaction on Financial Performance

The results of the analysis confirm that customer satisfaction has a positive and statistically significant effect on financial performance. With a path coefficient of 0.251, a t-statistic of 2.115, and a p-value of 0.034, it is evident that higher levels of customer satisfaction are associated with better financial outcomes for the company.

However, the effect size ($f^2 = 0.047$) suggests that this influence is relatively small. Although significant, customer satisfaction alone does not explain a large portion of financial performance variability. This implies that other factors—such as operational efficiency, service tariffs, and the number of active customers—also play important roles.

Findings from the SEM-PLS analysis show that when customers are satisfied with service quality, responsiveness, pricing fairness, and the convenience of digital platforms provided by PerumdaTirtanadi, these perceptions translate into tangible financial gains. Indicators such as improved Return on Equity (ROE), a more efficient Operating Ratio, and higher Total Asset Turnover (TATO) reflect this impact. Satisfied customers are more likely to remain loyal, pay bills promptly, use services actively, and recommend the company to others. All of these behaviors contribute positively to revenue generation and operational cost savings. Despite this, the modest effect size indicates that satisfaction is not the sole driver of financial success.

H2 – The Effect of Digital Service Systems on Financial Performance

The analysis also indicates that digital service systems have a significant and powerful impact on financial performance. With a path coefficient of 0.631, a t-statistic of 6.030, and a p-value of 0.000, the results demonstrate a strong direct relationship.

This conclusion is further supported by a large effect size ($f^2 = 0.382$). These findings align with the Resource-Based View (RBV) theory (Barney, 1991), which states that for a company to gain a sustainable competitive advantage, it must possess resources that are valuable, rare, inimitable, and well-organized.

In the context of PerumdaTirtanadi, the digital service platforms—including the MyTirtanadi application and the Halo Tirtanadi website—meet these criteria:

- Valuable: Enhance service access, lower costs, and improve efficiency
- Rare: Not yet widely adopted across similar regional water utilities
- Inimitable: Built in-house, difficult for competitors to replicate quickly
- Organized: Supported by the company's structure and technological infrastructure

Therefore, digital service systems are not merely support tools but act as strategic assets that significantly improve financial performance and customer experience. The strong influence observed confirms RBV's claim that internal digital capabilities can drive long-term competitive advantage.

H3 – Moderating Role of Digital Service Systems

The third hypothesis proposed that digital service systems moderate the relationship between customer satisfaction and financial performance. However, the analysis shows a path coefficient of only 0.019, a t-statistic of 1.881, and a p-value of 0.787, which is well above the 0.05 threshold for significance. Moreover, the effect size ($f^2 = 0.001$) is negligible.

These results indicate that digital service systems do not significantly strengthen or weaken the relationship between customer satisfaction and financial performance. Several factors may explain this:

- Not all customers actively use or understand the digital services provided.
- Customer adoption of platforms like MyTirtanadi and Halo Tirtanadi might still be limited.

- Differences in digital literacy, particularly among older or technologically inexperienced users, may prevent them from fully benefiting from these services.

Moreover, the relationship between customer satisfaction and financial performance may already be strong on its own—regardless of whether digital services are involved. Satisfied customers may still pay bills on time and remain loyal, even if they do not engage with the company's digital platforms.

According to RBV, digital systems can serve as strategic resources if effectively utilized and fully integrated into business processes. However, if these platforms are not optimally used by customers or not yet fully embedded in the core service structure, they may fail to moderate the satisfaction–performance link.

In conclusion, while digital platforms have a strong direct impact on financial performance, their role as a moderator remains statistically insignificant. To maximize their moderating potential, PerumdaTirtanadi needs to enhance digital literacy among its customers, improve user adoption, and ensure that digital solutions directly improve service satisfaction levels.

5. Conclusions

Based on the findings presented in the previous sections, this study draws several important conclusions regarding the effect of customer satisfaction on the financial performance of PerumdaTirtanadi, with digital service systems serving as a moderating variable:

- Customer satisfaction has a significant positive influence on financial performance. Higher levels of customer satisfaction contribute to better financial outcomes. Although the effect size is relatively small, customer satisfaction plays a meaningful role in shaping financial health, particularly in supporting revenue generation, customer loyalty, and timely bill payments.
- Digital service systems exert a strong and significant positive effect on financial performance. The implementation of digital platforms—such as MyTirtanadi and Halo Tirtanadi—has enhanced operational efficiency, reduced costs, and improved customer experience. These systems serve as strategic assets that align with the principles of the Resource-Based View (RBV), contributing directly to the company's competitive advantage and profitability.
- Digital service systems do not significantly moderate the relationship between customer satisfaction and financial performance. Although digital platforms independently influence financial performance, their role as a moderator in strengthening the link between customer satisfaction and financial outcomes was found to be statistically insignificant. This could be attributed to limited adoption, varying levels of digital literacy among customers, or insufficient integration of digital tools into the service experience.
- Digital transformation since the COVID-19 pandemic has played a crucial role in maintaining and enhancing financial performance. PerumdaTirtanadi's strategic move toward digital service delivery has helped the company adapt to changes in consumer behavior and operational challenges, ensuring business continuity and financial resilience.

In summary, both customer satisfaction and digital innovation are key internal resources that significantly affect company performance. However, for digital systems to also function as effective moderators, further efforts are required to boost customer engagement, digital accessibility, and integration across service processes.

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