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Driving Public Service Quality through Innovation and CRM: A Study of Perumda Air Minum Tirta Pakuan, Bogor

Ahmad Dzaki Rabbani[1], Alim Setiawan Slamet[2], Jono Mintarto Munandar[3], Furqon Syarief Hidayatulloh[4]
[1,2,3,4]IPB University, Indonesia

Evaluating public service quality is fundamental in measuring the performance of government institutions, particularly in sectors regulated by law. One of the most vital infrastructure services is the provision and management of clean water by regional water utilities. This study focuses on Perumda Air Minum Tirta Pakuan in Bogor City, a benchmark utility expected to exemplify innovation and high-quality service delivery. The research investigates the influence of innovation and customer relationship management (CRM) on service quality and formulates strategic recommendations. A mixed-methods approach was employed, combining descriptive statistics, Structural Equation Modeling–Partial Least Squares (SEM-PLS), and SWOT analysis. The study involved 140 customer respondents and five experts. Findings confirm that innovation and CRM have a positive and significant effect on service quality, with CRM also positively influencing innovation. Based on these insights, a growth and development strategy is recommended to strengthen Tirta Pakuan's service excellence.

Keywords: Customer Relationship Management; Innovation; Service Quality

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*Correspondence:
Ahmad Dzaki Rabbani
dzakirabbani@apps.ipb.ac.id

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INTRODUCTION

Public service delivery is one of the key benchmarks by which citizens evaluate the performance and effectiveness of government institutions. In Indonesia, Law No. 25 of 2009 serves as the legal foundation for ensuring that the public receives high-quality services.

Within the infrastructure sector, the Regional Public Water Utility (Perusahaan Umum Daerah/Perumda Air Minum) plays a vital role in providing clean water access and is authorized to manage water distribution to communities (Imaniyar & Kustanti, 2014). In addition to water distribution, these utilities are responsible for maintaining the pipeline network, water installations, and related infrastructure. Their operations are governed not only by local governments but also by regulations from the Ministry of Home Affairs, Ministry of Public Works and Public Housing (PUPR), Ministry of Health, and other relevant authorities.

As a key provider of a basic necessity, clean water, Perumda Air Minum contributes directly to the achievement of Sustainable Development Goal (SDG) 6: Clean Water and Sanitation. This goal reflects a global commitment to ensuring universal access to safe water and adequate sanitation. Improved access not only enhances public health and productivity but also lays the foundation for inclusive and sustainable development. Ensuring clean water availability is thus critical for intergenerational well-being and for fostering a healthy, productive environment.

Since the reform of national structures and policies in 1998, Perumda Air Minum has undergone significant transformations. The government has aimed to enhance transparency and efficiency in company management, improve infrastructure, and implement restructuring programs across regions. In recent years, there has been a renewed commitment to investing in water resource infrastructure and modern technologies to improve water service delivery.

However, regional water utilities face diverse challenges that vary by locality. One persistent issue is the inability to fully meet community water demands, as evidenced by numerous public complaints concerning low water pressure or complete water outages. From a quality standpoint, challenges include high turbidity of raw water during the rainy season, malfunctioning treatment units, and other risks affecting water quality (Yogaswara & Moesriati, 2021).

Addressing customer complaints is a critical indicator of service performance, as dissatisfaction with Perumda Air Minum has been widely reported across Indonesia. Customers expect fast and responsive service when submitting complaints, accessing information, or conducting transactions (Halief & Putro, 2017; Nurlita & Arif, 2019). As a service-oriented company, service quality forms the frontline of Perumda Air Minum's corporate image. According to (Halief & Putro, 2017), good service is characterized by transparency, clear procedures, information certainty, fairness, safety and comfort of services, and staff conduct. However, a gap still exists between community expectations and the actual service quality delivered (Nurlita & Arif, 2019).

A potential solution lies in leveraging digital technologies to increase responsiveness. Innovation and strong customer relations can foster a more supportive environment for both the utility and its customers. Innovation is influenced by various factors including organizational culture, human resources, demographics, market developments, legal frameworks, and regulatory policies. Given its close interaction with these elements, Perumda Air Minum is well-positioned to drive innovation.

One strategic approach to improving service quality is through Customer Relationship Management (CRM), which helps enhance customer satisfaction, loyalty, and profitability by building and maintaining effective relationships and stakeholder engagement (Baashar et al., 2020).

Some regional water utilities have been recognized for their exemplary service, including Perumda Tirta Pakuan of Bogor City, which is considered a model water utility in Indonesia. In 2024, Tirta Pakuan was named one of the best regionally owned enterprises (BUMD) and ranked third nationwide by the Ministry of Public Works and Housing for its water service management. This evaluation was based on four key performance indicators as outlined in Article 59 of the Ministerial Regulation on the Development of Drinking Water Systems: financial performance, operations, service delivery, and human resources.

The service dimension includes service coverage, customer growth, complaint resolution, customer water quality, and domestic water consumption. One of Tirta Pakuan's main challenges lies in balancing the number of customers with adequate water distribution. In 2024 alone, the utility received over 36,000 customer

Table 1. Tirta Pakuan's 2024 Customer Complaints Data

No.	Type of Complaint	Total Complaints	Percentage (%)
1	Distribution/service pipe leakage	4130	11,24
2	Leakage near the water meter	2110	5,74
3	Damaged stop cock/gate valve	966	2,63
4	Leakage in customer's internal piping	4237	11,54
5	Unfinished excavation site	51	0,14
6	Low water pressure	901	2,45
7	Murky/turbid water	1924	5,24
8	No water supply	10478	28,53
9	Cloudy/unclear water meter display	4477	12,19
10	Relocation of water meter	5781	15,74
11	Jammed/stuck water meter	934	2,54
12	Broken water meter glass	16	0,04
13	Missing water meter	111	0,30
14	Malfunctioning water meter reading	2	0,01
15	Missing meter seal	7	0,02
16	Other remarks / Miscellaneous complaints	10	0,03
17	Incorrect tariff classification	593	1,61
Total		**36728**	**100**

complaints, with nearly 30% concerning water not flowing.

In terms of innovation, Tirta Pakuan has taken significant steps toward digital transformation, allowing for quicker problem detection and easier access for customers to file reports or conduct transactions. Regarding CRM implementation, the utility has expanded its public engagement through social media, its official website, and mobile apps. More personalized communication is also offered via WhatsApp and real-time notifications about service disruptions.

Despite these advances, empirical studies remain limited on how innovation and CRM directly affect service quality in Perumda Tirta Pakuan. As a model utility, if these two factors are found to significantly improve service quality, they could serve as valuable references for other water utilities with similar characteristics. Therefore, this study aims to analyze the effects of innovation and CRM on service quality, the influence of CRM on innovation, and formulate strategies to enhance the service quality of Perumda Tirta Pakuan in Bogor City.

LITERATURE REVIEW

Service Quality

According to (Tjiptono & Chandra, 2020), service quality encompasses all aspects of a product or service offering that are capable of delivering benefits to customers. (Sharma et al., 2024) further describe service quality as a comprehensive evaluation of service excellence, which is determined by the gap between customer expectations and actual performance. This evaluation plays a critical role in attracting and retaining customers.

Based on these definitions, service quality can be understood as a multidimensional concept that involves the interaction between products, services, people, processes, and the environment. These elements work together to fulfill customer needs and deliver added value.

In the context of public services, service quality is a crucial factor that significantly affects organizational outcomes, particularly in terms of public satisfaction. People tend to express higher satisfaction when the services provided meet or exceed expectations, and conversely, express dissatisfaction when services fall below established standards (Mulyapradana et al., 2022).

To achieve high-quality service, it is important to adopt a standardized framework for measurement. One widely used model is the SERVQUAL dimensions proposed by (Zeithaml & Parasuraman, 2004). This model identifies five key dimensions of service quality: tangibles, reliability, responsiveness, assurance, and empathy.

- Tangibles refer to the physical appearance of facilities, equipment, and personnel. This includes

visible attributes such as staff uniforms, buildings, and infrastructure.

- Reliability, in contrast, is an intangible dimension that reflects the ability to deliver promised services accurately and dependably.
- Responsiveness is the willingness and ability of staff to assist customers and provide prompt service.
- Assurance relates to the competence, courtesy, and credibility of employees, and their ability to instill trust and confidence in the service users.
- Empathy involves understanding and caring for individual customer needs, which is demonstrated through personalized service and attention.

Innovation

(Sari et al., 2023) define innovation as the deliberate introduction and application of new ideas, processes, products, or procedures within a work unit, aimed at generating benefits for individuals, groups, organizations, and society at large. Meanwhile, (Wipulanusat et al., 2019) describe innovation in the public sector as the creation and implementation of new techniques, processes, products, and services to enhance sector performance and respond to public needs.

According to Rogers, as cited in (Lestari et al., 2020), innovation refers to an idea, practice, or object that is perceived as new by an individual or group and is subsequently adopted. Rogers proposed several indicators to assess the characteristics of innovation:

- Relative Advantage: An innovation must demonstrate superiority or added value compared to previous alternatives. The element of novelty is essential, distinguishing it from prior versions or solutions.
- Compatibility: An innovation should be compatible with existing systems or practices. This ensures that prior innovations are not discarded entirely, which can be cost-effective and facilitate a smoother transition and learning process.
- Complexity: As a novel idea or process, innovation may involve a higher level of complexity. However, this is generally acceptable if it offers improved or more effective outcomes compared to previous approaches.
- Trialability: Innovations should be testable, allowing stakeholders to evaluate their advantages before full-scale adoption. The trial phase enables users to assess performance and build confidence in the innovation.
- Observability: The results and benefits of innovation must be observable. Stakeholders need to clearly see how the innovation functions and the improvements it brings.

Previous research has examined the relationship between innovation and service quality. For example, (Rew et al., 2020) analyzed the connection between innovation, quality, productivity, and customer satisfaction in service-based companies and found that innovation has a positive impact on service quality. Similarly, (Chen & Shen, 2019) reported a significant positive correlation between service innovation and service quality.

Customer Relationship Management (CRM)

Strategically, Customer Relationship Management (CRM) is a holistic approach that encompasses the processes of customer acquisition, selection, retention, and collaboration, with the ultimate goal of enhancing customer loyalty and profitability (Kandell, 2000; Parvatiyar & Sheth, 2001; Swift, 2001). In this context, an effective CRM strategy should be able to create added value for customers through relationship management, the development of loyalty programs, and innovation in products and services (Sen & Sinha, 2011).

More broadly, CRM can be understood as a strategic system that integrates information, business processes, technology, and human resources with the main objective of strengthening a company's relationships with its customers (Becker et al., 2009); Kincaid, 2003). This system manages key business activities such as marketing, sales, customer service, and support to identify, retain, and enhance customer value (Wang & Feng, 2012).

Based on the literature reviewed, it can be concluded that the primary objective of CRM is to reinforce the relationship between a company and its customers by strategically managing CRM activities, including the processes of customer identification, acquisition, retention, and development. Ultimately, this is aimed at increasing customer loyalty and long-term profitability (Ngai et al., 2009).

METHODOLOGY

Research Method

This study adopts a mixed-method approach, combining both quantitative and qualitative research methods. The quantitative method involves numerical

data that describe quantities, amounts, or specific ranges, which are collected and analyzed to support the formulation of research conclusions (Albers, 2017). In contrast, the qualitative method focuses on the subjective assessment of attitudes, opinions, and behaviors, allowing for deeper exploration of the research context (Kusumastuti & Khoiron, 2019).

In this study, the quantitative approach is employed to examine the relationships between variables, while the qualitative approach is used to gain deeper insights and develop strategic recommendations for Tirta Pakuan to improve the quality of its services.

Type of Data

The data used in this study are primary data, which were collected directly by the researcher from first-hand sources in the field (Bungin, 2015). Data collection was carried out through questionnaire responses from participants and interviews with expert respondents.

The sampling method used in this study is purposive sampling, where the sample is selected based on specific criteria. In this case, respondents were selected based on the following criteria: domiciled in Bogor City, users of Tirta Pakuan services, and regularly engaged in transactions with Tirta Pakuan.

According to (Hair et al., 2017), the number of respondents can be determined by applying a ratio of 10 respondents for each indicator. As this study utilizes 14 indicators, the required sample size is 140 respondents. In addition, five expert respondents were involved in the qualitative portion of the research, consisting of representatives from academia, industry practitioners, and customer representatives.

Data Analysis

After all data were successfully collected, data processing was conducted to enable analysis and to address the research questions. In this study, quantitative data were analyzed using Structural Equation Modeling (SEM), while qualitative data were examined using SWOT analysis.

SEM was selected because it offers greater advantages and the ability to analyze complex models comprehensively, compared to other methods commonly used in management research, such as path analysis and multiple regression analysis (Haryono & Wardoyo, 2012; Maysyaroh et al., 2024).

Based on the aforementioned framework, this study proposes three hypotheses:

H_1 = Innovation has a significant effect on the service quality of Tirta Pakuan

H_2 = CRM has a significant effect on the service quality of Tirta Pakuan

H_3 = CRM has an effect on the innovation of Tirta Pakuan

Meanwhile, in the SWOT analysis, strategy formulation is carried out through the development of two matrices: an internal matrix and an external matrix. The internal matrix consists of strengths and weaknesses, while the external matrix comprises opportunities and threats. These two matrices are then matched to generate strategic recommendations.

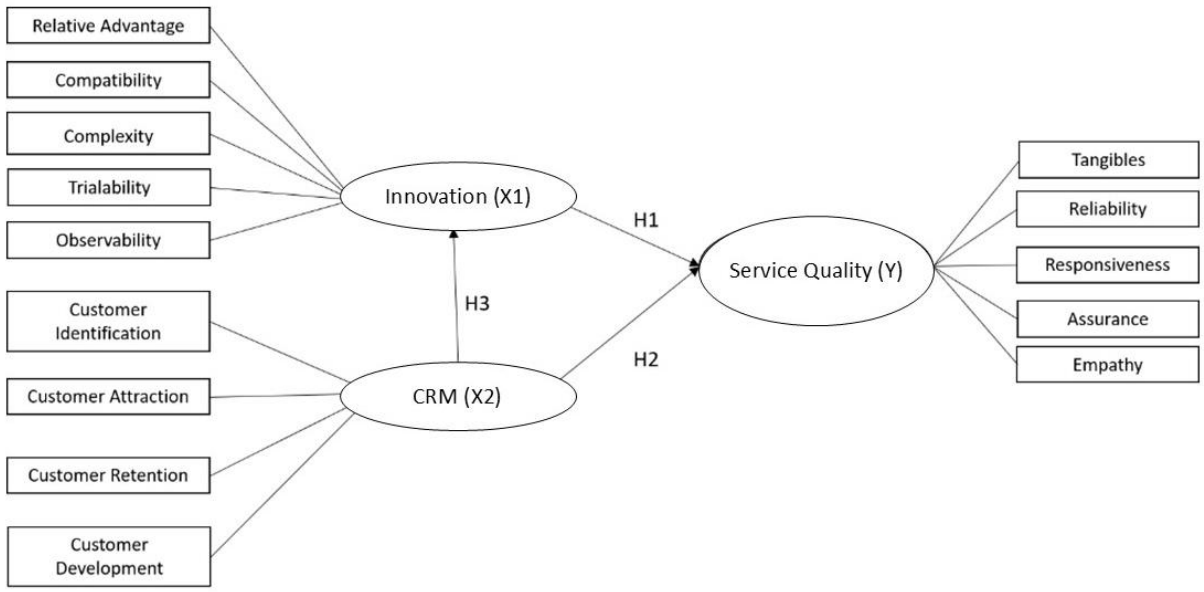

Figure 1. Research framework

ANALYSIS

Bogor City is located in West Java Province and is an enclave within Bogor Regency. As of 2024, there are approximately 320,000 households in Bogor City, 66.14% of which are customers of Tirta Pakuan. On average, customers consume 20.01 cubic meters per household connection (SR) per month. Tirta Pakuan produces 2,584 liters of water per second, with an average tariff of IDR 7,232. The non-revenue water (NRW) rate is recorded at 24.41%, which is slightly lower than the national average of 25%.

Bogor City consists of six sub-districts (kecamatan) and 68 urban villages (kelurahan). Several rivers flow through the area, including the Cisadane, Ciliwung, and Cidepit Rivers, which serve as raw water sources for Tirta Pakuan. The region also has several natural springs, such as Tangkil and Bantar Kambing Springs. To facilitate service delivery, Tirta Pakuan divides its operational area into seven service zones spread across the sub-districts.

Respondent Characteristics

This study involved 140 respondents who are residents of Bogor City and active customers of Perumda Tirta Pakuan. The distribution of respondent characteristics based on domicile, average monthly water bill, type of residence, and communication history with Tirta Pakuan is presented in Table 2.

As shown in Table 2, the highest proportion of respondents resides in West Bogor (Bogor Barat), accounting for 29.3% of the total. Other respondents are distributed across Tanah Sareal (22.9%), North Bogor (17.9%), South Bogor (15.7%), Central Bogor (8.6%), and East Bogor (5.7%).

Table 2. Respondent Characteristics

Characteristic		Total (persons)	Percentage (%)
Domicile	West Bogor	41	29,3
	South Bogor	22	15,7
	Central Bogor	12	8,6
	East Bogor	8	5,7
	North Bogor	25	17,9
	Tanah Sareal	32	22,9
Average monthly bill	< IDR100.000	25	17,9
	IDR 100.000 – IDR 200.000	67	47,9
	IDR 200.000 – IDR 300.000	28	20,0
	IDR 300.000 – IDR 400.000	12	8,6
	> IDR 400.000	8	5,7
Type of residence	Residential area	64	45,7
	Cluster	21	15,0
	Detached/single-family house	55	39,3
Known service channels	Social media	55	39,1
	Official website	26	19,0
	Mobile App (SIMOTIP)	30	21,2
	Don't know	29	20,7
Communication history with Tirta Pakuan	Yes	41	29,3
	No	99	70,7

In terms of water usage, the most common monthly bill among Tirta Pakuan customers ranges between IDR 100,000 and IDR 200,000, representing 47.9% of all respondents. This variation is also influenced by the type of residence, with the majority of respondents (45.7%) living in housing complexes, followed by those residing in single/tapak houses (39.3%) and gated residential clusters (15%).

To enhance communication with its customers, Tirta Pakuan provides several service channels, including social media, its official website, and the Sistem Informasi Mobile Tirta Pakuan (SIMOTIP) mobile application. However, not all customers are aware of these channels. The most widely recognized platform is social media, known by 39.1% of respondents. Despite being launched in 2017, the

SIMOTIP app is known by only 21.2%, and just 19% are aware of the official website. The remaining respondents are unaware of any of these service platforms. Moreover, despite the availability of multiple communication channels, only 29.3% of respondents reported ever being contacted by Tirta Pakuan through SMS, social media, or the application, while the majority stated otherwise.

Based on their experience as Tirta Pakuan customers, respondents provided general assessments on several service aspects, including response to customer complaints, quality of service facilities and supporting infrastructure, service tariff appropriateness, and overall service quality. The detailed results of these assessments are presented in Table 3.

Table 3. Respondents' Overall Assessment

Type of Assessment	Average Rating
Response to customer complaints	3,5
Service facilities and supporting infrastructure	3,57
Service tariff appropriateness	3,32
Overall service quality	3,54

As shown in Table 3, all aspects were rated highly except for the appropriateness of service tariffs, which received a moderate rating. This may be attributed to technical issues, such as undetected water leaks that lead to unexpectedly high bills, as well as administrative issues, such as incorrect customer classification. Another reason is that several respondents perceived the water tariff as too expensive, either in terms of affordability or the perceived mismatch between service cost and the quality of products and services received, making the tariff burdensome for some customers.

In contrast, other service aspects were rated as fairly satisfactory by respondents: response to customer complaints (3.5), service facilities and supporting infrastructure (3.57), and overall service quality (3.54).

Measurement Model Evaluation

Outer model evaluation was conducted to assess the measurement model in terms of its validity and reliability. Validity was evaluated using indicator loadings, while Cronbach's Alpha and Composite Reliability (CR) were used to assess the reliability of the constructs.

As shown in Figure 2, all indicators for the variables innovation, CRM, and service quality demonstrated outer loading values above 0.70. This indicates that the indicators exhibit good convergent validity and are reliable in measuring their respective constructs. Furthermore, the values of Cronbach's Alpha and Composite Reliability shown in Table 4 exceed the threshold of 0.70, suggesting that all constructs meet the criteria for internal consistency reliability.

Table 4. Reliability result

Variable	Cronbanch's Alpha	Composite Reliability
CRM (X2)	0,889	0,923
Innovation (X1)	0,943	0,957
Service Quality (Y)	0,926	0,944

Structural Model Evaluation

Structural model evaluation is conducted to examine the influence between the variables being tested. This evaluation also determines the direction and magnitude of the relationships among the variables. The results of the analysis are presented in Table 5, which shows the path coefficients for each relationship investigated in the model.

Based on the SEM-PLS analysis, the results indicate that all hypotheses are statistically supported. The relationship between Innovation and Service Quality has a coefficient of 0.422, with a t-value of

4.096 and p-value of 0.000, indicating a significant effect.

Similarly, the relationship between CRM and Service Quality shows a coefficient of 0.465, with a t-value of 4.455 and p-value of 0.000, also indicating significance.

Meanwhile, the relationship between CRM and Innovation has a coefficient of 0.855, with a t-value of 36.174 and p-value of 0.000, suggesting a very strong and significant influence.

The R^2 value for Service Quality is 0.730, meaning that 73% of the variance in Service Quality can be explained by Innovation and CRM simultaneously.

The R^2 value for Innovation is 0.731, indicating that 73.1% of the variance in Innovation is explained by CRM.

The effect size of Innovation on Service Quality, indicated by a t-value of 4.096, is considered strong. This finding aligns with (Antonio et al., 2023), who reported a positive and significant influence of innovation on public service quality. Similarly, (Kristanti et al., 2023) found that innovation contributes to the improvement of service quality.

In line with these results, (Anggraeny, 2013) also highlighted that innovation plays a key role in enhancing service delivery. (Rima Nurmalah et al., 2024) further support this conclusion, emphasizing that innovation has a critical role in influencing service quality. Among the various innovations introduced by Tirta Pakuan, one notable example is the implementation of a Geographic Information System (GIS) to support operational

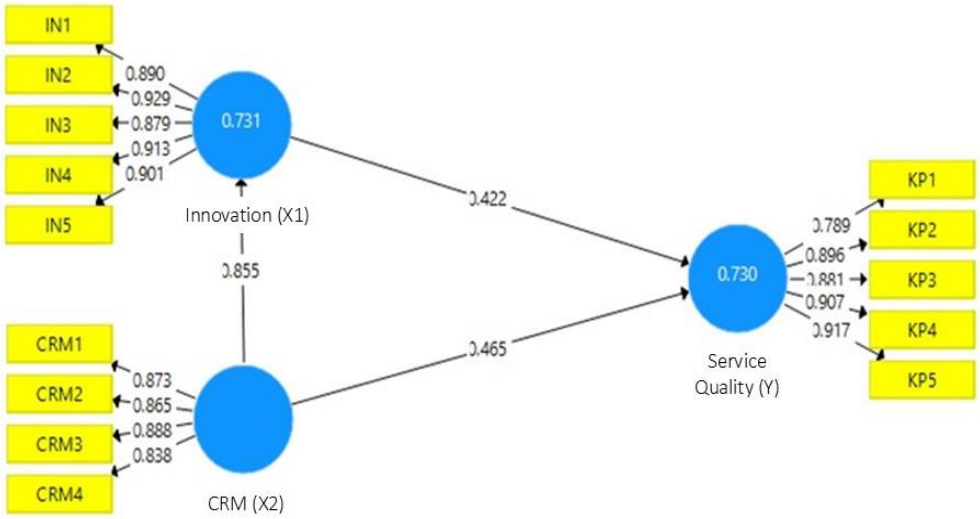

Figure 2. Loading indicator

Table 5. Structural model evaluation results

Relationship	Path Coef.	t-statistic	p-value	R^2
Innovation → Service Quality	0,422	4,096	0,000	0,730
CRM → Service Quality	0,465	4,455	0,000	0,730
CRM → Innovation	0,855	36,174	0,000	0,731

efficiency and service delivery. This computer-based system facilitates the visualization and integration of various types of geographic and location data. Through this system, the company is able to perform real-time monitoring of water distribution conditions, including pipelines, connections, and customer data. As a result, technical issues can be identified and addressed more quickly and accurately. This significantly contributes to improving operational efficiency and the handling of customer complaints.

In addition, Table 5 shows that CRM has a strong influence on service quality, with a t-value of 4.455. This finding is in line with (Munira, 2015), who demonstrated that CRM has a significant impact on service quality. As part of its CRM implementation efforts, Tirta Pakuan regularly conducts customer satisfaction surveys to gather feedback and improve service delivery.

This activity is not only intended to measure customer satisfaction with the services provided, but also serves as a means to collect constructive

suggestions, criticisms, and feedback. The feedback obtained forms an important foundation for the evaluation and improvement of services, particularly in aligning service delivery with customer needs and expectations. This process reflects Tirta Pakuan's commitment to building long-term, harmonious relationships with its customers, while simultaneously supporting the overall enhancement of service quality.

Furthermore, CRM demonstrates a strong influence on innovation, with a t-value of 36.174, indicating a substantial effect. This result is consistent with the findings of (Valmohammadi, 2017), who confirmed that CRM implementation has a significant impact on innovation.

Within the context of Tirta Pakuan, a concrete example of CRM-driven innovation is reflected in the development of a digital information system application called SIMOTIP. This application was designed to strengthen interaction between the company and its customers by offering a range of digital service features.

Key features of SIMOTIP include bill and account checking, new connection requests, self-reporting of meter readings, and a customer complaint channel. The presence of SIMOTIP illustrates the company's adaptation to digital transformation as part of its CRM-based innovation strategy.

SWOT Analysis

SWOT analysis was used to formulate strategies for improving the service quality of Tirta Pakuan. Based on the analysis and expert interviews, the results of the Internal Factor Evaluation (IFE) and External Factor Evaluation (EFE) matrices are presented in Table 6.

The IFE matrix, which consists of strengths and weaknesses, has a total score of 2.775, indicating that Tirta Pakuan's internal service quality is in a moderate condition (within the range of 2.0–2.99). Meanwhile, the EFE matrix, which includes opportunities and threats, is used to identify external environmental factors affecting the company. The total score of the EFE matrix is 3.284, suggesting that Tirta Pakuan's external service quality factors are in a strong condition (within the range of 3.0–4.0).

Based on the total scores from the IFE and EFE matrices, Tirta Pakuan's position on the Internal-External (IE) Matrix, illustrated in Figure 3, is located in Cell II. The recommended strategy for this position is a "Grow and Build" approach, which may include intensive strategies such as market penetration, market development, and product/service development, as well as integrative strategies such as forward integration, backward integration, or horizontal integration.

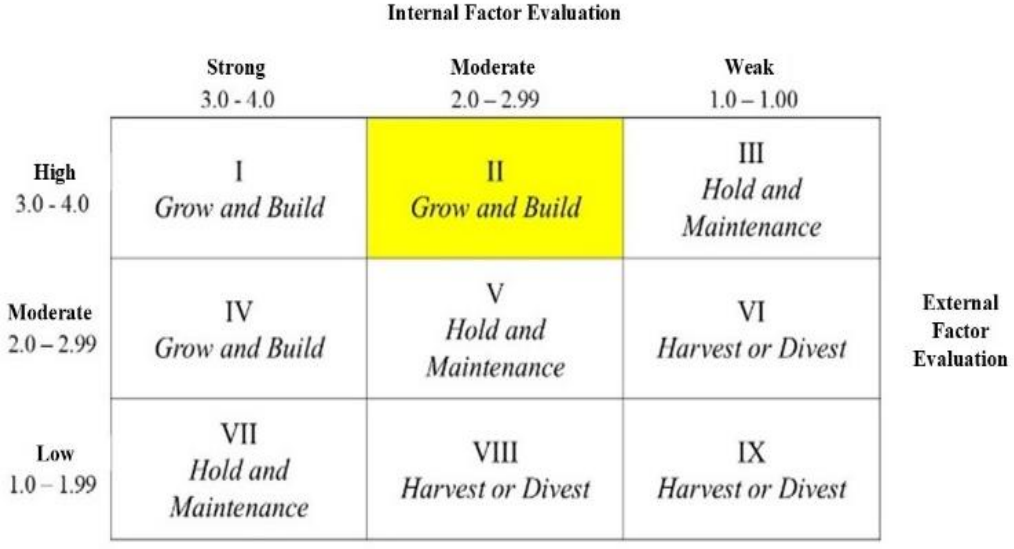

Figure 3. Internal–External Matrix of Tirta Pakuan's Service Quality

In terms of market penetration, a suitable strategy for Tirta Pakuan is to enhance water quality management and infrastructure by investing in the improvement of water treatment processes, aiming to meet drinking water standards. These efforts are expected to boost customer trust in the quality of services provided.

For market development, Tirta Pakuan could pursue a strategy of expanding service coverage to prioritized areas, especially unserved regions, such as

Table 6 IFE and EFE matrix

No.	Internal Factors	Weight	Rating	Score
Strengths				
1.	Extensive service coverage and affordable tariffs	0,086	3	0,257
2.	Availability of a digital complaint system and flexible service hours	0,096	3	0,289
3.	Reliable raw water sources and consistently maintained water quality	0,096	3	0,288
4.	Competent and professional human resources	0,092	4	0,366
5.	Strong support from technology and digital service innovations	0,096	4	0,386
6.	A solid institutional image supported by key stakeholders	0,092	4	0,370
Weaknesses				
1.	Internal efficiency policies sometimes lead to a decline in service quality	0,064	1	0,064
2.	Rehabilitation and mapping of the water distribution network are not yet optimal	0,075	2	0,150
3.	Slow response time to customer complaints	0,075	2	0,150
4.	Lack of proactive notifications during service disruptions	0,065	2	0,129
5.	Distributed water quality is not yet safe for direct consumption	0,086	2	0,172
6.	Low utilization of digital services due to insufficient public outreach	0,076	2	0,153
Total		**1**		**2,775**
Opportunities				
1.	Potential to expand service coverage and increase customer consumption	0,097	3	0,292
2.	Constructive feedback from customers	0,088	4	0,352
3.	Declining groundwater quality as a momentum to improve services	0,091	3	0,274
4.	Stable raw water sources	0,091	3	0,274
5.	Growing role of social media as a customer service channel	0,092	3	0,276
Threats				
1.	Risk of natural disasters and climate change	0,092	3	0,277
2.	Government regulatory dynamics	0,093	4	0,372
3.	Threats to water source security due to land-use changes	0,103	4	0,413
4.	Economic pressure on the community	0,082	3	0,246
5.	Geographical conditions requiring special handling	0,092	3	0,277
6.	Social pressure: public expectations and digital reputation	0,077	3	0,230
Total		**1**		**3,284**

peripheral zones or areas that have previously relied on groundwater sources. This strategy would help improve equitable access to clean water and establish a new customer base.

In terms of product/service development, Tirta Pakuan may focus on enhancing digital service quality and process automation. This includes expanding digital features such as e-payments, online complaint submission, and automated notifications, as well as integrating customer service systems to improve response time and information transparency.

The recommended derivative strategies were formulated through the matching stage, which combines key points identified in the analysis of strengths, weaknesses, opportunities, and threats. These strategies include the SO (Strength–Opportunity), WO (Weakness–Opportunity), ST (Strength–Threat), and WT (Weakness–Threat) strategies. Each of these approaches is designed to

optimize the current conditions of the subject under study. The detailed formulation of these strategies is presented in Figure 4.

Based on the results of the matching stage, a total of 12 strategic recommendations were identified for Tirta Pakuan. Referring to the most frequently reported customer complaints, the priority strategies include: proposing funding to the government or private partners to support network infrastructure investments; prioritizing investment allocation in geographically vulnerable and disaster-prone areas; and strengthening raw water monitoring systems as a mitigation effort against environmental risks.

Figure 4 Matching stage

SO Strategy	WO Strategy
Maximize service coverage up to 100% while maintaining quality standards and affordable pricing (S1 + S3 + O1 + O3 + O4) Optimize service digitalization based on customer feedback (S2 + S5 + O2 + O5) Maintain effective long-term communication and relationships with customers (S4 + S6 + O2 + O5)	Propose funding from the government or private partners for investment in the distribution network (W1 + W2 + W5 + O1 + O4) Automate customer notifications across multiple service channels (W4 + O2 + O5) Add service and information points in selected areas to improve accessibility (W4 + O1 + O2)
ST Strategy	**WT Strategy**
Strengthen raw water monitoring systems to mitigate environmental risks (S3 + S5 + T1 + T3 + T5) Leverage institutional reputation and data for policy advocacy to anticipate adverse regulations (S4 + S6 + T2) Develop adaptive tariff and service schemes that respond to the community's economic conditions (S1 + T4)	Prioritize investment in geographically vulnerable and disaster-prone areas (W1 + T1 + T5) Educate the public on the benefits of using PDAM water over groundwater, especially for economically and geographically vulnerable groups (W6 + T1 + T4 + T5) Strengthen the integrated service system and ensure a quick response mechanism (W3 + W4 + T6)

CONCLUSION

Based on the findings of this study, it can be concluded that, in general, respondents' assessment of the public service quality at Perumda Tirta Pakuan is relatively positive, although some concerns remain regarding the appropriateness of service tariffs. To support service quality, Tirta Pakuan is significantly influenced by both innovation and CRM (Customer Relationship Management) strategies. Moreover, CRM also has a demonstrated effect on driving innovation within the organization.

Various technology-driven innovations have tactically optimized Tirta Pakuan's service delivery. In addition, communication and relationship-building with customers, although limited in reach, have contributed to shaping the image of Tirta Pakuan as a responsive and transparent public service provider.

The recommended strategy to support service quality is the "Grow and Build" strategy. Among several possible strategic initiatives, the most prioritized include: (1) seeking funding from government or private sector partners to support infrastructure investment; (2) prioritizing investment allocation in geographically vulnerable and disaster-prone areas; and (3) strengthening raw water monitoring systems as part of environmental risk mitigation efforts.

Based on these findings, several recommendations are proposed. First, this study has ample room for further development in future research. One key limitation lies in its focus on general service quality assessment, without deeper exploration of the relationship between service quality and customer satisfaction.

Future studies are encouraged to integrate additional independent variables to provide a more comprehensive understanding of the determinants of service quality. Another limitation is the focus on a single institution, Perumda Tirta Pakuan. To enhance the generalizability of the results, future research could examine other public service entities, both in the water sector and across other sectors such as electricity, transportation, or public administration.

For local governments, as policy-makers, it is recommended to strengthen monitoring and supervision of regional water utilities to maximize their potential. Strategic and continuous oversight is essential to ensure that the quality of services delivered aligns with community needs and public service standards.

Additionally, active public participation is also essential to support improved performance and services. Community involvement, whether through feedback, social monitoring, or engagement in public education programs, can contribute positively to the development of adaptive, participatory, and sustainable services. With synergy between the government, the community, and Perumda, public services—especially in the water sector—can become more high-quality and people-oriented.

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