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| RESEARCH ARTICLE

The Relationship of Service Quality Process Improvements and Collection Rates of An Electric Cooperative in Bataan

Juvy Ann A. Tugonon[1] and Darwin G. Quintos[2]
[12] Doctor of Business Administration, La Consolacion University Philippines
Corresponding Author: Juvy Ann A. Tugonon, **E-mail**: juvyann.tugonon@email.lcup.edu.ph

| ABSTRACT

Electric cooperatives play a vital role in ensuring reliable electricity distribution and maintaining financial sustainability through efficient revenue collection. However, collection inefficiencies, service delivery issues, and evolving customer expectations continue to challenge the operational performance of many electric cooperatives. This study determined the relationship between service quality process improvements and collection rates of an electric cooperative in Bataan. Specifically, it examined customers' assessments of process improvements in terms of reliability, assurance, tangibles, empathy, and responsiveness, evaluated collection rates, identified current collection challenges, and proposed additional process improvements. A descriptive-correlational research design utilizing a mixed-methods approach was employed. Data were gathered from 252 electric cooperative customers through a researcher-made questionnaire based on the SERVQUAL framework. Descriptive statistics, including weighted mean and standard deviation, were used to analyze service quality and collection rates, while Pearson's correlation coefficient was applied to determine the relationship between variables. Qualitative interviews with key personnel were analyzed through thematic coding to validate and enrich the quantitative findings. Findings revealed that respondents rated the cooperative's service quality process improvements as "Very Good" across reliability (M = 3.25), assurance (M = 3.21), tangibles (M = 3.27), empathy (M = 2.80), and responsiveness (M = 3.22). Collection rates were also rated Very Good (M = 3.25). Inferential analysis showed a significant positive relationship between service quality process improvements and collection rates ($r = 0.452$, $p < .05$), with process improvements explaining 20.4% of the variance in collection performance ($R^2 = 0.204$). Interview findings identified operational delays, outdated systems, data management issues, regulatory constraints, and external economic conditions as persistent challenges affecting collection efficiency. Service quality process improvements significantly contribute to improved collection rates. Strengthening customer-centered services, digital technologies, and data-driven collection strategies can further enhance revenue recovery, operational efficiency, and long-term sustainability of electric cooperatives.

| KEYWORDS

Service quality, process improvements, collection rates, electric cooperative, SERVQUAL, revenue collection, customer satisfaction

| ARTICLE INFORMATION

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Introduction

Electric cooperatives play a critical role in providing reliable and affordable electricity services, particularly in rural and semi-urban communities where access to energy is essential for economic growth, social welfare, and community development. As member-owned organizations, electric cooperatives must maintain both operational efficiency and financial sustainability to ensure uninterrupted service delivery. Among the key determinants of financial sustainability is collection efficiency, which refers to the cooperative's ability to recover billed revenues from consumers within prescribed periods. Efficient collection systems provide the financial resources necessary for infrastructure maintenance, system expansion, technological modernization, and

service improvement. Conversely, poor collection performance can lead to cash flow constraints, deferred maintenance, increased system losses, and reduced capacity to invest in service innovations.

Collection efficiency has become increasingly important as electric utilities face growing operational demands, aging infrastructure, rising energy costs, and heightened customer expectations. In the Philippine context, electric cooperatives are expected not only to provide dependable electricity services but also to maintain sound financial management practices that support long-term sustainability. Timely revenue recovery enables cooperatives to fund maintenance activities, improve service reliability, minimize outages, and comply with regulatory requirements. Thus, collection performance extends beyond a financial indicator and serves as a measure of organizational effectiveness and customer engagement.

A growing body of literature suggests that collection performance is closely linked to service quality. Customers are more likely to comply with payment obligations when they perceive utility services as reliable, transparent, responsive, and customer oriented. Service quality has therefore emerged as a strategic factor influencing customer trust, satisfaction, and payment behavior. The SERVQUAL framework developed by Parasuraman, Zeithaml, and Berry (1991) Identifies five dimensions of service quality: reliability, assurance, tangibles, empathy, and responsiveness. These dimensions provide a comprehensive framework for evaluating customers' perceptions of service delivery and have been widely applied across utilities and public service organizations.

In recent years, utility providers have increasingly implemented process improvements to enhance service quality and operational performance. These improvements include automation of billing and collection systems, deployment of smart meters, development of digital payment platforms, implementation of customer relationship management systems, and strengthening of communication channels. Process improvements are organizational and operational interventions designed to increase efficiency, reduce errors, streamline workflows, and improve customer experiences. However, their effectiveness is often evaluated through customers' perceptions of service quality outcomes.

The rapid advancement of digital technologies has accelerated the transformation of utility operations worldwide. Electric cooperatives are now leveraging digital platforms to improve customer engagement, facilitate online payments, automate notifications, provide real-time service information, and enhance data management practices. Digital transformation offers opportunities to improve operational efficiency while simultaneously enhancing customer convenience and satisfaction. Innovations such as smart metering systems, mobile payment applications, cloud-based billing systems, automated reminders, and artificial intelligence-assisted customer support are increasingly becoming integral components of modern utility management. These technological developments not only strengthen service delivery but also support more effective collection practices by reducing payment barriers and improving communication between utilities and consumers.

Despite these advancements, many electric cooperatives continue to face challenges in achieving optimal collection performance. Factors such as delayed billing processes, payment affordability issues, manual operational practices, limited technological integration, and external economic pressures can impede collection efficiency. Understanding how service-quality-oriented process improvements influence collection outcomes is therefore essential for developing effective strategies that enhance both customer satisfaction and financial sustainability.

Existing studies have extensively examined service quality and financial performance within utility organizations. However, most investigations have treated these constructs independently, focusing either on customer satisfaction and service delivery or on operational and financial performance indicators. Limited empirical evidence exists regarding the direct relationship between service-quality-based process improvements and collection rates, particularly within the context of Philippine electric cooperatives.

Furthermore, while many studies discuss digital transformation, customer service enhancement, and operational efficiency initiatives, few have analyzed how improvements in reliability, assurance, tangibles, empathy, and responsiveness influence customers' payment behavior and overall collection performance. This gap is particularly evident in local electric cooperatives, where unique organizational, economic, and community-related conditions may affect both service quality perceptions and revenue recovery outcomes.

Given the limited literature integrating service quality, process improvement, and collection efficiency within a single framework, there remains a need for empirical investigation that examines these relationships in the context of electric cooperatives operating in the Philippines.

This study examined the relationship between service quality process improvements and collection rates in an electric cooperative in Bataan. Specifically, it evaluated customers' perceptions of process improvements in terms of reliability, assurance, tangibles, empathy, and responsiveness and determined their relationship with collection performance.

Research Questions

This study sought answers to the following research questions:

1. How do customers assess service quality process improvements?
2. How do customers describe collection rates?
3. Is there a significant relationship between service quality process improvements and collection rates?
4. What collection challenges remain despite process improvements?

Hypothesis

The study tested the following null hypothesis:

H_0: Service quality process improvements have no significant relationship with collection rates.

Literature Review

Service Quality and Process Improvement

Organizations continuously implement process improvements to enhance operational efficiency, improve service delivery, and achieve organizational goals. Process improvements refer to systematic and deliberate interventions designed to optimize workflows, procedures, technologies, and human resource capabilities. According to Public Sector Consultants (2020), process improvements in utility organizations commonly include infrastructure modernization, billing automation, system integration, digital payment platforms, workflow redesign, and customer service enhancements. Similarly, the American Public Power Association (2022) emphasized that electric utilities are increasingly adopting smart technologies, digital tools, and process innovations to improve operational performance and customer service.

While process improvements are internal organizational actions, their effectiveness is often reflected through customers' perceptions of service quality. Service quality is defined as customers' evaluation of how well a service meets or exceeds their expectations. Parasuraman, Zeithaml, and Berry (1988), through the SERVQUAL framework, explained that customers assess service quality using five dimensions: reliability, assurance, tangibles, empathy, and responsiveness. These dimensions remain among the most widely accepted measures of service performance across service industries, including utility organizations.

Reliability

Reliability refers to the organization's ability to perform services accurately, consistently, and dependably. Goodridge (2022) emphasized that reliability is particularly important in utility organizations because customers expect continuous service delivery, accurate billing, and dependable operational performance. Similarly, Ezechi et al. (2025) argued that reliable billing and collection processes strengthen customer confidence and reduce disputes that may hinder payment compliance. Studies by Carr and Thomson (2022) and Littlechild (2021) further demonstrated that billing accuracy and schedule consistency contribute significantly to customers' perceptions of service reliability.

Assurance

Assurance refers to employees' competence, courtesy, professionalism, and ability to inspire trust and confidence among customers. Sangpikul (2023) explained that assurance is reflected in employees' knowledge, credibility, and communication skills. In utility services, customer trust is strengthened when employees demonstrate expertise in addressing billing inquiries, resolving complaints, and explaining service policies. Choi et al. (2024) further emphasized that employee professionalism and transparent communication significantly contribute to customer confidence and satisfaction.

Tangibles

Tangibles refer to the physical and technological aspects of service delivery, including facilities, equipment, communication materials, and digital service platforms. Awara (2022) argued that visible and accessible service elements shape customers' perceptions of organizational professionalism. Mesly et al. (2024) reported that modern payment centers, digital platforms, and user-friendly interfaces improve customer convenience and strengthen perceptions of service quality. In utility settings, tangible improvements such as mobile applications, smart meters, online portals, and self-service kiosks enhance accessibility and customer engagement.

Empathy

Empathy refers to the organization's ability to provide personalized attention, understanding, and individualized support to customers. Lajante et al. (2023) described empathy as the capacity of service providers to recognize and respond to customers' unique circumstances and needs. According to Shuqair et al. (2021), customers who perceive empathetic treatment are more likely to develop trust and satisfaction even when service issues arise. Sharif et al. (2024) further noted that empathy contributes to stronger customer relationships and increased loyalty by creating positive emotional connections between organizations and consumers.

Responsiveness

Responsiveness refers to the willingness and ability of an organization to provide prompt service and timely assistance. Negassa et al. (2023) explained that responsiveness reflects how quickly and effectively organizations address inquiries, complaints, and service requests. Huang et al. (2022) reported that prompt responses enhance customer trust and satisfaction, while delays generate frustration and dissatisfaction. Likewise, Hangasjärvi (2024) emphasized that responsiveness is particularly important in utility services where concerns regarding billing, outages, and service disruptions require immediate attention.

Collectively, these dimensions provide a comprehensive framework for evaluating how effectively operational improvements are translated into service outcomes. In utility organizations, service quality serves as the observable outcome of internal process improvements and plays an important role in shaping customer behavior and organizational performance.

Reliability and Collection Compliance

Reliability influences customers' willingness to fulfill payment obligations by ensuring accurate and predictable service delivery. Jou et al. (2022) found that billing accuracy significantly improves customer trust and reduces disputes, thereby encouraging

timely payments. Similarly, Datta et al. (2023) reported that consistent billing schedules help customers anticipate financial obligations and improve payment compliance. Utility customers are more likely to settle accounts promptly when billing systems are perceived as accurate and dependable.

Assurance and Customer Trust

Trust is a critical determinant of payment behavior. Przepiorka and Horne (2021) stressed that transparent billing practices and proactive communication increase customer confidence in utility providers. Mohamed et al. (2023) likewise found that clear explanations regarding charges, service changes, and policies improve perceived organizational credibility. When customers trust the competence and integrity of utility providers, they are more willing to comply with billing requirements and maintain positive payment behavior.

Tangibles and Payment Accessibility

The availability of convenient payment channels and modern service facilities contributes to payment compliance. Moghavvemi et al. (2021) defined payment convenience as the ease with which customers can settle their financial obligations through accessible and flexible payment methods. Hijazi et al. (2023) demonstrated that online payment systems significantly improve customer satisfaction and encourage timely payments. Lee et al. (2023) additionally reported that digital payment platforms strengthen customer trust and reduce payment barriers, resulting in improved collection performance.

Empathy and Customer Retention

Empathy contributes to customer loyalty and long-term engagement. Meylina et al. (2024) found that organizations that accommodate customers' specific circumstances experience higher levels of satisfaction and retention. Lundgren et al. (2024) emphasized that flexible payment plans, personalized communication, and support for financially vulnerable consumers improve customer relationships and willingness to comply with payment obligations. Customers who perceive fair and compassionate treatment are less likely to delay payments or disengage from service providers.

Responsiveness and Payment Behavior

Responsiveness directly influences customer perceptions of fairness and organizational commitment. Awa and Ikwor (2021) found that prompt responses to customer inquiries significantly improve satisfaction levels across service industries. Mutuku et al. (2024) reported that timely resolution of billing concerns reduces payment delays and increases customer confidence. Furthermore, Yang et al. (2024) demonstrated that timely assistance positively influences customers' evaluations of overall service quality, which in turn supports stronger payment compliance and collection efficiency.

The reviewed literature consistently suggests that improvements in reliability, assurance, tangibles, empathy, and responsiveness strengthen customer satisfaction, trust, and engagement. These outcomes positively influence payment behavior, thereby contributing to improved collection performance.

Conceptual Framework

Guided by the SERVQUAL framework and the reviewed literature, this study proposes that service quality process improvements influence collection rates in electric cooperatives. Process improvements are operational interventions implemented by the organization, while service quality represents customers' perceptions of the outcomes of these interventions. Collection rates serve as the financial outcome influenced by customers' experiences with service quality.

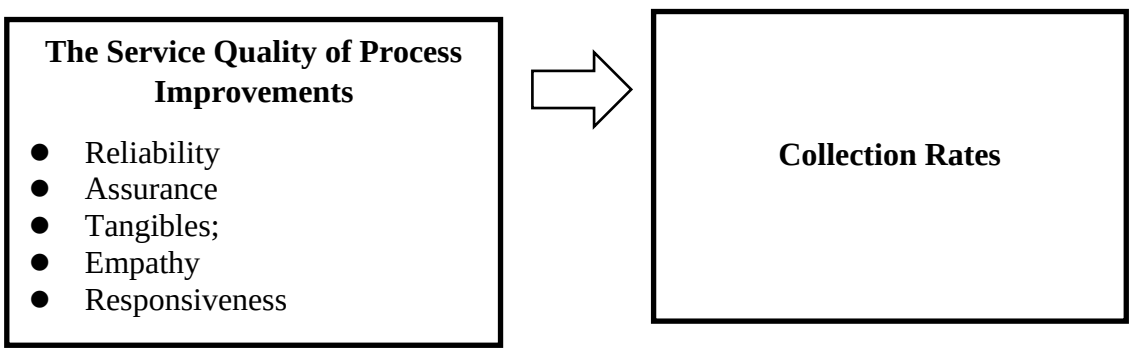

Figure 1. Conceptual Framework of the Study

The framework assumes that improvements in reliability, assurance, tangibles, empathy, and responsiveness enhance customer perceptions of service quality. As customers experience more reliable services, trustworthy interactions, convenient payment systems, personalized support, and prompt responses, they are more likely to comply with payment obligations. Consequently, service quality process improvements are expected to contribute positively to collection rates.

This framework provides the basis for examining the relationship between service quality process improvements and collection performance in an electric cooperative in Bataan. It further supports the study's assumption that customer-centered operational improvements can generate both service quality benefits and financial sustainability outcomes.

Methodology

Research Design

This study employed a descriptive-correlational mixed-methods research design to examine the relationship between service quality process improvements and collection rates in an electric cooperative in Bataan. The quantitative component utilized a descriptive-correlational approach to assess customers' perceptions of service quality process improvements in terms of reliability, assurance, tangibles, empathy, and responsiveness, and to determine their relationship with collection rates. Descriptive statistics were used to summarize the respondents' assessments, while correlational analysis was employed to establish the presence and strength of relationships between the variables.

To complement and validate the quantitative findings, a qualitative component was incorporated through semi-structured interviews with selected personnel of the electric cooperative. The integration of quantitative and qualitative data allowed for a deeper understanding of the operational challenges and contextual factors influencing collection performance. This mixed-methods approach enhanced the comprehensiveness of the study by providing both numerical evidence and explanatory insights regarding service quality improvements and collection outcomes.

Respondents of the Study

I. The study was conducted among customers of an electric cooperative operating in Bataan. The total customer population consisted of 1,000 registered consumers. From this population, a sample of 252 customers participated in the survey.

II. The respondents were selected using purposive sampling, a non-probability sampling technique that allows the researcher to identify individuals who possess relevant knowledge and experience regarding the services provided by the electric cooperative. To ensure the relevance of responses, only customers who had maintained active accounts and had sufficient experience in availing of the cooperative's services were included in the study.

III. For the qualitative component, key informants from various operational units of the cooperative were interviewed to obtain insights into collection practices, operational challenges, and process improvement initiatives. These participants included representatives from management, billing, customer service, field operations, and information technology units.

Research Instrument

Data were collected using a researcher-developed questionnaire anchored on the SERVQUAL framework developed by Parasuraman, Zeithaml, and Berry (1988). The instrument was designed to measure customers' perceptions of service quality process improvements across five dimensions: Reliability; Assurance; Tangibles; Empathy; and Responsiveness.

The questionnaire consisted of three sections. The first section assessed the respondents' perceptions of service quality process improvements. The second section measured collection rate-related indicators. The third section examined the challenges encountered during the implementation of process improvements within the collection process.

Prior to administration, the instrument underwent validation by experts in business management, service quality, and utility operations to establish content validity. Necessary revisions were incorporated based on their recommendations. The validated instrument was then distributed to the selected respondents for data collection.

In addition, semi-structured interview guides were used to gather qualitative information from key personnel. The interviews explored operational challenges, customer payment behavior, collection practices, and recommendations for improving collection efficiency.

Data Analysis

The quantitative data were analyzed using both descriptive and inferential statistical techniques.

Mean

The weighted mean was utilized to determine the average assessment of respondents regarding service quality process improvements, collection rates, and collection-related challenges. The mean provided an overall measure of respondents' perceptions across the study variables.

Standard Deviation

Standard deviation was employed to measure the degree of variation or dispersion in respondents' responses from the calculated mean. This statistic helped determine the consistency of perceptions across the sample.

Pearson Product-Moment Correlation Coefficient (Pearson r)

IV. Pearson's r was used to determine the significance and strength of the relationship between service quality process improvements and collection rates. The test assessed whether improvements in reliability, assurance, tangibles, empathy, and responsiveness were significantly associated with collection performance. The null hypothesis was tested at the 0.05 level of significance.

Thematic Analysis

V. The qualitative interview data were analyzed using thematic analysis. Interview transcripts were reviewed, coded, and categorized into emerging themes. Similar responses were grouped into meaningful patterns that explained the quantitative findings. The identified themes were subsequently integrated with the survey results to provide a more comprehensive interpretation of the collection challenges and operational realities experienced by the cooperative.

Ethical Considerations

The study adhered to established ethical standards in the conduct of research involving human participants.

Informed Consent

Prior to participation, respondents were informed about the purpose, objectives, procedures, and expected outcomes of the study. Participants were provided with sufficient information to make an informed decision regarding their involvement and were asked to provide their consent before answering the survey or participating in interviews.

Confidentiality and Anonymity

The researcher ensured the confidentiality of all information obtained during the study. No identifying information was included in the analysis or final report. Responses were treated with strict confidentiality and were used solely for academic and research purposes. All data were stored securely and were accessible only to the researcher.

Voluntary Participation

Participation in the study was entirely voluntary. Respondents were informed that they could decline participation or withdraw from the study at any point without penalty or consequence. The researcher respected the rights, dignity, and welfare of all participants throughout the research process.

Through adherence to these ethical principles, the study ensured the protection of participants while maintaining the integrity, credibility, and trustworthiness of the research findings.

Results

Service Quality Process Improvements

Table 1 summarizes the respondents' assessment of the service quality process improvements implemented by the electric cooperative across the five SERVQUAL dimensions.

VI. Table 1. Summary of Service Quality Process Improvements

Dimension	**Mean**	**Interpretation**
Reliability	3.25	Very Good
Assurance	3.21	Very Good
Tangibles	3.27	Very Good
Empathy	2.80	Very Good
Responsiveness	3.22	Very Good
Overall Mean	**3.15**	**Very Good**

The findings indicate that respondents generally perceived the service quality process improvements of the electric cooperative as "Very Good" across all SERVQUAL dimensions. Among the dimensions, Tangibles obtained the highest mean score (M = 3.27), followed by Reliability (M = 3.25), Responsiveness (M = 3.22), and Assurance (M = 3.21). Although still interpreted as very good, Empathy received the lowest mean score (M = 2.80), suggesting that customer-centered and personalized services require further enhancement.

A closer examination of the individual indicators revealed several areas with comparatively lower ratings. Under reliability, the indicator on smart meter upgrades for minimizing billing errors received the lowest mean, suggesting that customers may not yet fully experience the benefits of advanced metering technologies. Under assurance, community sessions on electrical safety and emergency protocols obtained the lowest score, indicating limited visibility or participation in these educational initiatives. Similarly, the tangibles dimension showed relatively lower ratings for real-time usage displays through user-friendly meters, implying that customers perceive such technologies as insufficiently implemented. In empathy, the lowest-rated indicators were personalized usage reports with cost-cutting recommendations and elderly support programs through dedicated hotlines and home visits, indicating a need for more individualized customer assistance. Finally, under responsiveness, AI chatbot deployment for immediate customer support received the lowest rating, suggesting opportunities for improving digital customer service channels.

Overall, the findings suggest that while the cooperative has successfully implemented numerous service quality improvements, further investments in personalization, advanced metering technologies, and digital customer engagement tools may strengthen customer experiences and support operational effectiveness.

Collection Rates

Table 2 summarizes respondents' assessment of collection-related performance.

Table 2. Summary of Collection Rates

Indicator	**Mean**
Overall Collection Rates	3.25
Interpretation	Very Good

The overall mean of 3.25 indicates that respondents perceived the cooperative's collection performance as "Very Good". This finding suggests that operational practices supporting revenue collection are generally effective and contribute to organizational stability.

Among the collection-related indicators, the highest mean scores were obtained by: Dependability of online payment systems and digital service requests (M = 3.34); and Resolution of customer complaints and service concerns (M = 3.34).
These findings indicate that customers highly value convenient payment channels and efficient issue resolution mechanisms. The availability of digital payment systems appears to facilitate timely payments by reducing transaction barriers, while prompt complaint handling strengthens customer trust and satisfaction.
Conversely, the indicators with the lowest ratings were associated with: Achievement of expected collection targets (M = 2.67); and Complete recovery of billed receivables within the billing cycle (M = 2.74).
These results suggest that although collection performance is generally favorable, challenges remain in consistently meeting collection targets and recovering all receivables within the prescribed period. The findings imply the presence of payment delays, customer affordability concerns, and operational limitations that affect collection consistency.

Inferential Analysis

Correlation Results

Pearson Product-Moment Correlation analysis was conducted to determine the relationship between service quality process improvements and collection rates.
The results revealed that all service quality dimensions, namely reliability, assurance, tangibles, empathy, and responsiveness, exhibited statistically significant positive relationships with collection rates ($p < .05$). Consequently, the null hypothesis was rejected.
These findings indicate that customers who perceive higher levels of service quality are more likely to demonstrate positive payment behaviors, thereby contributing to improved collection performance. The results further suggest that investments in service quality improvements can positively influence revenue recovery and operational sustainability.

Regression Results

Table 3. Regression Analysis Result

Statistic	Value
R	0.452
R^2	0.204
Significance	0.000

The regression model produced an R value of 0.452, indicating a moderate positive relationship between service quality process improvements and collection rates.
The coefficient of determination ($R^2 = 0.204$) indicates that approximately 20.4% of the variation in collection performance is explained by service quality process improvements. This finding demonstrates that improvements in reliability, assurance, tangibles, empathy, and responsiveness contribute substantially to collection outcomes. However, the remaining 79.6% of variability may be influenced by other factors, such as economic conditions, customer affordability, regulatory requirements, and external environmental circumstances.
The results affirm the importance of customer-centered process improvements in enhancing organizational financial performance.

Current Challenges

Table 4 presents a summary of the challenges encountered by the electric cooperative despite the implementation of service quality process improvements.

Table 4. Summary of Current Collection Challenges

Challenge	Observation
Delayed collection of receivables	Observed
Difficulty achieving collection targets	Observed
Seasonal fluctuations in collections	Observed
Economic constraints affecting payments	Observed

The overall mean score of 3.00 indicates that respondents generally agreed that these challenges continue to affect collection performance.
The findings reveal that the cooperative experiences difficulties in collecting all receivables within the billing period and consistently achieving collection targets. Respondents also recognized that collection performance is affected by seasonal factors, including economic downturns and external disruptions. These circumstances contribute to fluctuations in payment behavior and reduce the predictability of revenue recovery.
Although the cooperative maintains regulatory compliance and demonstrates gradual improvements in collection performance, external economic pressures and operational inefficiencies continue to hinder the full realization of collection objectives.

Integration of Qualitative Findings

To enrich the quantitative results, interview data from key personnel were subjected to thematic analysis. Participants were coded as follows: P1 (Manager), P2 (Billing Staff), P3 (Customer Service Staff), P4 (Field Operations Staff), and P5 (IT Staff).

Table 5. Summary of Qualitative Themes

Theme	Representative Codes	Participant Evidence
Operational Delays	Manual encoding, delayed billing, reconciliation delays	P1, P2
System Constraints	System crashes, inaccurate records, customer retrieval issues	P3, P4
Compliance Despite Challenges	Regulatory adherence, reporting compliance	P1, P2
Technology Barriers	Legacy systems, integration difficulties	P5
External Economic Factors	Inflation, affordability issues, payment prioritization	P1, P3

Discussion of Qualitative Findings

The interview findings supported the quantitative results by providing explanations for the collection challenges identified in the survey.

The theme Operational Delays highlighted the continued reliance on manual and semi-manual processes. P1 reported delays in bill generation caused by manual encoding, while P2 emphasized reconciliation difficulties due to delays in reflecting customer payments. These factors help explain the lower ratings associated with collection target achievement and receivable recovery.

The theme System Constraints revealed challenges involving system crashes during peak collection periods and inaccurate customer records. According to P3 and P4, these limitations contribute to inefficient customer servicing and delayed collection activities.

Under Compliance Despite Challenges, respondents acknowledged that the cooperative consistently satisfies regulatory requirements despite operational difficulties. This finding aligns with the relatively high rating obtained for regulatory compliance.

The theme Technology Barriers pointed to difficulties in integrating modern payment technologies with legacy systems. P5 noted that outdated infrastructure limits digital transformation efforts and slows the implementation of innovative collection mechanisms.

Finally, External Economic Factors emerged as a significant theme affecting payment behavior. P1 and P3 explained that inflation, rising living costs, and financial constraints often cause customers to prioritize essential household expenditures over electricity payments. These findings support the observed seasonal and economic fluctuations in collection rates.

Overall, the qualitative findings validate the quantitative results and demonstrate that collection performance is influenced by both internal operational conditions and external socio-economic factors. While service quality improvements have enhanced customer experiences and collection outcomes, continued investment in technology modernization, process automation, and customer-focused collection strategies remains necessary to achieve sustained improvements in collection efficiency.

Discussion

Service Quality Improvements and Collection Rates

The findings of this study revealed that service quality process improvements have a significant positive relationship with collection rates, as evidenced by the rejection of the null hypothesis and the moderate positive correlation identified through Pearson's r analysis ($r = 0.452$, $p < .05$). The results indicate that customers who perceive higher levels of reliability, assurance, tangibles, empathy, and responsiveness are more likely to demonstrate favorable payment behaviors, contributing to improved collection performance.

These findings support the SERVQUAL framework of Parasuraman, Zeithaml, and Berry (1988), which posits that customers evaluate service quality through the dimensions of reliability, assurance, tangibles, empathy, and responsiveness. The consistently high ratings across these dimensions suggest that the cooperative's process improvements are positively influencing customer perceptions. In turn, favorable service experiences encourage customer cooperation, trust, and willingness to fulfill financial obligations.

The results also align with utility revenue management principles, which emphasize the importance of customer satisfaction and service efficiency in sustaining revenue recovery. Revenue collection is not solely a financial function but is also influenced by customers' perceptions of fairness, transparency, convenience, and organizational competence. When customers receive dependable services, accurate billing, and prompt support, they are more likely to maintain positive payment behavior and less likely to delay payments or dispute charges.

Furthermore, customer trust theories suggest that trust serves as a critical mechanism linking service quality to customer behavior. Customers who trust the cooperative's billing processes, employees, and service systems are more inclined to comply with payment requirements. The high ratings received by assurance, responsiveness, and reliability dimensions indicate that trust has been strengthened through service quality initiatives, contributing to improved collection performance.

Reliability and Revenue Recovery

Among the service quality dimensions, reliability emerged as one of the strongest-performing areas, with respondents indicating that the cooperative consistently implements activities that enhance service dependability. Reliability is particularly important in utility operations because billing accuracy, service continuity, and operational consistency directly affect customers' willingness to pay.

The findings show that respondents positively perceived the cooperative's efforts to conduct infrastructure inspections, deploy smart-grid technologies, and improve outage management. These initiatives contribute to customer confidence in service delivery and reduce disputes associated with inaccurate billing or inconsistent services.

However, the relatively lower rating received by smart meter upgrades indicates that customers may not yet fully experience the benefits of advanced metering technologies. Smart meters play an important role in revenue recovery by improving billing accuracy, reducing manual errors, and enabling real-time consumption monitoring. Enhanced digitalization of billing processes can minimize customer complaints, streamline collection activities, and increase confidence in the accuracy of charges.

The qualitative findings further reinforce this conclusion. Participants identified manual encoding procedures and delayed reconciliation processes as obstacles to efficient billing and collection. These operational delays may contribute to missed collection targets and incomplete receivable recovery. Therefore, greater investment in smart metering, billing automation, and integrated digital platforms could significantly enhance reliability and strengthen revenue recovery.

Empathy and Payment Compliance

Although empathy received an overall rating of "Very Good," it recorded the lowest mean among the five service quality dimensions. This finding suggests that while customers recognize the cooperative's efforts to address customer needs, opportunities remain to strengthen personalized and customer-centered services.

Two indicators received particularly low ratings: personalized usage reports with cost-saving recommendations and dedicated support programs for elderly customers. These findings indicate that customers desire more individualized engagement and tailored assistance.

Personalized billing reports can serve as important tools for promoting payment compliance by helping customers better understand their consumption patterns, identify opportunities to reduce energy costs, and manage household budgets. When customers are provided with relevant and understandable information, they are more likely to perceive billing processes as transparent and fair, thereby supporting timely payment behavior.

Similarly, targeted assistance for vulnerable consumers may improve customer relationships and reduce delinquency rates. Elderly customers, low-income households, and consumers experiencing financial hardship often require flexible payment options, personalized communication, and specialized support services. The literature suggests that organizations demonstrating empathy and accommodation foster greater customer trust, loyalty, and compliance.

The interview findings support this interpretation. Participants emphasized the need for flexible payment arrangements and differentiated service approaches tailored to the unique circumstances of various customer groups. These results suggest that strengthening empathy-based interventions may contribute to improved collection performance while enhancing customer satisfaction.

Persistent Collection Challenges

VII. Despite the positive assessment of service quality process improvements, the findings indicate that several collection challenges persist. Both survey and interview results revealed issues associated with delayed receivable collection, difficulty consistently achieving collection targets, seasonal performance fluctuations, and external economic pressures.

One of the most significant challenges identified was economic hardship. Interview participants reported that many consumers face increasing financial constraints due to rising living costs and competing household priorities. As a result, electricity payments are sometimes deferred in favor of more immediate necessities such as food, healthcare, and transportation expenses. Inflation further exacerbates these challenges by reducing consumers' disposable income and increasing financial vulnerability. During periods of economic instability, collection rates may decline despite improvements in service quality because customers simply have fewer resources available to meet payment obligations.

Disaster-related disruptions also contribute to collection variability. Respondents acknowledged that natural disasters and unforeseen emergencies can affect customers' ability to make timely payments. Such events often create temporary income disruptions and increase household expenditures, leading to payment delays.

Internal operational limitations remain another important challenge. The interview findings identified manual processes, delayed billing generation, system crashes, outdated infrastructure, and data management issues as obstacles to efficient collection operations. Participants also noted difficulties associated with outdated systems that limit the integration of modern payment technologies.

The convergence between quantitative and qualitative findings suggests that collection performance is influenced by both internal operational factors and external socioeconomic conditions. Therefore, improvements in service quality alone may not entirely eliminate collection challenges unless they are complemented by broader operational and technological reforms.

Practical Implications

The findings provide several practical implications for electric cooperatives seeking to strengthen collection performance and improve financial sustainability.

VIII. First, the cooperative should accelerate the implementation of smart metering systems to enhance billing accuracy and reduce manual intervention. Smart meters can improve customer trust while supporting more efficient revenue management. Second, implementing real-time billing synchronization systems would address many of the challenges identified in the interviews, particularly delayed payment posting and billing reconciliation. Real-time data sharing between departments can improve operational efficiency and collection monitoring.

Third, SMS and email reminders should be expanded to improve customer awareness of billing schedules, due dates, and payment obligations. Automated notifications can reduce missed payments and improve customer engagement.

Fourth, the integration of digital wallets and online payment platforms would increase payment convenience and accessibility. Providing multiple payment channels enables customers to settle bills more efficiently and reduces collection barriers.

Fifth, the cooperative should explore the use of predictive analytics to identify high-risk accounts, forecast seasonal payment trends, and implement proactive collection strategies before arrears accumulate.

Finally, customer segmentation strategies should be adopted to accommodate the varying needs of residential, commercial, industrial, elderly, and low-income consumers. Tailoring communication, payment options, and support services to specific customer groups may improve collection performance while maintaining positive customer relationships.

Conclusion

The study confirms that service quality process improvements significantly influence collection rates in an electric cooperative. Reliability, assurance, tangibles, empathy, and responsiveness all exhibited significant positive relationships with collection performance, indicating that improved customer perceptions of service quality are associated with better payment behavior and enhanced revenue recovery.

Customers generally perceived the cooperative's service quality initiatives as very good, particularly in terms of reliability, responsiveness, and tangible improvements. However, findings also revealed that empathy-related initiatives, including personalized usage reports and support programs for vulnerable consumers, require further enhancement. Likewise, opportunities remain to improve smart metering, digital customer engagement, and advanced service technologies.

Despite the positive impact of service quality improvements, the cooperative continues to face challenges in consistently achieving collection targets and recovering all receivables within each billing cycle. Qualitative evidence revealed that technological limitations, manual workflows, outdated systems, economic hardship, inflation, and disaster-related disruptions continue to constrain collection efficiency.

Overall, the findings suggest that customer-centered process improvements and technology-enabled collection systems are essential for enhancing both financial sustainability and service performance. By strengthening digital infrastructure, improving customer engagement strategies, and addressing operational inefficiencies, electric cooperatives can further improve collection outcomes while maintaining high levels of customer satisfaction and trust.

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