International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

A Structural Equation Model on Service Quality, Technical Quality Factors, and Business Governance as Predictors of Customer Satisfaction in Electric Cooperatives

Jezzel L. Jayme[1], Vicente Salvador E. Montaño[2]

[1]Doctor in Business Administration Student, University of Mindanao-Main,
[2]Professor, University of Mindanao-Main

Abstract

This study examined customer satisfaction among residential member-consumers of electric cooperatives in Region XII by assessing service quality, technical quality factors, and business governance; identifying significant predictors; developing and evaluating a structural model; and comparing structural relationships across cooperatives. Using a quantitative descriptive-correlational and structural equation modeling design, the study involved 499 residential member-consumers from COTELCO Main, COTELCO-PPALMA, SOCOTECO I, SOCOTECO II, and SUKELCO in the SOCCSKSARGEN Region. Data were gathered through a structured survey questionnaire and analyzed using descriptive statistics and Covariance-Based Structural Equation Modeling with Multi-Group Analysis (CB-SEM MGA), including model fit assessment, measurement invariance testing, and pairwise path-difference testing. Findings revealed that service quality, technical quality factors, business governance, and customer satisfaction were all rated high. Business governance was the strongest predictor of customer satisfaction, followed by service quality, while technical quality factors had no significant direct effect. The proposed structural model demonstrated an adequate fit to the data and was retained as the study's best-fit model without omitting any latent constructs, although structural relationships varied across cooperatives. The findings imply that effective governance and quality service delivery are essential in strengthening customer satisfaction and supporting reliable, accountable, and responsive electric cooperative operations.

Keywords: business administration, electric cooperatives, residential member consumers, service quality, technical quality factors, business governance, customer satisfaction, Covariance-Based Structural Equation Modeling with Multi-Group Analysis (CB-SEM MGA, Region XII

SDG Indicators: #7 (Affordable and Clean Energy), #9 (Industry, Innovation, and Infrastructure), #11 (Sustainable Cities and Communities)

1. INTRODUCTION

The electric power industry is a foundation of modern development, supporting economic growth, technological advancement, and better living conditions in communities. Thus, electric distribution

utilities (EDUs) are important contributors to national development because a stable energy power supply supports the effective operation of residential, commercial, and government institutions (Kale & Aggrawal, 2024). The reliability of electricity distribution matters in this context, as interruptions, voltage instability, and delayed restoration can disrupt household activities, business operations, public services, and overall consumer welfare (Migisha et al., 2023).

In the Philippines, electric cooperatives play a vital role in providing electricity services, particularly in rural and semi-urban communities where access to reliable power is essential for household, economic, and community development. The National Electrification Administration (NEA) 2024 mandates that these nonprofit, member-owned energy providers are obligated to deliver affordable and dependable electricity, with a focus on social welfare and equitable access, rather than profit maximization. In rural communities, electric cooperatives serve an important function in expanding electricity access to underserved areas and strengthening local economic activities. Through community-based governance and institutional participation, they contribute to inclusive development and community progress (Escresa & Glova, 2024). Electric Cooperatives are also responsible for complying with the Key Performance Standards (KPS) established by the National Electrification Administration (NEA). These standards evaluate financial, technical, and institutional aspects, with a focus on service reliability, accountability, and organizational performance (NEA, 2011; Lantican & Villaseñor, 2021). Furthermore, Glova and Escresa-Guillermo (2021) emphasized that electric cooperatives in the Philippines are obligated to provide stable and affordable electricity to rural communities.

Despite their role in supporting community development, electric cooperatives still encounter operational challenges that can affect the quality of their services. Financial limitations and strict regulations often limit their initiatives to adopt new technology and upgrade infrastructure. At the same time, the increasing demand of consumers for reliable, responsive, and sustainable electricity services places additional pressure on the cooperatives to enhance and upgrade their systems (Escresa, 2024; Guarino, 2024). These national challenges reflect broader developments in the global energy sector, where utilities are increasingly expected to satisfy changing consumer needs while pursuing smarter, more reliable, and sustainable energy systems.

Over the past two decades, the global energy sector has experienced major transformations due to increasing consumer expectations for reliable, affordable, and equitable electricity services, along with rapid technological advancement and stronger efforts towards sustainability (Chen et al., 2021; IEA, 2023). As countries progress to smarter and cleaner energy systems, customer satisfaction is becoming an important basis for assessing the efficiency and social responsibility of electricity providers (IEA, 2023; World Bank, 2022). Customer experiences and opinions are important because they help determine how well the electric power industry continues to serve the public. Therefore, energy management and service delivery should focus more on customer needs, expectations, and satisfaction.

Similarly, the growing emphasis on quality management has pointed out the importance of customer satisfaction as a measure of an organization's performance. For electric cooperatives, however, customer satisfaction is influenced by many factors, including service quality, technical performance, governance practices, and actual experiences of member-consumers. Previous studies indicate that consumers' perceptions of reliability and trust in electric providers are collectively influenced by technical quality governance practices and service quality (Santos Neto et al., 2022). This standpoint confirms that customer satisfaction is not only a marketing concern but also an important factor in sustaining operations and strengthening long-term trust between energy providers and consumers. In this regard, monitoring

customer satisfaction has become necessary in assessing the overall performance of companies, including electric utilities (Boente & Lustosa, 2020).

The power sector continues to face a significant challenge due to the deterioration of energy infrastructure, in line with the existing literature. To address this concern, continuous maintenance, modernization of facilities, and adequate investments are necessary to ensure service reliability and meet the increasing demand for electricity (Shakou et al., 2019; Wang et al., 2020a, 2020b; International Energy Agency [IEA], 2023; European Commission, 2023). In developing nations, the World Bank (2020) acknowledges that an important issue is not only the production of sufficient electricity but also its equitable, reliable, and efficient distribution. To achieve this, electric service providers need upgraded facilities, good management methods, and reliable services that respond to what consumers need and expect.

According to the World Bank Group, infrastructure is essential in supporting progress, promoting transformation, and addressing challenges related to sustainable economic growth and the achievement of the United Nations' Sustainable Development Goals (SDGs). A recent analysis found that modernizing infrastructure is essential to achieving 72% of the SDG targets, either directly or indirectly (Lezak et al., 2019), highlighting the crucial role of enhanced energy systems in improving customer satisfaction through reliable, efficient service delivery.

In the case of Philippine electric cooperatives, aging infrastructure interacts with limited resources and increasing customer expectations to create operational challenges that may directly affect member-consumer satisfaction and trust. Although the energy sector continues to improve, electricity providers still experience challenges in delivering quality service. Issues such as limited financial resources, weak governance practices, and old infrastructure can affect their capacity to provide stable and reliable electricity. These problems may be worsened by low-cost recovery, technical losses, poor planning and insufficient investment, which can reduce operational efficiency and service reliability (Ewuim, 2020; International Energy Agency [IEA], 2023; World Bank, 2024; National Electrification Administration [NEA], 2025). Many electric cooperatives in the Philippines and other developing countries still operate with aging infrastructure and limited technical resources, resulting in frequent power interruptions that may affect customer satisfaction (Vital, 2025; The RCSAS, 2025).

Furthermore, electric service providers are increasingly challenged by consumers' expectations for affordable, sustainable, and responsive services.

According to Santos Neto et al. (2022) and The RCSAS (2025), customer satisfaction is influenced by service-related factors such as accurate billing, prompt response to complaints, and power supply. These concerns are more evident among cooperative-based utilities, where regulatory limits and limited resources may contribute to service inefficiencies. This highlights the need for more focused improvement strategies that can strengthen service performance and build greater consumer trust (Vital, 2025).

Although customer satisfaction in the energy industry has been widely examined, limited research has focused specifically on studies of electric cooperatives in the Philippines. Guarino et al. (2024), in a case study of the Eastern Samar Electric Cooperative, found that reconnection time, power quality, and meter placement significantly influence customer satisfaction. However, the study did not fully examine broader dimensions of business governance and technical quality, which may also contribute to the satisfaction of member-consumers. Similarly, Navarro and Bacatan (2023), in their study of the Northern Davao Electric Cooperative, found a strong positive relationship between service quality and customer satisfaction. However, their study did not examine the combined influence of service quality, technical quality, and business governance practices. These limitations point to a significant gap in the literature and highlight

the need for a more comprehensive study on the factors affecting customer satisfaction in cooperative-based utilities. Addressing is important in developing effective strategies to improve service delivery and strengthen consumer confidence in electric cooperatives.

In understanding the relationship between service quality and customer satisfaction in an electric cooperative, it is important to consider the classification of its member-consumers. The classification of member consumer units according to consumption class is essential in studying energy consumption patterns and improving service delivery within electric cooperatives (NEA, 2011; Escresa & Glova, 2024). Through this categorization, cooperatives can identify different consumption, behavior, demand profiles, and consumer preferences, which may support more appropriate operational decisions and regulatory measures.

As emphasized in recent literature, electric cooperatives classify their member-consumers into four main categories – residential, commercial, industrial, and public buildings- based on their electricity consumption volume, demand characteristics, and service requirements. Each category represents a distinct market segment with unique consumption behaviors and sensitivities to service interruptions. Residential consumers prioritize price, accessibility, and reliability among these classes, as electricity is essential for daily comfort and home activities (Abeygunawarndane et al., 2024).

The scope of this study is limited to residential member-consumers of electric cooperatives in Region XII. The decision to delimit the population to residential consumers is based on their numerical dominance among cooperative members and on their distinctive service usage characteristics compared to those of the industrial and commercial sectors. This approach ensures greater homogeneity of responses, enhances the internal validity of the structural model, and yields insights directly applicable to the majority of the cooperative's consumer base. As noted by Ramnath et al. (2022), effective consumer classification can inform utility decisions on demand response management and consumer segmentation, enabling targeted strategies to improve service performance and satisfaction. In addition, it is feasible to identify specific household consumers to attract them and offer them enhanced products and services.

Research by Suharyati, Utami, and Supriadi (2023) reveals that customer satisfaction is driven by how customers assess a product or service's performance relative to their expectations. When perceived performance falls below customer expectations, dissatisfaction is likely to occur. In contrast, when performance meets or exceeds expectations, customers tend to experience satisfaction or even delight. However, managing customer satisfaction remains challenging because there is no single universal framework or fixed approach that applies to all organizations. Therefore, organizations need to adopt flexible and continuous strategies that allow them to adjust their practices based on changing conditions and evolving customer satisfaction. This process often requires considerable effort and resources, but it remains an essential part of an organization's success. Effective management of customer satisfaction helps improve service performance and contributes to long-term business sustainability and stakeholder trust (Guarino et al., 2024). A company's competitive advantage plays an important role in its growth and in its ability to create value for customers (Kovanoviene, Romeika, & Baumung, 2021). This highlights the need for organizations to adopt customer-centric strategies. In the energy market, customers have become demanding and quality-conscious, as they are increasingly aware of the services and products they expect from energy providers (Zywiołek & Mrowiec, 2022).

Meanwhile, Merlo (2020) asserted that client satisfaction is an important factor in organizational success. In this regard, organizations need to invest in customer satisfaction that promotes effective communication and stronger customer engagement. Through these efforts, organizations can better understand the needs

of their customers and provide services that create meaningful value. Building on this perspective, Guarino (2024) emphasized that accurately measuring customer satisfaction is also essential for electric cooperatives because it serves as an important indicator of future customer loyalty. Reliable satisfaction measures allow cooperatives to better understand member-consumer perceptions, identify areas for service improvement, conduct cost-benefit analyses, and establish evidence-based performance goals. Moreover, these measures support performance benchmarking, address service-related knowledge gaps, and contribute to financial sustainability by strengthening member-consumer trust, satisfaction, and continued support.

Building on this perspective, it is important to develop a more comprehensive understanding of the key variables that contribute to customer satisfaction. Although service quality and customer satisfaction have been widely studied in the energy sector, limited attention has been given to how these concepts interact within the distinct context of Philippine electric cooperatives. Previous research has evaluated service quality, technical performance, and governance as separate variables (Rosak-Szyrocka, Zywiolek, and Mrowiec 2022; Jou et al., 2022), resulting in a limited understanding of their combined effect on customer satisfaction. Addressing this gap may provide a more comprehensive understanding of how internal management practices, service delivery processes, and member-consumer interactions influence customer satisfaction. In the context of Region XII, this understanding is important in developing evidence-based strategies that may help improve service effectiveness and strengthen member-consumer satisfaction.

The study focuses on electric cooperatives in Region XII. It aims to develop a structural equation model that integrates service quality, technical quality factors, and business governance as predictors of customer satisfaction among residential member-consumers. Specifically, it sought to answer the following objectives: (a.) assess the level of service quality, technical quality factors, business governance, and customer satisfaction as perceived by residential member-consumers (b) examine the relationships among service quality, technical quality factors, business governance, and customer satisfaction among residential member-consumers (c) determine the significant predictors of customer satisfaction among service quality, technical quality factors, and business governance (d) develop and evaluate the best-fit Structural Equation Model (SEM) that explains customer satisfaction in electric cooperatives using Covariance-Based Structural Equation Modelling (CB-SEM) (e) compare the structural relationships across groups of electric cooperatives using Multi-Group Analysis (MGA) to determine whether the effects of service quality, technical quality factors, and business governance on customer satisfaction differ across groups.

Based on the study's conceptual framework and objectives, it was hypothesized that service quality, technical quality factors, and business governance significantly influence customer satisfaction among residential member-consumers of electric cooperatives in Region XII. Individually, each factor is expected to have a positive effect on customer satisfaction. When examined together, these factors are proposed to create a structural model that can significantly predict the satisfaction of member-consumers. These hypotheses were anchored in established theoretical and empirical foundations, including the SERVPERF model (Cronin & Taylor, 1992), Grönroos' Service Quality Framework (1984), Agency Theory (Jensen & Meckling, 1976), Stakeholder Theory (Freeman, 1984), the OECD Principles of Corporate Governance (2023), and the American Customer Satisfaction (ACSI) model (Fornell et al., 1996). Structural Equating Modeling using the covariance-based approach (CB-SEM) was employed to assess both the direct and combined effects of these predictors on customer satisfaction

Measuring customer satisfaction in electric cooperatives has gradually developed through different models

and methods designed to improve service quality and customer experience. Previous studies have introduced comprehensive frameworks that combine various evaluation techniques, allowing a clearer and more practical understanding of customer satisfaction in the electric sector (Ong et al., 2023; Jou et al., 2022; Santos Neto et al., 2022).

This study supports the relevance of the American Customer Satisfaction Index (ACSI) as a useful framework for assessing customer satisfaction in electric cooperatives. The model's core dimensions, such as perceived quality, perceived value, and service performance, provide a structured basis for assessing service outcomes. Previous studies support this perspective. Yilmaz and Kinaş (2020) found that customer satisfaction in an electric distribution company is strongly influenced by perceived quality, where a one-unit increase in perceived quality leads to a 0.25-unit increase in customer satisfaction. Similarly, Medina et al. (2020) emphasized the presence of service gaps between the expectations and the actual services delivered by a local electric cooperative. Building on the foundational work of Fornell et al. (1996), who introduced the American Customer Satisfaction Index as a quality-driven performance metric, these findings support its relevance as a framework for measuring member-consumer satisfaction in electric cooperatives.

Service Quality serves as a key variable in this study and is assessed using the SERVPERF framework, which focuses on the actual performance of services as perceived by member-consumers. Although service quality was initially conceptualized under the SERVQUAL model developed by Parasuraman et al. (1985), this study utilizes the SERVPERF model proposed by Cronin and Taylor (1992), which measures service quality solely based on customers' perceptions of service performance. The SERVPERF model is used to assess service quality through examining perceived service performance across five fundamental dimensions: tangibles, reliability, responsiveness, assurance, and empathy. This model was preferred over SERVQUAL because it focuses on actual service performance rather than the gap between customer expectations and perceptions. This makes it more appropriate for performance-driven industries such as electric cooperatives, where service delivery, reliability, and responsiveness are directly experienced by member consumers. Earlier studies established the usefulness of SERVPERF as a performance-only measure of service quality, while more recent comparative studies continue to examine SERVPERF, weighted SERVPERF, and other service quality models in predicting customer satisfaction (Cronin & Taylor, 1992, 1994; Raza, 2024; Iqbal et al., 2025). In addition, Cronin and Taylor (1994) contend that SERVQUAL is inadequately supported by empirical and conceptual evidence, whereas SERVPERF provides a valid and reliable instrument for evaluating service quality.

Another theory is the framework proposed by Grönroos (1984), which conceptualizes service quality as a two-dimensional construct consisting of technical quality, which is the tangible consequence received by the customer, and functional quality, which pertains to the manner in which the service is delivered. In the context of electric cooperatives, technical quality may be reflected in operational aspects such as power reliability, outage frequency, outage duration, voltage stability, and responsiveness in service restoration, since these factors relate to the actual performance and continuity of electricity service received by member-consumers (Grönroos, 1984; IEEE, 2022; IEA, 2023; Ong et al., 2023)

In this research, the business governance framework is anchored on the Cooperative Development Authority (CDA) Governance Code, which outlines the regulatory governance requirements for cooperatives in the Philippines. This framework is further supported by the OECD Principles of Corporate Governance (2015), which present internationally recognized standards for promoting good governance practices. Both frameworks emphasize transparency, accountability, fairness, and ethical leadership as

essential governance principles that promote responsible management, member participation, and organizational credibility in cooperative operations (CDA, 2018; OECD, 2023). Agency Theory and Stakeholder Theory further support these governance principles. The Agency theory highlights the need for accountability and transparency in aligning management actions with member-consumer interests (Jensen & Meckling, 1976), while Stakeholder theory emphasizes the importance of considering the interests of various stakeholders in organizations' decision-making (Freeman, 1984).

The theories presented provide a foundational framework for examining the important factors influencing electric cooperative performance. They enable a structured analysis of measurable variables, including service quality, technical quality factors, and governance practices, and their impact on customer satisfaction. They also support empirical analysis of service delivery factors by systematically examining relationships among organizational practices, technical performance, and customer perceptions.

The conceptual framework serves as the foundation for identifying and connecting the study's key variables, explaining their direction and interrelationships. It serves as both a visual and an intellectual guide, illustrating how the study's components interact in line with existing literature and theoretical concepts. The framework is grounded in a synthesis of scholarly perspectives, ensuring coherence and methodological rigor while guiding analysis. It supports the study's purpose by clarifying relationships among variables and strengthening the overall structure and focus of the research process (Kulesa et al., 2024).

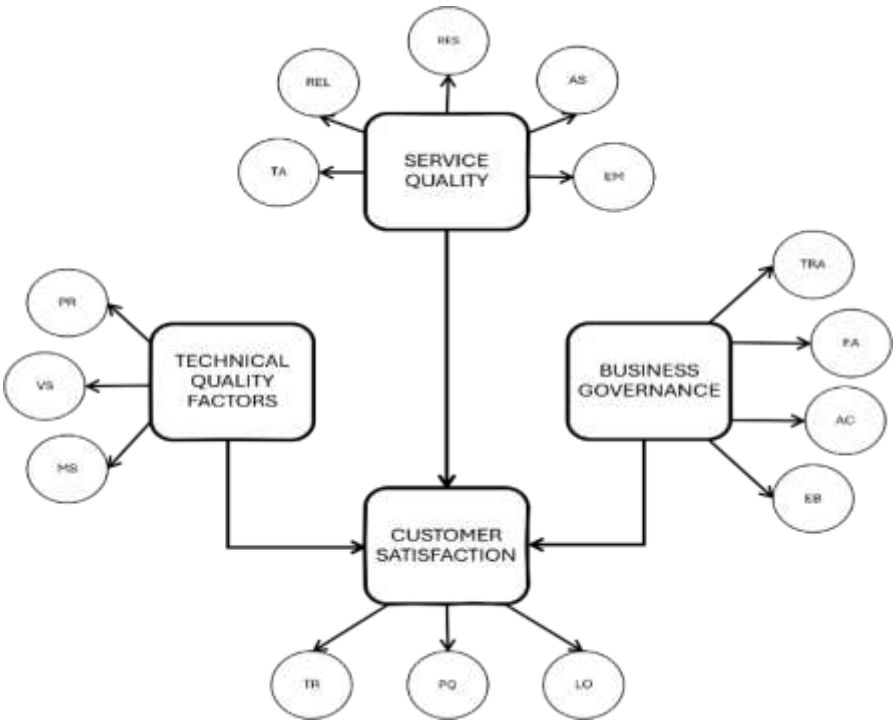

Figure1. Proposed Research Framework Depicting Service Quality, Technical Quality Factors, and Business Governance as Predictors of Customer Satisfaction in Electric Cooperatives

LEGEND:	
TECHNICALQUALITYFACTORS	**BUSINESS GOVERNANCE**
PR – Power Reliability	TRA – Transparency
VS – Voltage Stability	FA – Fairness

MS – Maintenance and Safety	AC – Accountability
	EB – Ethical Behavior
SERVICE QUALITY	**CUSTOMER SATISFACTION**
TA – Tangibility	TR – Trust
REL – Reliability	PQ – Perceived Quality
RES – Responsiveness	LO – Loyalty
AS – Assurance	
EM – Empathy	

Figure 1 presents the proposed structural model, illustrating the direct effects of service quality, technical quality factors, and business governance on customer satisfaction. Collectively, these variables are expected to influence member-consumers' evaluations of electric cooperative services and contribute to their overall level of satisfaction.

Service Quality is assessed through various indicators that capture both tangible and intangible aspects of service delivery. Key indicators include tangibility, which refers to physical facilities and equipment; reliability, which refers to the ability to consistently and accurately deliver the promised service; responsiveness, which reflects the willingness to provide prompt assistance to customers; assurance, which encompasses competence and trustworthiness; and empathy, which involves giving attention to each customer's unique needs (Parasuraman et al., 1988; Zygiaris et al., 2022). These dimensions provide a comprehensive basis for evaluating how member-consumers perceive service performance across various points of interaction. In the context of electric cooperatives, service quality goes beyond the continuous provision of electricity. It also includes customer-related services such as billing accuracy, timely response to complaints, service accessibility, and clear communication with member-consumers. The consistent delivery of high service quality in these areas is essential in developing positive customer perceptions, building trust, and improving overall satisfaction.

Technical quality factors are the operational and technical components of electricity service that determine reliability, efficiency, and safety. These indicators reflect the outcomes of electricity service experience by member-consumers; although they may not directly observe or fully understand the technical operations behind electricity distribution, they experience its results through the continuity of power supply, voltage stability, speed of restoration, and safety of service (Grönroos, 1984; Migisha et al., 2023). In the context of electric cooperatives, technical quality is particularly relevant, because member-consumers primarily evaluate electricity services based on observable outcomes, such as whether the supply is continuous, stable, and safe for household, commercial, and institutional use In this study, technical quality is operationalized using three measurable indicators: power reliability, voltage stability, and maintenance and safety. Power reliability refers to the continuity of the electricity supply. Voltage stability ensures that electricity is delivered within acceptable limits, enabling safe and efficient operation of customer equipment. Maintenance and safety are reflected in the cooperatives' compliance with preventive maintenance schedules and adherence to established operational safety procedures (IEEE, 2022; IEEE, 2018; IEC, 2025). These indicators collectively capture the technical performance of electric cooperatives in providing member-consumers with reliable, stable, and safe electricity services.

However, business governance is commonly assessed through indicators that reflect the principles that govern organizational management and decision-making. Key indicators include transparency, which refers to openness in communication and disclosure of information; fairness, which ensures equitable

treatment of member-consumers; accountability, which pertains to the responsibility of management in performing their duties and obligations; and ethical behavior, which involves adherence to moral standards and integrity in operations (CDA, 2018; OECD, 2023). These dimensions offer a comprehensive evaluation as a basis for how member-consumers perceive governance practices within electric cooperatives. In this context, business governance is important in the development of internal management processes, service delivery, member participation, and organizational credibility. Consistently, applying sound governance practices is therefore essential in building this trust, promoting responsible management, and improving overall customer satisfaction.

Customer satisfaction in electric cooperatives is conceptualized using indicators such as perceived quality, trust, and loyalty, which are aligned with the American Customer Satisfaction Index (ACSI) framework (Fornell et al., 1996; Fornell et al., 2006). Perceived quality refers to the overall assessment of the quality of electricity services as experienced by member-consumers. It is shaped by their accumulated service experiences and by how well the actual service outcomes meet their expectations. In customer satisfaction models, perceived quality is considered an important foundation for relational and behavioral responses because it represents a broad evaluation of service excellence (Fornell et al., 1996). Trust refers to member-consumers' confidence in the cooperative's ability to supply consistent, dependable, and fair services and is widely recognized as a critical relational outcome of sustained satisfaction, particularly in utility and cooperative contexts (Morgan & Hunt, 1994). Loyalty reflects member-consumers' intentions to continue their membership, recommend the cooperative, and maintain long-term engagement, representing the behavioral outcome of sustained satisfaction (Fornell et al., 1996; Ong et al., 2023; Iqbal et al., 2025). Overall, these dimensions help provide a clearer understanding of customer satisfaction and its related outcomes among member-consumers of electric cooperatives using a structural equation modeling framework.

The limited research on service quality, technical quality factors, and business governance as predictors of customer satisfaction in electric cooperatives emphasizes the need to develop an integrated structural model that reflects the unique context and operations of cooperatives. In previous research, these aspects have been examined separately, which may overlook the unique member-consumer relationships, perceived technical performance, and governance mechanisms that influence customer satisfaction. Using Covariance-Based Structural Equation Modeling (CB-SEM), the study examines the structural relationships among the proposed constructs, evaluates the overall model fit, and identifies the significant predictors of customer satisfaction. This approach supports methodological rigor by simultaneously testing the proposed relationships. It contributes to theory by enabling the simultaneous testing of the proposed relationships and by offering a context-specific model for understanding customer satisfaction in electric cooperatives.

This study contributes to the attainment of the United Nations Sustainable Development Goals (SDGs) by providing evidence that may guide improvements in the operations and service delivery of electric cooperatives. It contributes to SDG 7 (Affordable and Clean Energy) by identifying factors that can enhance the reliability, safety, maintenance, and overall quality of electricity services, thereby supporting more dependable and accessible energy for residential member-consumers. It also supports SDG 9 (Industry, Innovations, and Infrastructure) by emphasizing the importance of strengthening technical quality factors, improving service performance, and promoting more efficient and resilient energy infrastructure. Furthermore, the study contributes to SDG 11 (Sustainable Cities and Communities) by promoting reliable, responsive, and customer-oriented electricity services that enhance the quality of life

of residential member-consumers and support the development of safer, more resilient, and sustainable communities served by electric cooperatives.

2. METHODS

This section presents the research method and procedure employed in the study. It includes the research respondents, materials and instrument, design and procedures, and data analysis.

Research Respondents

The respondents of the study were residential member-consumers of five electric cooperatives operating in Region XII, also known as the SOCCSKSARGEN Region. These electric cooperatives were COTELCO Main (Cotabato Electric Cooperative, Inc.), COTELCO-PPALMA (Cotabato Electric Cooperative, Inc. – PPALMA), SOCOTECO I (South Cotabato I Electric Cooperative, Inc.), SOCOTECO II (South Cotabato II Electric Cooperative, Inc.), and SUKELCO (Sultan Kudarat Electric Cooperative, Inc.). The study locale was selected because these cooperatives serve a substantial number of residential member-consumers in Cotabato, South Cotabato, and Sultan Kudarat, making them appropriate for examining service quality, technical quality factors, business governance, and customer satisfaction in the electric cooperative setting.

After data screening and listwise deletion, 499 valid responses were retained, ensuring that the analysis was based only on complete and usable data. The responses were fairly distributed across the five participating electric cooperatives in Region XII, as follows: SOCOTECO II with 106 respondents (21.24%), COTELCO-PPALMA with 105 respondents (21.04%), COTELCO Main with 104 respondents (20.84%), SUKELCO with 98 respondents (19.64%), and SOCOTECO I with 86 respondents (17.23%). The final sample was considered sufficient for Structural Equation Modeling because SEM requires an adequate number of respondents to generate stable parameter estimates and acceptable statistical power, particularly when the model includes several latent constructs and observed indicators (Hair et al., 2022; Kline, 2023). Therefore, the 499 valid responses provided a reliable basis for testing the pooled structural model and for conducting comparisons across electric cooperatives.

The respondents were selected through stratified sampling, with each electric cooperative serving as one stratum. This approach ensured that all five cooperatives were included and properly represented in the study. The final number of respondents from each cooperative was determined based on the complete and usable questionnaires retained after data screening. Although the number of respondents per cooperative was not exactly equal, the distribution was considered acceptable because each cooperative had enough participants n for group-specific analysis.

The relatively balanced distribution of respondents, ranging from 86 to 106 per cooperative, was considered appropriate for the study because one of its objectives was to compare structural relationships across electric cooperatives. Since the study employed CB-SEM and Multi-Group Analysis, an adequate number of valid cases in each cooperative group was necessary. This enabled the researcher to examine both the overall pooled structural model and the group-specific models for COTELCO-Main, COTELCO-PPALMA, SOCOTECO I, SOCOTECO II, and SUKELCO.

The respondents of the study were required to meet specific inclusion criteria. They had to be at least 18 years old, active residential member-consumers of their respective electric cooperatives, and must have experienced at least one service-related transaction or interaction with the cooperative, such as a billing concern, service request, complaint, or other customer-related matters. Cooperative employees, officers, and board members were excluded from the study to avoid possible conflicts of interest and response bias.

Materials and Instrument

The study used a structured questionnaire as the primary research instrument for data collection. It was designed to gather the perceptions of residential member-consumers regarding service quality, technical quality factors, business governance, and customer satisfaction.

The questionnaire consisted of four sections. The first section measured service quality based on five indicators: tangibility, reliability, responsiveness, assurance, and empathy. The items were adapted and modified from Libo-on (2021) and were anchored to the SERVPERF model of Cronin and Taylor (1992). These items were contextualized to reflect the actual experiences of member-consumers with electric cooperative services, particularly in terms of facilities, billing records, employee assistance, complaint handling, and customer support.

The second section assessed Technical Quality Factors using three indicators: power reliability, voltage stability, and maintenance and safety. The items were adapted and revised from Satapathy et al. (2012) and were simplified to ensure that residential member-consumers could easily understand the technical concepts. These items covered electricity availability, advance notice of power interruptions, voltage stability, transformer-related concerns, meter functionality, linemen response, inspections, and safety reminders.

The third section measured Business Governance, which consisted of four indicators: transparency, fairness, accountability, and ethical behavior. The items were adapted and revised from Sunaryo et al. (2023), OCDC (2023), Budiyah and Suyono (2020), Susianto (2014), and Putra Arda et al. (2021). These items were contextualized to assess the member-consumers' perceptions of how the cooperative communicates rates and policies, applies rules fairly, addresses complaints, reports performance, takes responsibility for service-related concerns, and demonstrates ethical leadership.

The final section measured customer satisfaction, which consisted of three indicators: trust, perceived quality, and loyalty. The items were adapted and revised from Santos Neto et al. (2022) and were aligned with the customer satisfaction framework used in the study. The statements were contextualized to capture member-consumers' confidence in the electric cooperative, their overall perception of electricity service quality, and their willingness to continue receiving services from and remain loyal to the cooperative.

The questionnaire used a five-point Likert scale to determine the respondents' level of agreement with each statement. The scale allowed the respondents to indicate the extent to which each statement reflected their experience with their electric cooperative. Responses were interpreted as Very High for mean scores ranging from 4.21 to 5.00 (Strongly Agree), High for 3.41 to 4.20 (Agree), Moderate for 2.61 to 3.40 (Neutral), Low for 1.81 to 2.60 (Disagree), and Very Low for 1.00 to 1.80 (Strongly Disagree). The descriptive interpretations served as the basis for determining the respondents' perceptions of service quality, technical quality factors, business governance, and customer satisfaction.

The adapted questionnaire was subjected to expert validation to establish content validity. It was evaluated by five panel validators, and one external expert in the field in terms of clarity, organization, suitability, item adequacy, purpose attainment, and rating scale appropriateness of the rating scale. As shown in Appendix G, the expert validation results obtained an overall mean rating of 4.7, which was interpreted as Excellent. This suggests that the instrument was clear, appropriate, well-organized, and aligned with the objectives of the study. The validators' comments and recommendations were also considered in revising and refining the questionnaire before its pilot testing and final administration.

The reliability of the questionnaire was assessed using Cronbach's alpha to determine the internal consistency of the items. Before the final data collection, the instrument was pilot-tested among 30

respondents to ensure its clarity, consistency, and suitability for the study. All major constructs obtained Cronbach's alpha values above the acceptable threshold of 0.70, indicating that the instrument had satisfactory internal consistency. Service quality composed of 20 items, obtained a Cronbach's alpha of 0.942, which is interpreted as excellent. Technical quality factors, consisting of 12 items, obtained an alpha of 0.854, interpreted as good. Business governance, measured through 16 items, had an alpha value of 0.919, also interpreted as excellent. Customer satisfaction, measured by 12 items, obtained an alpha of 0.897, interpreted as good. Overall, the 60-item questionnaire yielded a reliability coefficient of .962, which is interpreted as excellent. These findings indicate that the questionnaire demonstrates strong reliability and is appropriate for use in the final data gathering/ suitable for the final data gathering.

The instrument was further examined through Confirmatory Factor Analysis as part of the CB-SEM procedure. This step was conducted to determine whether the observed indicators adequately measured their assigned latent constructs before proceeding with the assessment of the structural model.

Design and Procedure

This study used a quantitative descriptive-correlational research design to examine the relationships among service quality, technical quality factors, business governance, and customer satisfaction among residential member-consumers of electric cooperatives in Region XII. This design was appropriate because the study focused on existing relationships among variables without manipulations or treatment. It also enabled the researcher to measure the degree of association among the constructs and determine how the predictor variables relate to customer satisfaction using numerical data (Creswell & Creswell, 2023; Polit & Beck, 2021).

The study also employed Covariance-Based Structural Equation Modeling (CB-SEM) to test the hypothesized structural model. This method was appropriate because the study involved latent constructs measured through multiple observed indicators. It also allowed the researcher to examine the direct effects of service quality, technical quality factors, and business governance on customer satisfaction. It also allowed the evaluation of overall model fit and provided a basis for determining whether the proposed model adequately represented the observed data (Hair et al., 2022; Kline, 2023; Dash & Paul, 2021).

The research process started with the preparation of the modified survey questionnaire, followed by its validation and pilot testing. After securing permission from the relevant authorities and participating electric cooperatives, the questionnaire was administered to qualified residential member-consumers. The completed responses were collected, encoded, and screened for completeness and suitability for analysis. Following listwise deletion, 499 valid cases were retained and used for the pooled CB-SEM and cooperative-level Multi-Group Analysis.

The data were analyzed using appropriate statistical procedures. The mean and standard deviation were used to describe the level of service quality, technical quality factors, business governance, and customer satisfaction among member-consumers of electric cooperatives. The Pearson Product-Moment Correlation was used to determine the relationships among the variables. The measurement model was assessed through Confirmatory Factor Analysis as part of the CB-SEM procedure to determine whether the observed indicators properly measure their respective latent constructs. Furthermore, model fit was evaluated using established fit indices, including CFI, TLI, GFI, NFI, and RMSEA, based on commonly accepted threshold values.

A Multi-Group Analysis was then conducted to compare the structural relationships among the five cooperatives. The analysis involved configural, metric, and scalar invariance testing, followed by pairwise path-difference tests. Measurement invariance testing was necessary to determine whether the constructs

were measured consistently across the cooperative groups (Cheung & Rensvold, 2002; Putnick & Bornstein, 2016). Since metric invariance was established, comparing the structural paths across cooperatives was deemed appropriate. However, because scalar invariance was not supported, latent mean comparisons were interpreted only descriptively and with caution.

Ethical considerations were observed throughout the conduct of the study. Before the data collection, the research protocol underwent ethical review and was granted a Compliance Certificate for Study Ethics Protocol Review (UMERC-2026-079) by the University of Mindanao Ethics Review Committee (UMERC). This ensured that the study complied with established ethical standards for research involving human participants. Participation was entirely voluntary. The respondents were properly informed about the purpose of the study, including their right to withdraw at any time without penalty. Confidentiality and anonymity were strictly observed, and all the data gathered were used only for academic and research purposes. No financial or material incentives were given to the respondents, ensuring that their participation was based solely on the informed consent and their willingness to contribute to the study.

3. RESULT AND DISCUSSION

The study's findings regarding the research objectives are presented in this part of the paper to provide a clearer understanding of the idea and its implications. It includes descriptive results, correlation analysis, pooled SEM results, model fit assessment, and Multi-Group Analysis across the five electric cooperatives in Region XII.

Service Quality

The respondents' assessments of service quality, in terms of the following indicators: tangibility, reliability, responsiveness, assurance, and empathy, are presented in Table 1. The result shows an overall mean of 4.04 and a standard deviation of 0.68, indicating that service quality was perceived as high. This means that most respondents believed the electric cooperatives could provide satisfactory service through their facilities, personnel, reliability, and customer assistance. The standard deviation values are all below 1.00, which further indicates the relative consistency of the respondents' responses.

Table 1

Level of Service Quality as Perceived by the Respondents

Indicators	Standard Deviation	Mean	Descriptive Level
Tangibility	0.66	4.20	High
Reliability	0.81	3.94	High
Responsiveness	0.84	3.90	High
Assurance	0.73	4.10	High
Empathy	0.73	4.06	High
Overall	**0.68**	**4.04**	**High**

The result shows that tangibility was the highest mean among the indicators, and responsiveness was the lowest. This implies that respondents gave the most favorable assessment to the visible and physical aspects of service delivery, such as facilities, equipment, personnel appearances, and service-related

resources. However, the comparatively lower responsiveness rating suggests that the cooperatives may still improve the speed, timeliness, and efficiency of responding to consumer concerns, power-related complaints, service interruptions, and requests for assistance. This is supported by Zygiaris et al. (2022), who emphasized that responsiveness reflects prompt service and willingness to help customers. Similarly, Yılmaz and Kınaş (2020) found that responsiveness is an important dimension of customer satisfaction in electric distribution services, while J.D Power (2024) highlighted that customer satisfaction in utilities is strongly affected by communication, problem resolution, and service response. Thus, improving response mechanisms may further strengthen the service experience and satisfaction of member-consumers.

Technical Quality Factors

The respondents' assessments of technical quality factors in terms of the following indicators: power reliability, voltage stability, and maintenance and safety are presented in Table 2. The result shows an overall mean of 3.99, with a standard deviation of 0.71, indicating that technical quality factors are perceived as high. This means that most respondents believed that the electric cooperatives were performing satisfactorily in maintaining safe, stable, and reliable electricity service.

Table 2

Level of Technical Quality Factors as Perceived by the Respondents

Indicators	Standard Deviation	Mean	Descriptive Level
Power Reliability	0.84	3.91	High
Voltage Stability	0.77	3.98	High
Maintenance and Safety	0.74	4.08	High
Overall	**0.71**	**3.99**	**High**

The findings showed that maintenance and safety was the highest mean among the indicators, and power reliability was the lowest. This implies that member-consumers considered the cooperative's safety measures, maintenance activities, and operational care more favorably than other technical aspects of service delivery. However, the lower power reliability rating indicates that the consistency of power supply and the management of service interruptions may still need to be improved. This is consistent with the study of Santos Neto et al. (2022), which emphasized that continuity and quality of electric distribution service influence residential consumers' satisfaction.

Similar to this is the study of Villareal et al. (2025), which explains that voltage stability and power reliability are essential for efficient and reliable distribution of electric services. In support of these findings, the J.D. Power (2024) Electric Utility Residential Customer Satisfaction Study concluded that service reliability and prompt restoration following outages are among the most significant factors determining customer satisfaction. Therefore, while the electric cooperatives generally performed well in technical quality, strengthening power reliability and reducing service interruptions remain essential for enhancing overall customer satisfaction.

Business Governance

The respondents' assessment of business governance in terms of the following indicators: transparency,

fairness, accountability, and ethical behavior, are presented in Table 3. The overall mean of 4.00, with a standard deviation of 0.75, indicates that business governance was perceived to be high. This means that most respondents perceived the electric cooperatives as practicing responsible, fair, transparent, and ethical management, suggesting that these principles are generally evident in their operations.

Table 3

Level of Business Governance as Perceived by the Respondents

Indicators	Standard Deviation	Mean	Descriptive Level
Transparency	0.85	3.98	High
Fairness	0.81	3.99	High
Accountability	0.78	4.01	High
Ethical Behavior	0.81	4.01	High
Overall	**0.75**	**4.00**	**High**

Findings showed that ethical behavior and accountability were the highest means among the indicators, and transparency was the lowest, but all of them are at a high level. This implies that most respondents perceived their electric cooperatives as practicing ethical and accountable governance, while also recognizing opportunities to further improve openness, information sharing, and communication with member-consumers. Considering member-consumers are also stakeholder-owners of the cooperative, timely and transparent disclosure of information on rates, service policies, power interruptions, financial matters, and governance decisions is essential in to strengthen trust, promote accountability, and encourage informed member participation. This finding aligns with the principles outlined by the OECD (2023), which identify transparency and accountability as fundamental components of effective corporate governance. It is further supported by IFC (2023), which emphasized the role of transparency and disclosure in building stakeholder confidence, and by Koeswayo et al. (2024), who demonstrated that strong governance and control systems promote transparency, accountability, and trust. Therefore, adopting a more proactive approach to disclosure and communication mechanisms may further enhance the confidence and satisfaction of member-consumers by ensuring timely access to relevant information and fostering greater trust in the cooperative's governance practices.

Customer Satisfaction

The respondents' assessment of customer satisfaction in terms of the following indicators: trust, perceived quality, and loyalty, is presented in Table 4. The results revealed a high level of customer satisfaction, as reflected by the overall mean of 4.08 and a standard deviation of 0.76. This implies that most respondents perceived their electric cooperatives positively, reflecting satisfaction with the quality of services provided, confidence in the cooperative's performance, and continued support for its programs and implementations.

Table 4

Level of Customer Satisfaction as Perceived by the Respondents

Indicators	Standard Deviation	Mean	Descriptive Level
Trust	0.76	4.14	High
Perceived Quality	0.81	4.05	High
Loyalty	0.84	4.04	High
Overall	**0.76**	**4.08**	**High**

Findings showed that trust was the highest mean among the indicators, and loyalty was the lowest. This implies that member-consumers have confidence in the services, operations, and management of the electric cooperatives. Although the rating was high, findings suggest that long-term member-consumer commitment may further be enhanced through stronger engagement initiatives, improved communication strategies, and the consistent delivery of quality service. The relationship between satisfaction and continued support is consistent with the results of Dam and Dam (2021), which demonstrated that higher levels of customer satisfaction contribute to stronger customer loyalty and sustained commitments to service providers. It is further supported by the results of Lawal, Ajewole, and Bada (2021), indicating that satisfaction among member-consumers is influenced by continuity of supply, ease of payment, and prompt response to service concerns. Jou et al. (2022) further emphasized the role of service quality in influencing customer satisfaction in electric utility services, noting that reliable service delivery, effective customer support, and accessible service systems contribute to greater consumer confidence. Therefore, maintaining consistent, fair, and responsive services remains important for electric cooperatives to promote trust and strengthen member-consumer loyalty.

Relationship Among Service Quality, Technical Quality Factors, Business Governance, and Customer Satisfaction

The correlation results presented in Table 5 show the extent to which service quality, technical quality factors, and business governance are associated with customer satisfaction. All variables were found to have a positive and significant relationship ($p < 0.001$), indicating that improvements in these areas correspond with higher levels of customer satisfaction. Among the identified variables, business governance has the strongest correlation with customer satisfaction ($r = 0.860$), followed by technical quality factors ($r = 0.813$) and service quality ($r = 0.812$). These results underscore the important role of good governance, reliable technical performance, and effective service delivery in providing a positive member-consumer experience.

Table 5

Correlation Matrix of Service Quality, Technical Quality Factors, Business Governance, and Customer Satisfaction

Paired Variables	r-value	p-value	Decision
Service Quality – Technical Quality Factors	0.869	<0.001	Reject H_o
Service Quality –	0.848	<0.001	Reject H_o

Business Governance			
Service Quality – Customer Satisfaction	0.812	<0.001	Reject H_o
Technical Quality Factors - Business Governance	0.873	<0.001	Reject H_o
Technical Quality Factors - Customer Satisfaction	0.813	<0.001	Reject H_o
Business Governance - Customer Satisfaction	0.860	<0.001	Reject H_o

The observed relationships suggest that respondents who viewed the cooperative's technical operations more favorably also tend to provide higher assessments of service quality. In the same way, positive perceptions of governance practices may contribute to greater confidence in the electric cooperative's ability to deliver reliable services and maintain effective operations. However, these results reflect patterns of association among variables and should not be interpreted as evidence that one indicator directly causes changes in another. This interpretation is emphasized by Hair et al. (2022), explaining that correlation analysis identifies the strength and direction of relationships without establishing causal effects. Furthermore, Ong et al. (2023) emphasized that customer perceptions of electric utility services are shaped by multiple service and performance-related factors, while Yilmaz and Kinaş (2020) emphasized the interconnected nature of service quality dimensions in influencing customer perceptions.

Significant Structural Predictors of Customer Satisfaction

The results presented in Table 6 indicate that business governance significantly contributed to the prediction of customer satisfaction, obtaining the highest standardized coefficient among the variables analyzed ($\beta = 0.0680$, $p < 0.001$). The result indicates that perceptions of transparent, accountable, fair, and ethical electric cooperative management are closely related to higher levels of member-consumer satisfaction. While the other factors contributed to the model, the stronger effect of business governance implies that how the electric cooperative is managed and governed plays an important role in shaping member-consumers' overall satisfaction and confidence.

Table 6

Pooled Structural Path Coefficients Predicting Customer Satisfaction

Exogenous Variables	Path	Standardized Coefficient β	Sig.	Interpretation
Service Quality	$SQ \rightarrow CS$	0.210	0.020	Significant Predictor
Technical Quality Factors	$TQ \rightarrow$ CS	0.040	0.739	Not Significant
Business Governance	$BG \rightarrow$ CS	0.680	< 0.001	Significant Predictor

The findings further revealed that service quality had a significantly positive contribution to customer satisfaction ($\beta = 0.210$, $p = 0.020$). Although its effect was comparatively lower than business governance, the result demonstrates that consumer-focused service delivery remains important in shaping satisfaction. Indicators such as reliability, responsiveness, assurance, empathy, and tangibility continue to contribute to consumer evaluations; however, their direct contribution becomes less evident when considered together with business governance and technical quality factors in the model.

Meanwhile, the analysis showed technical quality factors did not significantly predict customer satisfaction (β = 0.040, p = 0.739). This result should be interpreted within the context of the model, as the technical quality remains an essential component of electric utility performance. However, when evaluated together with service quality and business governance, its indicators did not exhibit a significant independent effect on customer satisfaction. Although technical quality factors were significantly associated with customer satisfaction in the correlation analysis, their effect may overlap with or be absorbed by broader perceptions of service quality and governance.

Best-Fit Pooled Structural Equation Model of Customer Satisfaction

Table 7 presents the model fit indices for the pooled and cooperative-specific SEM models. Model fit was evaluated using the Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Goodness of Fit Index (GFI), Normed Fit Index (NFI), and Root Mean Square Error of Approximation (RMSEA). Generally, CFI, TLI, GFI, and NFI values of 0.90 or higher indicate acceptable model fit, while values approaching to 0.95 indicate good fit. For RMSEA, values of 0.08 or lower indicate acceptable fit, whereas values between 0.08 to 0.10 suggest a marginal but still acceptable fit (Hu & Bentler, 1999; Hair et al., 2022).

The pooled model showed acceptable fit based on the incremental fit indices, which were within acceptable levels: CFI = 0.963, TLI = 0.954, GFI = 0.954, and NFI = 0.954. These values indicate that the proposed structural model adequately represented the relationships of service quality, technical quality factors, business governance, and customer satisfaction. Although the RMSEA value of 0.088 exceeded the cutoff value of 0.08, it is still within the range considered to be an acceptable or marginal model fit. Considering the overall fit assessment, the pooled model demonstrated an adequate representation of the observed data and provided an appropriate basis for evaluating the relationships among the variables.

Table 7

Model Fit Indices for the Pooled and Cooperative-Specific SEM Models

Group	N	χ^2	df	χ^2/df	p	CFI	TLI	GFI	NFI	RMSEA
POOLED (All)	499	406.97	84	4.845	< 0.001	0.963	0.954	0.954	0.954	0.088
COTELCO Main	104	207.2	84	2.467	< 0.001	0.931	0.913	0.89	0.89	0.119
COTELCO-PPALMA	105	127.2	84	1.514	0.002	0.978	0.973	0.939	0.939	0.07
SOCOTECO I	86	172.01	84	2.048	< 0.001	0.942	0.927	0.893	0.893	0.111
SOCOTECO II	106	215.62	84	2.567	< 0.001	0.919	0.899	0.876	0.876	0.122
SUKELCO	98	184.86	84	2.201	< 0.001	0.933	0.917	0.886	0.886	0.111

For the cooperative-specific models, COTELCO-PPALMA showed the strongest group-specific fit, with χ^2/df = 1.514, CFI = 0.978, TLI = 0.973, GFI = 0.939, NFI = 0.939, and RMSEA = 0.070. The cooperative-specific models likewise demonstrated acceptable incremental fit; however, their relatively high RMSEA values suggest limitations in achieving a closer fit to the observed data. These models may still provide useful insights but should be interpreted with caution. Given its overall fit, the final pooled model provides a more reliable foundation in examining the general structural relationships, while the group-specific models offer supplemental insights at the cooperative level.

Based on the responses of 499 residential member-consumers, Figure 2 presents the resulting final best-fit pooled structural equation model. The analysis confirms the suitability of the proposed framework, as all latent constructs involved were retained, and the model demonstrated an adequate fit with the observed

data. The structural paths further indicate that customer satisfaction is significantly explained by business governance and service quality, whereas technical quality factors do not exhibit a significant direct effect after considering the influence of other constructs. Business governance emerged as the strongest predictor ($\beta = 0.680$, $p < 0.001$), followed by service quality, which also had a significant but weaker influence on customer satisfaction ($\beta = 0.210$, $p = 0.020$). In contrast, technical quality factors showed a positive but non-significant direct effect ($\beta = 0.040$, $p = 0.739$), suggesting that their influence may be reflected through broader perceptions of service quality and business governance rather than through a direct relationship.

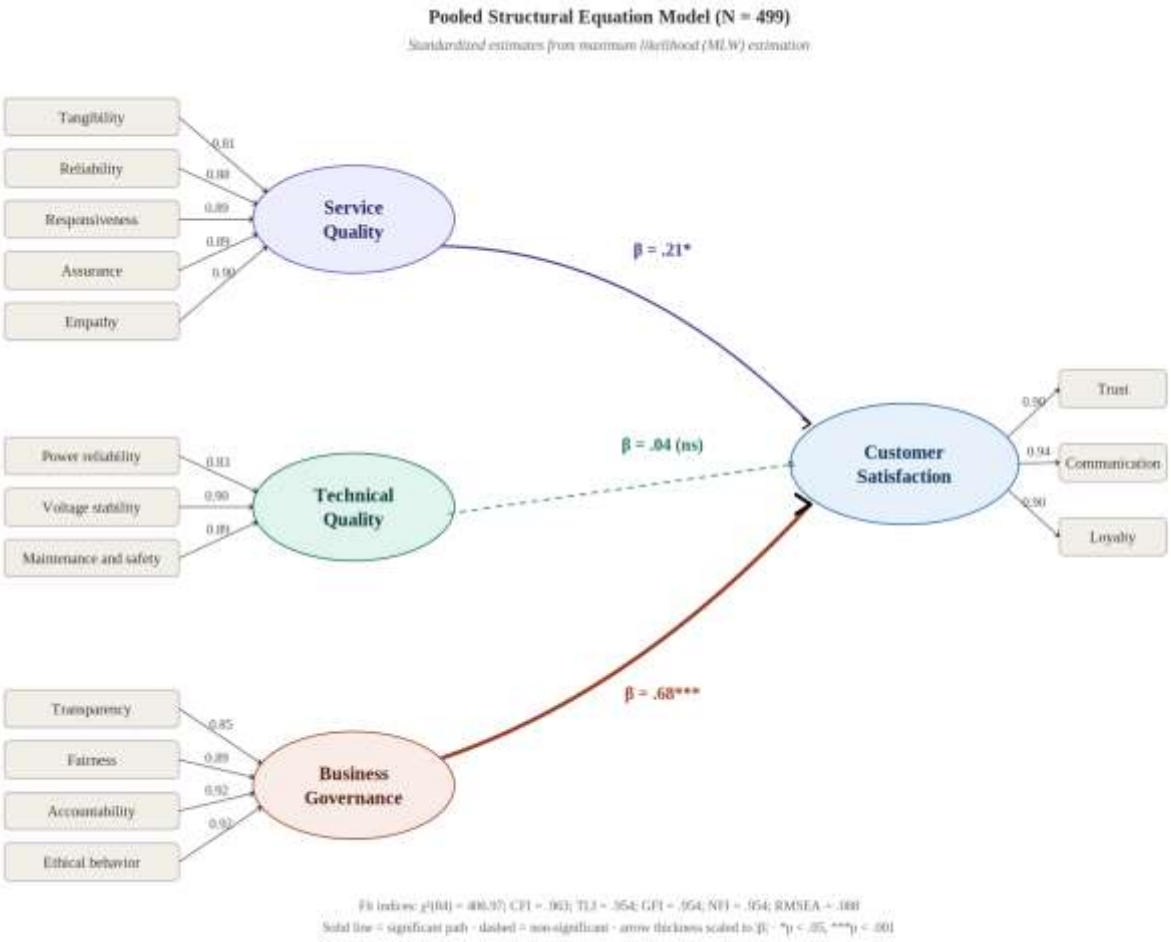

Figure 2. *Best-Fit Pooled Structural Equation Model of Customer Satisfaction*

The best-fit pooled SEM shows that satisfaction is not determined solely by the technical delivery of electricity, but it is strongly shaped by governance-related perceptions. This implies that member-consumers value how the cooperative is managed, how decisions are made fairly, how accountable the organization is, and how ethically it treats its stakeholders. Service quality also remains relevant, although its influence is weaker than the governance when all predictors are considered together.

Although technical quality factors showed a strong correlation with customer satisfaction, their non-significant direct effect in the SEM does not diminish their importance in the operations of the electric cooperatives. Instead, technical quality factors may contribute to satisfaction indirectly through member-consumers' overall service and governance perceptions. As explained by Dash and Paul (2021) and Hair et al. (2022), the influence of a predictor may become less apparent when related variables are analyzed

simultaneously in a structural model. This finding also supports Grönroos (1984), who emphasized that customers often assess technical performance as part of the broader service experience.

Furthermore, the best-fit pooled structural model maintained all variables specified in the study's conceptual framework. Although technical quality factors did not show a significant direct effect on customer satisfaction, they were retained because of their conceptual relevance within the proposed structural model. The retention of the variables after model evaluation confirms their continued theoretical relevance in explaining customer satisfaction.

Multi-Group Analysis of Structural Relationships Across Electric Cooperatives

Prior to conducting the Multi-Group Analysis (MGA), measurement invariance was assessed to ensure that the constructs were measured consistently across five participating cooperatives. Configural invariance determines whether the same factor structure applies across groups, metric invariance examines whether factor loadings are comparable, and scalar invariance assesses whether item intercepts are equivalent for valid latent mean comparisons (Byrne, 2016; Hair et al., 2022; Kline, 2023). In this study, configural invariance was supported since the model showed acceptable fit, $\chi^2 = 906.89$, df = 420, CFI = 0.942, and RMSEA = 0.048. Metric invariance was also supported, $\Delta\chi^2(55) = 72.33$, $p = 0.059$, and ΔCFI = -0.002, indicating that structural path comparisons across cooperatives were acceptable. However, scalar invariance was not supported, $\Delta\chi^2 = 24{,}132.44$, $p < 0.001$, and ΔCFI = -0.940; thus, latent mean differences should be interpreted only as descriptive patterns rather than strict rankings of cooperative performance.

The cooperative-specific structural models presented in Appendix B.2 to B.6 demonstrate how the proposed relationships among service quality, technical quality factors, business governance, and customer satisfaction manifest within each electric cooperative. Rather than representing a single pattern, the models reveal distinct structural configurations across groups, highlighting the influence of cooperative-specific conditions on the relationships among the variables of the study. These results extend the proposed model by providing a more detailed understanding of group-level variations and establish the foundation for examining differences through Multi-Group Analysis.

Structural Path Coefficients Across Electric Cooperatives

The results presented in Table 8 demonstrate that business governance played an important role in explaining customer satisfaction across the five electric cooperatives, although the strength of its influence varied by cooperative. Significant positive effects were observed in COTELCO Main ($\beta = 1.005$, $p < 0.001$), SOCOTECO I ($\beta = 0.910$, $p < 0.001$), and SUKELCO ($\beta = 0.559$, $p < 0.01$), suggesting that governance practices were closely associated with member-consumer satisfaction in these groups. In comparison, the relationship was not significant for COTELCO-PPALMA ($\beta = 0.013$) and SOCOTECO II Main ($\beta = 0.352$). These differences imply that while business governance consistently showed the strongest pattern among the predictors, its effect may depend on the specific operational and organizational conditions of each electric cooperative.

The influence of service quality on customer satisfaction also varied across the cooperative-specific models. A significant positive effect was observed only in COTELCO Main ($\beta = 0.583$, $p < 0.01$), while COTELCO-PPALMA ($\beta = 0.382$), SOCOTECO I ($\beta = -0.099$), SOCOTECO II ($\beta = -0.118$) and SUKELCO ($\beta = 0.106$), showed non-significant relationships. These results implies that although service quality contributes to satisfaction in some settings, its direct effect is not consistent across all cooperatives.

Similarly, technical quality factors did not significantly predict customer satisfaction in any cooperative-specific model. However, the direction and magnitude of the coefficients varied, ranging from a negative effect in COTELCO Main (β = −0.646) to positive in COTELCO-PPALMA (β = .578), SOCOTECO I (β = 0.144), SOCOTECO II (β = 0.583), and SUKELCO (β = 0.330). This suggests that technical performance remains an essential operational component, but its independent contribution to customer satisfaction was not consistently evident when considered alongside the other variables.

Table 8

Standardized Structural Path Coefficients by Electric Cooperative

Structural Path	COTELCO Main	COTELCO-PPALMA	SOCOTECO I	SOCOTECO II	SUKELCO
SQ → CS	0.583**	0.382	−0.099	−0.118	0.106
TQ → CS	−0.646	0.578	0.144	0.583	0.33
BG → CS	1.005***	0.013	0.910***	0.352	0.559**

Note. *SQ = Service Quality; TQ = Technical Quality; BG = Business Governance; CS = Customer Satisfaction. **p < 0.01; ***p < 0.001. Coefficients without asterisks are non-significant at α = 0.05. Standardized estimates slightly above 1.00 should be interpreted with caution.*

The findings highlight the importance of the role of business governance practices in shaping member-consumer satisfaction. This is supported by the study of Ltifi and Hichrii (2021), which emphasized that good governance strengthens positive customer perceptions and satisfaction outcomes. Similarly, Ong et al. (2023) emphasized that governance and service-related factors collectively influence customer satisfaction in electric utility services, while Migisha et al. (2023) and J.D. Power (2024) highlighted the importance of reliability, communication, customer care, and service experiences in shaping consumer perceptions. This indicates that satisfaction among cooperative members extends beyond the quality and reliability of services, as it is also influenced by their perceptions of transparent decision-making, fairness, accountability, and responsive management.

4. CONCLUSION AND RECOMMENDATION

Through the assessment of service quality, technical quality factors, and business governance, this study provides insights into the determinants of customer satisfaction among residential member-consumers of electric cooperatives in Region XII, Philippines. The results derived from descriptive analysis, correlation analysis, pooled Structural Equation Model, and Multi-Group Analysis revealed that satisfaction is a multidimensional outcome influenced by operational performance, governance practices, and the electric cooperative's ability to maintain positive relationships with its member-consumers.

The results suggest that electric cooperatives have established a generally positive foundation with service delivery, technical operations, and governance practices. However, the findings also highlight the need for continuous improvement in key areas, such as responsiveness, reliability, transparency, and member engagement, to further strengthen member-consumer trust, satisfaction, and long-term commitment.

The findings demonstrate that customer satisfaction is closely associated with service quality, technical quality factors, and business governance, showing a positive relationship. This highlights that member-consumer satisfaction extends beyond service performance, as perceptions of fair, transparent,

accountable, and ethical management also play a contributing factor in shaping confidence in electric cooperatives.

The best-fit pooled Structural Equation Model confirmed the important role of business governance and service quality in explaining customer satisfaction, with business governance showing the strongest predictive influence. Although technical quality factors did not show a significant direct effect within the combined model, its operational importance remains evident as it supports reliable and safe electricity services and may contribute through broader service perceptions. The retention of all constructs from the proposed framework further indicates that it provides a comprehensive basis for understanding the factors that shape customer satisfaction among residential member-consumers of electric cooperatives.

The observe difference across the involved electric cooperatives indicate that the factors associated with customer satisfaction are not uniform across organizational settings. These findings show the importance of considering cooperative-specific contexts when developing strategies to enhance member-consumer satisfaction, while also recognizing the value of a common framework for understanding the key determinants of satisfaction across electric cooperatives.

Electric cooperatives are encouraged to adopt context-specific strategies that strengthen governance, enhance service delivery, and sustain reliable technical operations. Priority may be given to improving transparency, accountability, communication, responsiveness, and member engagement through regular policy reviews, stakeholder consultations, and feedback mechanisms. These initiatives can support continuous organizational improvement while remaining aligned with each cooperative's operational priorities, institutional capacity, and available resources.

To support continuous improvement, electric cooperatives may consider expanding the use of customer feedback and performance monitoring in planning and decision-making. Regular assessment of member-consumer experiences, combined with periodic evaluation of service processes and operational performance, can help identify emerging concerns and guide appropriate interventions. Continued investment in system modernization, preventive maintenance, and workforce capability development may also contribute to sustaining reliable and efficient service delivery over time.

The findings of this study may be used as empirical evidence to support strategic planning, policy formulation, and performance evaluation within the electric cooperative sector. They may also serve as a reference for regulatory agencies, policymakers, cooperative federations, and future researchers in developing initiatives, policies, and studies that contribute to the continuous advancements of governance, service delivery, and member-consumer welfare.

Finally, future studies are encouraged to validate and refine the proposed structural model in other geographic regions and organizational settings to determine its broader applicability. Researchers may also examine potential mediating or moderating variables, compare different customer segments, and employ longitudinal or mixed-method approaches to provide a more comprehensive understanding of the factors that influence customer satisfaction in electric cooperatives.

References

1. Abeygunawardane S.K., Aravinthan V., Wang X., Pahwa A., Singh C., "Examining Power System Resilience from the Perspective of Consumers: A Review", *IEEE Access*, 2024, 1.
2. American Customer Satisfaction Index (ACSI), "ACSI Telecommunications Study 2023–2024", *American Customer Satisfaction Index*, 2024. https://theacsi.org

3. Anderson E.W., Fornell C., "A Customer Satisfaction Research Prospectus", in Rust R.T., Oliver R.L. (Eds.), *Service Quality: New Directions in Theory and Practice*, Sage Publications, 1994, 241–268.
4. Andria Y., Yoza J., Yoserizal Y., Ramafina S.F., "The Effect of the Outage Duration and Outage Frequency on Customer Satisfaction of PT PLN (Persero) ULP Simpang Empat", *Enrichment: Journal of Management*, 2023, 13 (1), 537–545. https://doi.org/10.35335/enrichment.v13i1.1280
5. Baleboina G.M., et al., "A Survey on Voltage Stability Indices for Power System Transmission and Distribution Systems", *Frontiers in Energy Research*, 2023. https://doi.org/10.3389/fenrg.2023.1159410
6. Boente D.R., Lustosa P.R.B., "Efficiency of Electricity Distribution Companies", *RAUSP Management Journal*, 2020, 55, 177–193.
7. Budiyah F., Suyono E., "Good Cooperatives' Governance and Performance in Banyumas Region", *Kompartemen: Jurnal Ilmiah Akuntansi*, 2020, 18 (2). https://doi.org/10.30595/kompartemen.v18i2.7469
8. Cooperative Development Authority, "Code of Governance for Cooperatives", *Cooperative Development Authority*, 2018. https://cda.gov.ph/
9. Creswell J.W., Creswell J.D., *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*, 6th ed., Sage Publications, 2023.
10. Cronin J.J., Taylor S.A., "Measuring Service Quality: A Reexamination and Extension", *Journal of Marketing*, 1992, 56 (3), 55–68. https://doi.org/10.1177/002224299205600304
11. Cronin J.J. Jr., Taylor S.A., "SERVPERF versus SERVQUAL: Reconciling Performance-Based and Perceptions-Minus-Expectations Measurement of Service Quality", *Journal of Marketing*, 1994, 58 (1), 125–131. https://doi.org/10.1177/002224299405800110
12. Dam S.M., Dam T.C., "Relationships Between Service Quality, Brand Image, Customer Satisfaction, and Customer Loyalty", *The Journal of Asian Finance, Economics and Business*, 2021, 8 (2), 585–593. https://doi.org/10.13106/JAFEB.2021.VOL8.NO2.0585
13. Dash G., Paul J., "CB-SEM vs PLS-SEM Methods for Research in Social Sciences and Technology Forecasting", *Technological Forecasting and Social Change*, 2021, 173, 121092. https://doi.org/10.1016/j.techfore.2021.121092
14. Department of Energy, "Philippine Energy Plan 2024–2040: Powering Inclusive Growth", *Department of Energy*, 2024. https://www.doe.gov.ph/
15. Department of Energy, "Philippines Electric Power Industry Performance and Reliability Reports", *Department of Energy*. https://www.doe.gov.ph/
16. Devi K., Kumar R., Rani S., "Descriptive and Correlational Research Design in Business Studies", *International Journal of Management Research*, 2022, 10 (2), 34–47.
17. Electric Power Research Institute, "Distribution Area Review 2023", *Electric Power Research Institute*, 2023.
18. Elphick S., Knott J.C., Drury G., Langstaff T., Robinson D.A., "Quantifying the Economic Impact of Supply Voltage Magnitude on Consumers", *Energies*, 2024, 17 (22), 5590. https://doi.org/10.3390/en17225590
19. Energy Regulatory Commission, "Philippine Distribution Code 2017 Edition", *Energy Regulatory Commission*, 2017. https://erc.gov.ph/

20. Escresa L.C., Glova A.M.G., "Politico-economic Determinants of the Performance of Electric Cooperatives in the Philippines", *Utilities Policy*, 2024, 91, 101815. https://doi.org/10.1016/j.jup.2024.101815
21. European Commission, "Grids, the Missing Link: An EU Action Plan for Grids", *Publications Office of the European Union*, 2023. https://op.europa.eu/
22. Ewuim N., "Quality Service Delivery and Customers' Satisfaction Within the Framework of the Enugu Electricity Distribution Company (EEDC) in Abakaliki, Ebonyi State, Nigeria", *Nnamdi Azikiwe University*, 2020.
23. Fornell C., Johnson M.D., Anderson E.W., Cha J., Bryant B.E., "The American Customer Satisfaction Index: Nature, Purpose, and Findings", *Journal of Marketing*, 1996, 60 (4), 7–18. https://doi.org/10.1177/002224299606000403
24. Fornell C., Mithas S., Morgeson F.V., Krishnan M.S., "Customer Satisfaction and Stock Prices: High Returns, Low Risk", *Journal of Marketing*, 2006, 70 (1), 3–14.
25. Freeman R.E., *Strategic Management: A Stakeholder Approach*, Pitman, 1984.
26. Kulesa J., Induru S., Hubbard E., Bhansali P., "The Conceptual Framework: A Practical Guide", Hospital Pediatrics, 2024, 14 (11), e503–e508. https://doi.org/10.1542/hpeds.2024-007794
27. Kunaifi S., Reinders A., "Perceived and Reported Reliability of the Electricity Supply at Three Urban Locations in Indonesia", Energies, 2018, 11 (1), 140. https://doi.org/10.3390/en11010140
28. Lantican R.A., Villaseñor R.J., "Governance Practices and Efficiency Among Electric Cooperatives", Journal of Energy Economics and Policy, 2021, 11 (3), 45–54.
29. Lawal M.O., Ajewole T.O., Bada O.M., "Electricity Consumers' Satisfaction During COVID-19 Lockdown in Some Selected States in Nigeria", Jindal Journal of Business Research, 2021, 10 (2), 238–250. https://doi.org/10.1177/22786821211045792
30. Lee V., Park S., Lee D., "The Effect of E-commerce Service Quality Factors on Customer Satisfaction, Purchase Intention, and Actual Purchase in Uzbekistan", Global Business & Finance Review, 2022, 27 (3), 56–74.
31. Lezak S., Ahearn A., McConnell F., Sternberg T., "Frameworks for Conflict Mediation in International Infrastructure Development: A Comparative Overview and Critical Appraisal", Journal of Cleaner Production, 2019, 239, 118099. https://doi.org/10.1016/j.jclepro.2019.118099
32. Libo-on J., "Consumers' Satisfaction on Service Quality of Electric Cooperative", American International Journal of Business Management, 2021, 4, 162–177.
33. Łowczowski K., Nadolny Z., "Voltage Fluctuations and Flicker in Prosumer PV Installation", Energies, 2022, 15 (6), 2075. https://doi.org/10.3390/en15062075
34. Ltifi M., Hichri A., "The Effects of Corporate Governance on the Customer's Recommendations: A Study of the Banking Sector at the Time of COVID-19", Journal of Knowledge Management, 2022, 26 (1), 165–191. https://doi.org/10.1108/JKM-06-2020-0471
35. Medina G.C., Martin N.A. Jr., Posadas R.C., "Challenges in Improving the Services of La Union Electric Cooperative Incorporated (LUELCO, Inc.) for Member-Consumer-Owners' Satisfaction in the Province of La Union", Southeast Asian Journal of Science and Technology, 2020, 5 (1).
36. Merlo T.E., Exploring Communication and Relationship Investment Strategies for Improving the Satisfaction of an Electric Cooperative's Key Accounts, Trevecca Nazarene University, 2020.

37. Migisha A.G., Ntayi J.M., Buyinza F., Senyonga L., Abaliwano J., Adaramola M.S., "Review of Concepts and Determinants of Grid Electricity Reliability", Energies, 2023, 16 (21), 7220. https://doi.org/10.3390/en16217220
38. Mokhtar M., Hassan M.Y., Rahman H.A., Abdullah H., "Power Distribution Performance Evaluation: Reliability, Voltage Stability, and Loss Reduction Strategies", Energy Reports, 2023, 9, 501–512. https://doi.org/10.1016/j.egyr.2023.02.025
39. Morgan R.M., Hunt S.D., "The Commitment–Trust Theory of Relationship Marketing", Journal of Marketing, 1994, 58 (3), 20–38.
40. National Electrification Administration, "Memorandum No. 2011-020: Key Performance Standards (KPS) for Electric Cooperatives", National Electrification Administration, 2011.
41. National Electrification Administration, "2024 Annual Report: Building Nations Through Transformative Rural Electrification", National Electrification Administration, 2025. https://nea.gov.ph/wp-content/uploads/2025/09/NEA-2024-Annual-Report_compressed-2.pdf
42. National Electrification Administration, "2024 Annual Report: Building Nations Through Transformative Rural Electrification", National Electrification Administration, 2024. https://nea.gov.ph/wp-content/uploads/2025/09/NEA-2024-Annual-Report_compressed-2.pdf
43. Navarro R.M., Bacatan J.R., "Analysing the Relationship Between Service Quality and Customer Satisfaction on the Power Services Delivery of Northern Davao Electric Cooperative", International Journal of Innovative Research in Management & Finance, 2023, 9 (6), 201–210.
44. North American Electric Reliability Corporation, "State of Reliability—Technical Assessment", North American Electric Reliability Corporation, 2023.
45. Organisation for Economic Co-operation and Development (OECD), G20/OECD Principles of Corporate Governance 2023, OECD Publishing, 2023. https://doi.org/10.1787/ed750b30-en
46. Organisation for Economic Co-operation and Development (OECD), Clean Energy Finance and Investment Roadmap of the Philippines, OECD Publishing, 2024. https://doi.org/10.1787/7a13719d-en
47. Ong A.K.S., Prasetyo Y.T., Kishimoto R.T., Mariñas K.A., Robas K.P.E., Nadlifatin R., Persada S.F., Kusonwattana P., Yuduang N., "Determining Factors Affecting Customer Satisfaction of the National Electric Power Company (MERALCO) During the COVID-19 Pandemic in the Philippines", Utilities Policy, 2023, 80, 101454. https://doi.org/10.1016/j.jup.2022.101454
48. Polit D.F., Beck C.T., Nursing Research: Generating and Assessing Evidence for Nursing Practice, 11th ed., Wolters Kluwer, 2021.
49. Protzko J., "Invariance: What Does Measurement Invariance Allow Us to Claim?", Educational and Psychological Measurement, 2025, 85 (3), 458–482. https://doi.org/10.1177/00131644241282982
50. Ramnath G.S., et al., "Household Electricity Consumer Classification Using Novel Clustering Approach, Review, and Case Study", Electronics, 2022, 11 (15), 2302. https://doi.org/10.3390/electronics11152302
51. Kulesa J., Induru S., Hubbard E., Bhansali P., "The Conceptual Framework: A Practical Guide", Hospital Pediatrics, 2024, 14 (11), e503–e508. https://doi.org/10.1542/hpeds.2024-007794
52. Kunaifi S., Reinders A., "Perceived and Reported Reliability of the Electricity Supply at Three Urban Locations in Indonesia", Energies, 2018, 11 (1), 140. https://doi.org/10.3390/en11010140
53. Lantican R.A., Villaseñor R.J., "Governance Practices and Efficiency Among Electric Cooperatives", Journal of Energy Economics and Policy, 2021, 11 (3), 45–54.

54. Lawal M.O., Ajewole T.O., Bada O.M., "Electricity Consumers' Satisfaction During COVID-19 Lockdown in Some Selected States in Nigeria", Jindal Journal of Business Research, 2021, 10 (2), 238–250. https://doi.org/10.1177/22786821211045792
55. Lee V., Park S., Lee D., "The Effect of E-commerce Service Quality Factors on Customer Satisfaction, Purchase Intention, and Actual Purchase in Uzbekistan", Global Business & Finance Review, 2022, 27 (3), 56–74.
56. Lezak S., Ahearn A., McConnell F., Sternberg T., "Frameworks for Conflict Mediation in International Infrastructure Development: A Comparative Overview and Critical Appraisal", Journal of Cleaner Production, 2019, 239, 118099. https://doi.org/10.1016/j.jclepro.2019.118099
57. Libo-on J., "Consumers' Satisfaction on Service Quality of Electric Cooperative", American International Journal of Business Management, 2021, 4, 162–177.
58. Łowczowski K., Nadolny Z., "Voltage Fluctuations and Flicker in Prosumer PV Installation", Energies, 2022, 15 (6), 2075. https://doi.org/10.3390/en15062075
59. Ltifi M., Hichri A., "The Effects of Corporate Governance on the Customer's Recommendations: A Study of the Banking Sector at the Time of COVID-19", Journal of Knowledge Management, 2022, 26 (1), 165–191. https://doi.org/10.1108/JKM-06-2020-0471
60. Medina G.C., Martin N.A. Jr., Posadas R.C., "Challenges in Improving the Services of La Union Electric Cooperative Incorporated (LUELCO, Inc.) for Member-Consumer-Owners' Satisfaction in the Province of La Union", Southeast Asian Journal of Science and Technology, 2020, 5 (1).
61. Merlo T.E., Exploring Communication and Relationship Investment Strategies for Improving the Satisfaction of an Electric Cooperative's Key Accounts, Trevecca Nazarene University, 2020.
62. Migisha A.G., Ntayi J.M., Buyinza F., Senyonga L., Abaliwano J., Adaramola M.S., "Review of Concepts and Determinants of Grid Electricity Reliability", Energies, 2023, 16 (21), 7220. https://doi.org/10.3390/en16217220
63. Mokhtar M., Hassan M.Y., Rahman H.A., Abdullah H., "Power Distribution Performance Evaluation: Reliability, Voltage Stability, and Loss Reduction Strategies", Energy Reports, 2023, 9, 501–512. https://doi.org/10.1016/j.egyr.2023.02.025
64. Morgan R.M., Hunt S.D., "The Commitment–Trust Theory of Relationship Marketing", Journal of Marketing, 1994, 58 (3), 20–38.
65. National Electrification Administration, "Memorandum No. 2011-020: Key Performance Standards (KPS) for Electric Cooperatives", National Electrification Administration, 2011.
66. National Electrification Administration, "2024 Annual Report: Building Nations Through Transformative Rural Electrification", National Electrification Administration, 2025. https://nea.gov.ph/wp-content/uploads/2025/09/NEA-2024-Annual-Report_compressed-2.pdf
67. National Electrification Administration, "2024 Annual Report: Building Nations Through Transformative Rural Electrification", National Electrification Administration, 2024. https://nea.gov.ph/wp-content/uploads/2025/09/NEA-2024-Annual-Report_compressed-2.pdf
68. Navarro R.M., Bacatan J.R., "Analysing the Relationship Between Service Quality and Customer Satisfaction on the Power Services Delivery of Northern Davao Electric Cooperative", International Journal of Innovative Research in Management & Finance, 2023, 9 (6), 201–210.
69. North American Electric Reliability Corporation, "State of Reliability—Technical Assessment", North American Electric Reliability Corporation, 2023.

70. Organisation for Economic Co-operation and Development (OECD), G20/OECD Principles of Corporate Governance 2023, OECD Publishing, 2023. https://doi.org/10.1787/ed750b30-en
71. Organisation for Economic Co-operation and Development (OECD), Clean Energy Finance and Investment Roadmap of the Philippines, OECD Publishing, 2024. https://doi.org/10.1787/7a13719d-en
72. Ong A.K.S., Prasetyo Y.T., Kishimoto R.T., Mariñas K.A., Robas K.P.E., Nadlifatin R., Persada S.F., Kusonwattana P., Yuduang N., "Determining Factors Affecting Customer Satisfaction of the National Electric Power Company (MERALCO) During the COVID-19 Pandemic in the Philippines", Utilities Policy, 2023, 80, 101454. https://doi.org/10.1016/j.jup.2022.101454
73. Polit D.F., Beck C.T., Nursing Research: Generating and Assessing Evidence for Nursing Practice, 11th ed., Wolters Kluwer, 2021.
74. Protzko J., "Invariance: What Does Measurement Invariance Allow Us to Claim?", Educational and Psychological Measurement, 2025, 85 (3), 458–482. https://doi.org/10.1177/00131644241282982
75. Ramnath G.S., et al., "Household Electricity Consumer Classification Using Novel Clustering Approach, Review, and Case Study", Electronics, 2022, 11 (15), 2302. https://doi.org/10.3390/electronics11152302
76. Raza H., "Service Quality as an Antecedent of Customer Satisfaction: A Comparative Analysis of Four Alternative Service Quality Models on Customers of the Banking Sector of Pakistan", *International Journal of Experiential Learning & Case Studies*, 2024, 8 (2), 239–277. https://doi.org/10.22555/ijelcs.v8i2.1017
77. Rosak-Szyrocka J., Żywiołek J., Mrowiec M., "Analysis of Customer Satisfaction with the Quality of Energy Market Services in Poland", *Energies*, 2022, 15 (10), 3622.
78. Salazar A., Aguilar J.G., Arellano T.L., "Principios de la Organización para la Cooperación y Desarrollo Económico como Instrumento de Medición de Gobierno Corporativo en las Cooperativas", 2018.
79. Santos Neto A.S., Reis M.R.C., Coimbra A.P., Soares J.C.V., Calixto W.P., "Measure of Customer Satisfaction in the Residential Electricity Distribution Service Using Structural Equation Modeling", *Energies*, 2022, 15 (3), 746. https://doi.org/10.3390/en15030746
80. Setiono B.A., Hidayat S., "Influence of Service Quality on the Dimensions of Reliability, Responsiveness, Assurance, Empathy, and Tangibles on Customer Satisfaction", *International Journal of Economics, Business and Management Research*, 2022, 6 (9), 330–341. http://doi.org/10.51505/ijebmr.2022.6924
81. Shafik M.B., Elbarbary Z.M.S., Bu Siqi, Azmy A.M., Hussien M.G., "Distribution Networks Reliability Assessment Considering Distributed Automation System with Penetration of DG Units and SOP Devices", *Energy Reports*, 2023. https://doi.org/10.1016/j.egyr.2023.05.224
82. Shakou L.M., Wybo J.L., Reniers G., Boustras G., "Developing an Innovative Framework for Enhancing the Resilience of Critical Infrastructure to Climate Change", *Safety Science*, 2019, 118, 364–378. https://doi.org/10.1016/j.ssci.2019.05.019
83. Sirisilla V., "The Significance of Descriptive-Correlational Design in Behavioral Research", *Asian Journal of Research in Business Economics and Management*, 2023, 13 (4), 55–64.
84. Suharyati U.K., Supriadi Y.N., "Customer Satisfaction Analysis of Service Quality Bank, Fintech, Cooperative with CSI and IPA Methods: Acces la Success", *Calitatea*, 2023, 24 (193), 140–153.

85. Sunaryo K., Zuhrohtun Z., EK S.H., Kusumswardhani I., Susanto H., "Implementation of Good Corporate Governance in Cooperatives: A Study in Yogyakarta, Indonesia", *Asian Journal of Social and Humanities*, 2023, 1 (04), 177–191. https://doi.org/10.59888/ajosh.v1i04.26
86. Tavakol M., Dennick R., "Making Sense of Cronbach's Alpha", *International Journal of Medical Education*, 2011, 2, 53–55. https://doi.org/10.5116/ijme.4dfb.8dfd
87. The RCSAS, "Electric Cooperatives and Customer Satisfaction Report", 2025. https://thercsas.com/wp-content/uploads/2025/08/rcsas5082025004.pdf
88. World Bank, *World Development Report 2021: Data for Better Lives*, *World Bank*, 2021.
89. World Bank, "Tracking SDG 7: The Energy Progress Report 2022", *World Bank*, 2022. https://www.worldbank.org/en/topic/energy/publication/tracking-sdg-7-the-energy-progress-report-2022
90. World Bank, "Strong Electric Utilities Critical to Clean Energy for All", *World Bank*, June 18, 2024. https://www.worldbank.org/en/news/press-release/2024/06/18/strong-electric-utilities-critical-to-clean-energy-for-all
91. Wang Q., Lin J., Zhou K., Fan J., Kwan M.P., "Does Urbanization Lead to Less Residential Energy Consumption? A Comparative Study of 136 Countries", *Energy*, 2020, 202, 117765. https://doi.org/10.1016/j.energy.2020.117765
92. Wang N., Zhu Y., Yang T., "The Impact of Transportation Infrastructure and Industrial Agglomeration on Energy Efficiency: Evidence from China's Industrial Sectors", *Journal of Cleaner Production*, 2020, 244, 118708. https://doi.org/10.1016/j.jclepro.2019.118708
93. Wright P., Batel S., "My Neighbourhood, My Country or My Planet? The Influence of Multiple Place Attachments and Climate Change Concern on Social Acceptance of Energy Infrastructure", *Global Environmental Change*, 2017, 47, 110–120. https://doi.org/10.1016/j.gloenvcha.2017.08.003
94. Villareal M.I.Z., Rosas-Caro J.C., Mayo-Maldonado J.C., Montoya O.D., Camarena-Martinez D., "Expansion Planning of Electrical Distribution Systems Considering Voltage Quality and Reliability Criteria", 2025. http://doi.org/10.3390/3n188112822
95. Vijay J., "The Expectation Confirmation Theory: A Service Perspective", *SSRN*, 2025. https://doi.org/10.2139/ssrn.5288999
96. Vital C.A., "Customer Relationship Management and Customer Satisfaction Between Electric Distribution Utilities", *The Review of Contemporary Scientific and Academic Studies*, 2025. https://www.researchgate.net/publication/395101416_Customer_Relationship_Management_and_Customer_Satisfaction_between_Electric_Distribution_Utilities
97. Yılmaz V., Kınaş Y., "Service Quality and Customer Satisfaction Analysis Using Partial Least Squares Structural Equation Modeling in an Electricity Distribution Company", *Alphanumeric Journal*, 2020, 8 (2), 391–406. https://doi.org/10.17153/oguiibf.534641
98. Zamanzadeh V., Ghahramanian A., Rassouli M., Abbaszadeh A., Alavi-Majd H., Nikanfar A.-R., "Design and Implementation Content Validity Study: Development of an Instrument for Measuring Patient-centered Communication", *Journal of Caring Sciences*, 2015, 4 (2), 165–178. https://doi.org/10.15171/jcs.2015.017
99. Zygiaris S., Hameed Z., Alsubaie M.A., Rehman S.U., "Service Quality and Customer Satisfaction in the Post-pandemic World: A Study of Saudi Auto Care Industry", *Frontiers in Psychology*, 2022, 13, 842141. https://doi.org/10.3389/fpsyg.2022.842141