



The Effect of PLN Mobile Application Effectiveness, Digital Invoicing, and Shuntrip on Electricity Payment Decisions

¹Umi Kultsum

¹Universitas Hasanuddin, Indonesia
kultsumu23a@student.unhas.ac.id

Abstract. This research evaluates the impact of the PLN Mobile application, digital invoice system and shuntrip technology on the effectiveness of paying electricity bills. Using quantitative methodology, data was collected through questionnaires distributed to 100 PLN mobile application users. Data analysis was carried out using Structural Equation Modeling (SEM) to test the relationship between variables and payment effectiveness. The research results show that the PLN Mobile application, digital invoices and shuntrip technology significantly increase the effectiveness of paying electricity bills and stimulate customers to pay electricity on time. With deep reality, provide reminders to customers. This research contributes to understanding how information technology such as mobile applications and digital invoices, as well as automatic reminder technology such as Shuntrip, can be used to improve service efficiency and influence customer behavior in public service industries such as PLN. This research provides important insights for electricity service providers to improve their payment systems and communication strategies to customers.

Keywords: Invoice digital, Payment Decision, Shuntrip, PLN Mobile.

1 Introduction

The electricity sector plays a crucial role in the development of the Indonesian economy. As a state-owned company, PLN is at the forefront of providing electricity services to the community. Therefore, customer satisfaction is one of the primary focuses of its business strategy to increase sales and generate profits for the company, in alignment with PLN's vision to become the leading electricity company in Southeast Asia and the top choice for energy solutions in the region [1].

The rapid advancement of digital technology has led to a significant transformation that enables people to access information quickly. One notable example is the influence on people's shopping patterns. Online buying and selling activities have shifted customers from offline to online shopping [2]. According to Hardiyanto et al. [3], although initially people preferred offline shopping by visiting stores and viewing products in person, they now choose to shop online due to its practicality and efficiency, utilizing applications installed on their smartphones. This shift in shopping patterns was further supported by the COVID-19 pandemic, which compelled people

to shop for daily necessities online as they were restricted from leaving their homes to prevent the spread of the virus. Consequently, online shopping has received a positive response from the public [4].

User-friendly platforms have encouraged more people to transition from offline to online activities. Understanding the psychological aspects of this transition is critical, as it reduces travel time, lowers the carbon footprint, alleviates urban congestion, and opens up opportunities for rural areas [5]. Society is capitalizing on the rapid technological advancements that cover almost all aspects of human life to develop new technological innovations, such as mobile applications. The presence of mobile applications is expected to simplify public access to company services through internet connectivity [5].

Using smartphones connected to the internet, users can access various important information through mobile applications. The main advantage of mobile applications is the ease of obtaining information and utilizing services in a portable manner without the need for a PC or notebook, as well as the ability to access up-to-date information without being constrained by time or location [6].

As an energy provider, PT PLN (Persero) distributes electricity to its customers without competition at the downstream or retail level, resulting in a monopoly [7]. However, the company must still provide customer value, maintain a relatively low perceived price, build a strong corporate image, and continuously improve service quality. These four components will lead to increased sales and higher customer satisfaction [8]. Customers must be the top priority for PT PLN (Persero), as stated in the company's vision and mission. Customer satisfaction is the reason why PT PLN (Persero) has been able to sustain its operations to date. Providing the best service is one of the key strategies for achieving customer satisfaction [7]. This indicates that several components contribute to meeting customer needs, which include overall value encompassing product quality, services offered, personal relationships, brand image, and total costs, which include financial expenses, time, effort, and mental engagement [9].

The extent to which customers are satisfied with the service is a crucial indicator of service success. When the service received does not meet customer expectations and needs, they will not be satisfied. Conversely, when customers feel that the products or services they use meet their expectations, they will be satisfied. Dissatisfaction can lead to negative attitudes toward the brand or service provider and may result in complaints [10].

PT PLN (Persero) places a high emphasis on customer satisfaction by incorporating elements of customer satisfaction into its 2024 initiative strategies, namely customer-focused, along with three other initiative strategies: green (accelerating Indonesia's transition to large-scale renewable energy), lean (becoming an agile, reliable, and competitive electricity provider for households, businesses, and industries), and innovative (promoting growth through innovative business models) [11]. In implementing the customer-focused strategy, PT PLN (Persero) strives to deliver world-class quality services to its consumers. This strategy is supported by two breakthrough programs, namely outage management & Yantek optimization, and the relaunch of the PLN Mobile application [11].

PLN's efforts in shifting customer lifestyles from offline to online go beyond launching a mobile application in the form of PLN Mobile. It also includes the presence of digital customer billing invoices and the implementation of Shuntrip technology to remind customers when it is time to make electricity payments [12]. However, using these three tools to habituate customers to timely electricity payments can be time-consuming and resource-intensive. Thus, research is needed to determine the effectiveness of each tool [12]. Understanding the effectiveness of these tools in influencing customer decision-making is still a critical issue.

This study investigates the influence of the effectiveness of the PLN Mobile application, digital invoices, and Shuntrip technology on timely and efficient customer electricity payment decisions. The research also aims to formulate solutions to address issues that are beneficial for PT PLN (Persero) UP3 North Makassar's management to improve service quality [12].

2 Literature Review

In this digital era, technological innovation has brought significant changes in various sectors, including the energy sector. PT PLN (Persero) as the largest electricity provider company in Indonesia, continues to adapt to technological developments to improve the quality of service to customers. One of these innovations is the PLN Mobile application, digital invoice, and shuntrip features. These three elements are designed to make it easier for customers to manage and pay their electricity bills. This study focuses on analyzing the effect of the effectiveness of the PLN Mobile application, Digital Invoice, and shuntrip on electricity payment decision-making strategies at PLN UP3 Makassar Utara. Sample Heading (Third Level). Only two levels of headings should be numbered. Lower-level headings remain unnumbered; they are formatted as run-in headings.

PLN Mobile Application. The PLN Mobile application is a digital platform provided by PT PLN to facilitate customers in accessing various services, such as electricity bill information, disruption reports, electricity token purchases, and other customer services. The effectiveness of mobile applications can be measured through several indicators such as ease of use, information reliability, service availability, and user satisfaction [13]. The effectiveness of this application is important to ensure users stay engaged and use the application for their needs. In the context of PLN Mobile, application effectiveness can influence customer decisions in making electricity payments.

Invoice Digital. Digital invoicing is a new method of presenting electricity bills to customers that replaces the traditional paper-based method. Digital invoices have several advantages over physical invoices, including efficiency, security, and ease of access. Research has shown that digital invoices can reduce company operational costs and increase transparency in billing [14]. The effectiveness of digital invoices can affect customers' trust in the company and ultimately influence their decision to make a payment.

Shuntrip. Shuntrip is an automatic shut-off feature that will disconnect electricity in case of overuse or load imbalance. This feature not only helps in electricity load management but also serves as a reminder mechanism for customers to immediately pay overdue electricity bills. Research indicates that shuntrip is effective in preventing losses caused by arrears in electricity payments [15]. The effectiveness of shuntrip in encouraging customers to make payments immediately can be one of the determining factors in making electricity payment decisions.

Electricity Payment Decision-Making Strategy. Decision-making is the process of selecting an action from several available alternatives. In the context of electricity payments, decision-making strategies involve customer considerations regarding when and how they will make payments. Several factors that influence consumer decision making include perception, motivation, experience, and available information [16]. In this context, the effectiveness of PLN Mobile, digital invoice, and shuntrip applications play an important role in shaping customer perceptions and experiences related to electricity payments.

Relationship between Effectiveness of PLN Mobile App, Digital Invoice, and Shuntrip on Decision-Making Strategy. In the marketing and consumer behavior literature, digital technology and information play an important role in consumer decision making. The PLN Mobile application, as one of the digital technology tools, can influence customer satisfaction by providing a variety of relevant information and easily accessible services [17]. Meanwhile, digital invoicing can increase transparency and reduce the possibility of human error, which directly affects customer trust in the company [18]. Finally, the shuntrip feature, as an automatic payment reminder tool, can reduce the risk of late payment and improve efficiency for customers [19].

Theoretically, these three elements-the PLN Mobile app, digital invoices, and shuntrip-can have a positive impact on electricity payment decision-making strategies. This is because they facilitate access to information, increase convenience, and reduce the risks associated with late payments.

3 Research Methods

This study employs a quantitative research approach to analyze the effect of the effectiveness of PLN Mobile applications, digital invoicing, and Shuntrip technology on customers' electricity payment decisions. The research is structured using a survey-based methodology, targeting PLN customers in the UP3 North Makassar region as respondents. A structured questionnaire was designed to collect data regarding customer perceptions and experiences with the three digital tools. The questionnaire consisted of several sections, including demographic information, frequency of usage, ease of use, perceived benefits, and overall satisfaction. Each question utilized a Likert scale ranging from 1 to 5, where 1 indicates "strongly disagree" and 5 indicates "strongly agree," to quantify customer perceptions and attitudes. The sample size was

determined using the Slovin formula, with a margin of error set at 5%, resulting in 100 respondents being surveyed.

To ensure the validity and reliability of the research instrument, a pilot test was conducted involving 30 respondents who were not part of the main sample. The results of the pilot test were analyzed using Cronbach's Alpha, with a threshold value of 0.70 indicating acceptable reliability for each section of the questionnaire. Following the pilot test, minor modifications were made to the wording of several questions to improve clarity and comprehension. Data collection was conducted both online and offline to accommodate different respondent preferences. The online survey link was distributed via email and social media platforms, while printed questionnaires were provided to customers visiting PLN service centers.

The collected data were analyzed using multiple regression analysis to determine the impact of the independent variables—PLN Mobile application effectiveness, digital invoicing effectiveness, and Shuntrip technology effectiveness—on the dependent variable, which is the electricity payment decision. Before conducting regression analysis, the data were tested for normality, multicollinearity, and heteroscedasticity to ensure that the assumptions for linear regression were met. Data analysis was carried out using Structural Equation Modeling (SEM) to test the relationship between variables and payment effectiveness. The results of this analysis provided insights into which digital tools most significantly influence customer payment decisions and the relative effectiveness of each tool in the context of PLN's digital service strategy.

4 Results and Discussion

This study analyzes the effect of the effectiveness of the PLN Mobile application, digital invoicing, and Shuntrip technology on electricity payment decisions using the Structural Equation Modeling (SEM) Partial Least Squares (PLS) method. SEM-PLS was chosen due to its suitability for complex models and its ability to handle multiple independent variables simultaneously. The analysis includes an evaluation of the measurement model (outer model) and the structural model (inner model). Descriptive statistics and SEM-PLS outputs are presented to provide a comprehensive understanding of the relationships between variables.

Descriptive Statistics. Table 1 presents the descriptive statistics of the main variables used in the study. The results show that the average score for PLN Mobile effectiveness is the highest (4.2), indicating that respondents view this application as the most impactful tool for facilitating timely payments. Digital invoicing effectiveness has a mean score of 3.8, while Shuntrip technology scored 3.6. The dependent variable, electricity payment decision, has a high mean value of 4.1, reflecting that customers generally make timely payments when these tools are effective. The standard deviation values for all variables are relatively low, suggesting a consistent perception among respondents.

Table 1. Descriptive Test Results.

Variable	Mean	Std. Dev	Minimum	Maximum
PLN Mobile App	4.2	0.45	3.5	5.0
Invoice Digital	3.8	0.52	2.5	4.7
Shuntrip	3.6	0.50	2.0	4.5
Payment Decision-Making	4.1	0.43	3.6	4.8

Measurement Model Evaluation. The measurement model was evaluated using reliability and validity tests. The reliability of each construct was assessed using Cronbach's Alpha and Composite Reliability (CR), where values greater than 0.7 indicate good internal consistency. All constructs met the reliability criteria, with CR values ranging from 0.80 to 0.91. Convergent validity was measured using the Average Variance Extracted (AVE), with values greater than 0.5 for all constructs, indicating that the items explain more than 50% of the variance of the constructs.

Measurement Model Evaluation. The structural model was evaluated by examining the path coefficients, R-squared values, and significance levels (p-values). The R-squared value for the dependent variable (electricity payment decision) is 0.79, suggesting that 79% of the variance in electricity payment decisions is explained by the effectiveness of PLN Mobile, digital invoicing, and Shuntrip technology. The path coefficients and their respective t-values are shown in Table 2. All three independent variables have a significant positive influence on electricity payment decisions, with PLN Mobile application effectiveness having the strongest effect ($\beta = 0.46$, $p < 0.01$).

4.1 Discussion

The results show that the effectiveness of PLN Mobile applications has the most substantial impact on electricity payment decisions. The high path coefficient indicates that the convenience, user interface, and features of the PLN Mobile application are highly valued by customers, making it a critical tool for encouraging timely payments. This finding suggests that enhancing the application's usability and adding new features, such as personalized reminders, could further increase its impact.

Digital invoicing also has a significant positive effect, as it provides accurate and transparent billing information, which builds customer trust and reduces the likelihood of payment disputes. Shuntrip technology, while having a positive influence, showed a slightly lower effect compared to the other tools. This indicates that while Shuntrip's real-time monitoring capabilities support customer awareness, it might not directly influence payment behavior as strongly as the PLN Mobile application.

In conclusion, the effectiveness of PLN Mobile, digital invoicing, and Shuntrip technology collectively explains a large portion of the variance in electricity payment

decisions. To maximize timely payments, PLN should prioritize continuous improvements to its mobile application and ensure that digital invoicing and Shuntrip technology are integrated seamlessly to support a comprehensive digital service strategy.

5 Conclusion

This study highlights the importance of digital innovation in influencing electricity payment decision strategies at PLN UP3 Makassar Utara. The PLN Mobile application and digital invoice system have proven to be effective tools in improving customer payment experiences. However, further improvements in the shuntrip feature are necessary to increase customer satisfaction and optimize payment punctuality. Future research should focus on exploring customer satisfaction levels and the long-term impact of these digital tools on payment behaviors.

Recommendations:

- PLN should continue enhancing the PLN Mobile application by integrating more user-friendly features.
- Digital invoices should be optimized to ensure even more transparency in billing processes.
- The shuntrip feature should be refined to ensure customer satisfaction without compromising payment discipline.

References

1. PT PLN (Persero), "Corporate Vision and Mission," Annual Report, 2023.
2. A. Santoso and R. Mulyadi, "Digital Technology's Impact on Consumer Behavior," *Journal of Technology and Society*, vol. 11, no. 2, pp. 76-88, Feb. 2021.
3. Hardiyanto *et al.*, "The Shift in Consumer Preferences from Offline to Online Shopping," *International Journal of Retail and Distribution Management*, vol. 29, no. 3, pp. 145-160, 2021.
4. Rakhmawati *et al.*, "The Influence of COVID-19 on Online Shopping Patterns," *Journal of Consumer Research*, vol. 12, no. 4, pp. 201-215, Dec. 2021.
5. M. I. Gunawan, "Development of PLN Mobile Application for Consumer Service Optimization," *International Journal of Information Systems and Technology*, vol. 14, no. 2, pp. 134-145, Mar. 2022.
6. H. W. Putra, "Mobile Applications and Their Role in the Digital Economy," *IEEE Transactions on Consumer Electronics*, vol. 58, no. 4, pp. 1485-1494, Nov. 2021.
7. PT PLN (Persero), "Corporate Overview," Company Profile, 2023.
8. H. Wibowo, "Consumer Behavior and Utility Services," *Journal of Utility Management*, vol. 23, no. 3, pp. 201-215, 2022.
9. P. Kotler, *Marketing Management*, 10th ed. Upper Saddle River, NJ: Prentice Hall, 2000, pp. 50-55.
10. F. Tjiptono, *Service Management and Marketing*, 3rd ed. Yogyakarta, Indonesia: Andi Publisher, 2008, pp. 112-115.
11. PT PLN (Persero), "2024 Initiative Strategy," Strategic Report, Jakarta, Indonesia, 2024.

12. R. Purnama, "Effectiveness of Digital Invoicing and Shuntrip Technology," *IEEE Transactions on Power Systems*, vol. 36, no. 4, pp. 1985-1995, Apr. 2023.
13. A. Wahyudi, "The Effectiveness of Mobile Applications in Enhancing Customer Engagement," *Journal of Digital Services*, vol. 5, no. 2, pp. 45-56, 2020.
14. A. Susilo and B. Santoso, "The Impact of Digital Invoicing on Operational Costs and Transparency," *International Journal of Business and Management*, vol. 14, no. 3, pp. 78-89, 2019.
15. A. Rahardian, "The Role of Automatic Shut-Off Features in Electricity Payment Management," *Journal of Electrical Engineering and Technology*, vol. 16, no. 2, pp. 123-134, 2021.
16. P. Kotler and K. L. Keller, *Marketing Management*, 15th ed. Upper Saddle River, NJ, USA: Pearson Education, 2016.
17. F. D. Davis, "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology," *MIS Quarterly*, vol. 13, no. 3, pp. 319-340, 1989.
18. D. Gefen, D. Karahanna, and V. R. Straub, "Trust and TAM in Online Shopping: An Integrated Model," *MIS Quarterly*, vol. 27, no. 1, pp. 51-90, 2003.
19. I. Ajzen, "The Theory of Planned Behavior," *Organizational Behavior and Human Decision Processes*, vol. 50, no. 2, pp. 179-211, 1991.

Open Access This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

