# Technology Adoption of Utility Mobile Applications across Generational Cohorts Using UTAUT: A PLS-SEM Approach

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**Abstract**. This study examines the determinants of users' intention to adopt the PLN Mobile application among Generations X, Y, and Z in East Nusa Tenggara, Indonesia, by extending the Technology Acceptance Model (TAM) with additional constructs, including perceived value, perceived trust, perceived security, attractiveness of alternatives, and social influence, with generational cohort as a moderating variable. A quantitative causal design was applied, collecting data from 438 PLN customers using proportional stratified sampling across four regional offices. Data were analyzed using Structural Equation Modeling–Partial Least Squares (SEM-PLS). The results revealed that perceived ease of use ($\beta = 0.322$, $p < 0.001$), social influence ($\beta = 0.268$, $p < 0.001$), and perceived security ($\beta = 0.194$, $p < 0.01$) had significant positive effects on intention to use, while perceived value, perceived trust, and perceived usefulness were not significant predictors. Social influence also significantly influenced perceived trust ($\beta = 0.531$, $p < 0.001$). Moderation analysis indicated that Generation Y exhibited the strongest moderating effects across most relationships, whereas Generation Z had the least impact. These findings provide actionable insights for public digital service providers, emphasizing the need to enhance ease of use, strengthen security, and leverage peer influence to improve adoption across generational segments.

## 1.    Introduction

Indonesia has experienced an unprecedented proliferation of mobile applications in recent years, propelled by rapid smartphone penetration, which is projected to surpass 88% by 2025 [1]. This growth has been accompanied by an expanding range of digital public services designed to improve citizen engagement and service delivery. Among these is the PLN Mobile application, launched by PT PLN (Persero) to facilitate access to essential electricity-related services such as prepaid token purchases, postpaid bill payments, electricity usage monitoring, outage reporting, and other service requests. Despite its comprehensive functionality and nationwide availability, actual adoption rates remain

modest in several provinces. In East Nusa Tenggara, for example, only a fraction of registered users actively engage with the application over time, suggesting the presence of adoption barriers beyond mere access to the technology [2].

Technology acceptance research provides a robust foundation for investigating such adoption gaps. The Technology Acceptance Model (TAM) [3] and the Unified Theory of Acceptance and Use of Technology (UTAUT) [4] have been widely applied to explain digital adoption behaviors through constructs such as perceived usefulness, perceived ease of use, performance expectancy, effort expectancy, and social influence. These frameworks have consistently demonstrated substantial explanatory power in predicting behavioral intention across diverse technologies and sectors. However, their application in public utility contexts, particularly in developing economies like Indonesia, remains relatively underexplored [5]. Furthermore, empirical studies that integrate additional constructs such as perceived trust, perceived security, and attractiveness of alternatives into these models are scarce in the literature, especially in high-quality international journals with an Indonesian focus [6].

Prior research in digital service adoption has predominantly concentrated on private-sector platforms, including mobile banking, e-commerce, and digital health services. Findings from [7] indicates that perceived ease of use, security, and trust are recurrent determinants of adoption. For example, mobile banking adoption studies in Indonesia have demonstrated that user trust in application performance and transaction security significantly influence behavioral intention, often outweighing the effects of promotional incentives. Similarly, UTAUT2-based research of [8] and [9] in e-commerce contexts has found generational differences in adoption behavior, with younger cohorts, particularly Generation Z, exhibiting heightened sensitivity to usability, peer influence, and the seamlessness of the user experience. However, public utility mobile platforms such as PLN Mobile differ substantially from commercial applications in their service scope, user motivation, and perceived value proposition, making it risky to generalize sector-specific findings without direct empirical validation [10]. TAM was later simplified by Venkatesh and Davis through the removal of the attitude construct and the empirical validation of the direct impact of PU, PEOU, and usage intention [11].

Comparative studies also reveal that public service platforms face unique adoption challenges, including perceptions of bureaucratic inefficiency, concerns over data privacy, and lower levels of habitual engagement compared to entertainment or retail applications. For example, Savari and Khaleghi [12] integrated TAM with the Norm Activation Model (NAM) to examine pro-environmental behaviors, showing that PU and PEOU significantly influence behavioral intention. Sharma et al. [13] also applied TAM in a meta-analysis of metaverse acceptance, reinforcing its relevance in evaluating emerging digital platforms. Research on e-government services in Southeast Asia suggests that even when platforms are technically robust, user skepticism about data handling and doubts about service responsiveness can suppress adoption. This gap in the literature underscores the need for context-specific studies that examine public utility applications, where trust and perceived security may interact differently with usability compared to purely commercial platforms [14] [15].

Generational differences further complicate the adoption landscape. Evidence shows that Generation Y (Millennials) and Generation Z, often referred to as "digital natives," are generally more adept at adopting and navigating new technologies than Generation X, whose formative years predate the digital era. Digital natives tend to expect intuitive, responsive, and secure interfaces, and their adoption decisions are influenced by both functional and experiential aspects. UTAUT2 acknowledges that generational cohort membership can act as a moderating factor, shaping the strength and direction of relationships between key adoption constructs and behavioral intention. Lee and Kim [16] also support this, finding age to moderate TAM variable influences on behavioral intention. In the case of PLN Mobile, generational segmentation (X, Y, Z) provides a means of explaining different adoption patterns and targeting outreach accordingly. Nonetheless, empirical applications of generational moderation within the public utility domain remain limited, leaving open questions about whether the generational effects observed in commercial platforms apply in the same way to government-backed services like PLN Mobile.

This study addresses these gaps by empirically examining how perceived ease of use, perceived security, and perceived trust influence users' behavioral intention to adopt the PLN Mobile application, with a particular focus on the moderating role of generational cohort membership (Gen X, Gen Y, and Gen Z). By employing a quantitative research design and analyzing data using Partial Least Squares Structural Equation Modeling (PLS-SEM), the study provides both theoretical and practical contributions. Theoretically, it extends the TAM framework by integrating security and trust into the adoption model within a public utility context, while empirically testing generational moderation effects that have been underrepresented in the literature. Practically, it offers actionable insights for PLN and other public service providers to design and promote mobile platforms that address generationally distinct priorities, whether those involve simplifying user interfaces, enhancing security assurances, or reinforcing trust through transparent communication. By bridging the gap between established digital adoption theories and the unique characteristics of public utility mobile applications, this research contributes to a more nuanced understanding of technology acceptance in the public sector.

## 2. Methods

This study adopted a causal quantitative research design to examine the determinants of PLN Mobile application usage intention among Generation X, Y, and Z customers in East Nusa Tenggara, Indonesia. The conceptual framework extended the Technology Acceptance Model (TAM) with perceived value, perceived security, perceived trust, social influence, and attractiveness of alternatives, with generational cohort as a moderating variable [17].

### 2.1. Sampling and Statistical Power
The population comprised 1,069,687 PLN Mobile registered users in East Nusa Tenggara. Using Slovin's formula with a 5% margin of error, the minimum sample size requirement was 400 respondents. Proportional stratified sampling was applied across the four PLN regional offices (Kupang, Flores West, Flores East, and Sumba) to ensure representativeness. A post-hoc statistical power analysis using G*Power 3.1 indicated that the achieved sample of 438 respondents was sufficient to detect medium effect sizes ($f^2 = 0.15$) at a power level of 0.95 for a model with up to seven predictors, satisfying the recommendations of Hair et al. [18] for PLS-SEM .

### 2.2. Ethical Considerations and Instrument Development
Ethical clearance for this research was obtained from the Research Ethics Committee of Telkom University. Participation was voluntary, and informed consent was obtained from all respondents. The instrument was developed based on validated measures from prior TAM and UTAUT studies, adapted for the PLN Mobile context. Pretesting was conducted with 30 respondents to ensure clarity and reliability, leading to minor wording adjustments before final distribution.

### 2.3. Data Collection
Data were collected between September and November 2024 through an online questionnaire using Google Forms. The questionnaire consisted of two sections: demographic information and construct measurement items. All latent variables were measured using three reflective indicators on a five-point Likert scale (1 = strongly disagree to 5 = strongly agree) [19].

### 2.4. Justification for PLS-SEM
Partial Least Squares Structural Equation Modeling (PLS-SEM) was chosen over covariance-based SEM because the model included multiple latent constructs, formative paths, and moderation effects, and the data distribution did not meet multivariate normality assumptions (Mardia's multivariate kurtosis = 12.46, $p < 0.001$). PLS-SEM is also suitable for predictive modeling in exploratory research and performs well with sample sizes between 100–500 [20].

## 2.5. Software and Analysis Procedures

The data were analyzed using SmartPLS version 4.0.9.6. Bootstrapping was performed with 5,000 resamples, a two-tailed significance test, and a 95% confidence interval to assess the significance of path coefficients. The analysis followed two stages: (1) Measurement Model Assessment and (2) Structural Model Assessment [21].

## 2.6. Measurement Model Assessment

Convergent validity was established as all outer loadings exceeded 0.70, average variance extracted (AVE) values were above 0.50, and composite reliability (CR) values exceeded 0.70. Discriminant validity was confirmed using the heterotrait-monotrait ratio (HTMT), with all HTMT values below 0.85. The constructs also met reliability thresholds based on Cronbach's alpha (>0.70) [21].

## 2.7. Structural Model Assessment

Collinearity diagnostics indicated that all variance inflation factor (VIF) values were below 3.3. The model's explanatory power was assessed using $R^2$ values: intention to use ($R^2 = 0.305$), attractiveness of alternatives ($R^2 = 0.096$), perceived trust ($R^2 = 0.106$), and perceived value ($R^2 = 0.325$). Predictive relevance ($Q^2$) values were above zero for all endogenous constructs, indicating good predictive accuracy. Path coefficients and their significance were reported for all hypothesized relationships.

## 2.8. Moderation Analysis

Generational cohort (X, Y, Z) was treated as a categorical moderator. Multi-group analysis (MGA) was conducted to test for significant differences in path coefficients across generational groups. In addition, technological literacy, initially considered as a potential moderator, was tested using product indicator interaction terms. However, the moderating effect of technological literacy was not statistically significant and is reported in the discussion section.

## 3. Results and Discussion

### 3.1. Respondent Characteristics

Data were collected from 438 respondents who were users or had experience using the PLN Mobile application in East Nusa Tenggara. The sampling method applied was purposive sampling with a target of individuals who met the criteria set by the researcher. An ethical consent form was read to the respondents before data collection to ensure their voluntary participation.

The demographic profile of the respondents showed that the majority belonged to Generation Y (26–44 years), with a total of 65.3% (Figure 2). By gender, 83.6% were male and 16.4% were female (Figure 3). By education, 61.9% were SMA/SMK graduates, 23.5% were bachelor's degree holders, and 14.2% were diploma holders (Figure 4). The majority of the respondents were employees in private companies (43.4%) and state-owned enterprises (BUMN/BUMD) (40.6%) (Figure 5).
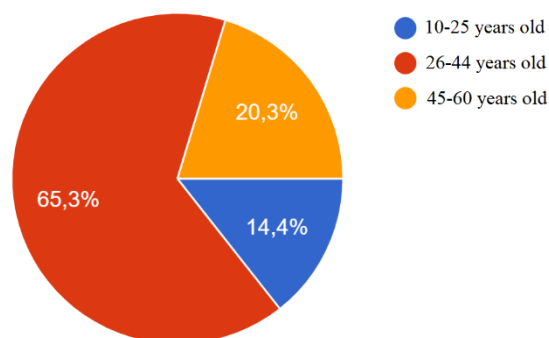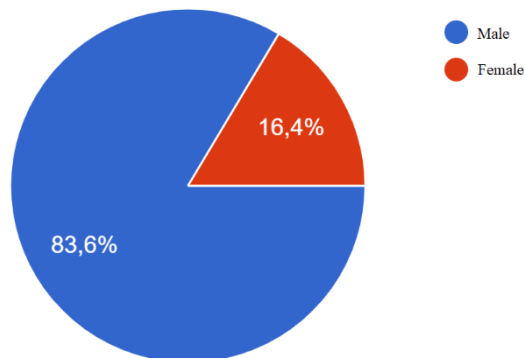


**Figure 1.** Respondents' Age

**Figure 2.** Respondents' Gender
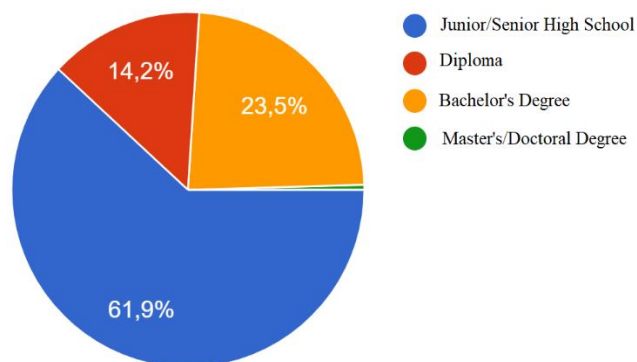


**Figure 3.** Highest Educational Attainment
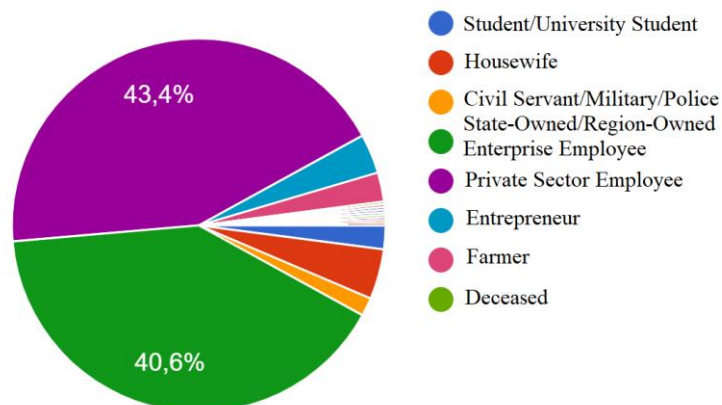


**Figure 4.** Type of Occupation

*3.2. Descriptive* Analysis of Variables

Each construct in the study was measured using three indicators on a five-point Likert scale. Below is a summary of respondent responses across constructs:

- Perceived Ease of Use: "The highest scoring item was "Learning to use the PLN Mobile application is easy," scoring 2011 out of a possible 2190 (92%) (Table 1).
- Perceived Usefulness: The highest item reached 2020 (92%) of respondents agreed the app was useful (Table 2).
- Perceived Value: The item "I find the PLN Mobile application beneficial to use" scored 93%, with the average across items at 91% (Table 3).

- Social Influences: Positive peer experiences significantly influenced usage, with scores averaging 90% (Table 4).
- Attractiveness of Alternatives: Highest score was 1972/2190 (90%), indicating that users viewed PLN Mobile as a competitive alternative (Table 5).
- Perceived Trust: The statement "I trust the PLN Mobile application to process payments accurately" scored 1898/2190 (87%) (Table 6).
- Perceived Security: The dimension scored high, with an average percentage of 90% across its indicators (Table 7).
- Intention to Use: The strongest intention item, "I intend to use the PLN Mobile application in the future" reached 95%, and the overall score averaged 93% (Table 8).

**Table 1**. Perceived Ease of Use

| Statement | | STS | TS | CS | S | SS | Total | Actual Score | Optimal Score | % Score |
|---|---|---|---|---|---|---|---|---|---|---|
| | | *Perceived Ease of Use* | | | | | | | | |
| I find it easy to learn how to use the PLN Mobile application | f | 0 | 1 | 1 | 174 | 262 | 438 | 2011 | 2190 | 92% |
| | % | 0,0% | 0,2% | 0,2% | 39,7% | 59,8% | 100,0% | | | |
| I find that using the PLN Mobile application runs smoothly | f | 0 | 7 | 2 | 174 | 255 | 438 | 1991 | 2190 | 91% |
| | % | 0,0% | 1,6% | 0,5% | 39,7% | 58,2% | 100,0% | | | |
| I can easily adapt to using PLN Mobile compared to other apps | f | 0 | 13 | 7 | 172 | 246 | 438 | 1965 | 2190 | 90% |
| | % | 0,0% | 3,0% | 1,6% | 39,3% | 56,2% | 100,0% | | | |

**Table 2.** Perceived Usefullness

| Statement | | STS | TS | CS | S | SS | Total | Actual Score | Optimal Score | % Score |
|---|---|---|---|---|---|---|---|---|---|---|
| | | *Perceived Usefulness* | | | | | | | | |
| I can make payments faster when using the PLN Mobile application | f | 0 | 10 | 5 | 163 | 260 | 438 | 1987 | 2190 | 91% |
| | % | 0,0% | 2,3% | 1,1% | 37,2% | 59,4% | 100,0% | | | |
| I feel that using the PLN Mobile application makes transactions simpler | f | 0 | 9 | 2 | 155 | 272 | 438 | 2004 | 2190 | 92% |
| | % | 0,0% | 2,1% | 0,5% | 35,4% | 62,1% | 100,0% | | | |
| I think making payments through PLN Mobile is a practical way | f | 0 | 13 | 3 | 153 | 269 | 438 | 1992 | 2190 | 91% |
| | % | 0,0% | 3,0% | 0,7% | 34,9% | 61,4% | 100,0% | | | |

**Table 3**. Perceived Value

| Statement | | STS | TS | CS | S | SS | Total | Actual Score | Optimal Score | % Score |
|---|---|---|---|---|---|---|---|---|---|---|
| | | *Perceived Value* | | | | | | | | |
| I feel that I can save money when making payments through the PLN Mobile application. | f | 0 | 36 | 4 | 144 | 254 | 438 | 1930 | 2190 | 88% |
| | % | 0,0% | 8,2% | 0,9% | 32,9% | 58,0% | 100,0% | | | |
| I find the PLN Mobile application useful to use. | f | 0 | 14 | 1 | 119 | 304 | 438 | 2027 | 2190 | 93% |
| | % | 0,0% | 3,2% | 0,2% | 27,2% | 69,4% | 100,0% | | | |
| I feel happy when using the PLN Mobile application. | f | 0 | 19 | 1 | 134 | 284 | 438 | 1997 | 2190 | 91% |
| | % | 0,0% | 4,3% | 0,2% | 30,6% | 64,8% | 100,0% | | | |

## Table 4. Social Influences

| Statement | | STS | TS | CS | S | SS | Total | Actual Score | Optimal Score | % Score |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | *Social Influences* | | | | | | |
| People around me (e.g., family or friends) encourage me to use the PLN Mobile application | f | 0 | 0 | 4 | 195 | 239 | 438 | 1987 | 2190 | 91% |
| | % | 0,0% | 0,0% | 0,9% | 44,5% | 54,6% | 100,0% | | | |
| I use the PLN Mobile application because of recommendations from others. | f | 0 | 0 | 15 | 184 | 239 | 438 | 1976 | 2190 | 90% |
| | % | 0,0% | 0,0% | 3,4% | 42,0% | 54,6% | 100,0% | | | |
| Positive experiences of others (e.g., family or friends) influence my decision to use the PLN Mobile application. | f | 0 | 0 | 2 | 190 | 246 | 438 | 1996 | 2190 | 91% |
| | % | 0,0% | 0,0% | 0,5% | 43,4% | 56,2% | 100,0% | | | |

## Table 5. Attractiveness of Alternative

| Statement | | STS | TS | CS | S | SS | Total | Actual Score | Optimal Score | % Score |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | **Attractiveness of Alternative** | | | | | | |
| I feel that the PLN Mobile application is an alternative to other payment methods. | f | 0 | 0 | 46 | 212 | 180 | 438 | 1886 | 2190 | 86% |
| | % | 0,0% | 0,0% | 10,5% | 48,4% | 41,1% | 100,0% | | | |
| I feel that the PLN Mobile application is satisfactory enough as a payment tool. | f | 0 | 0 | 35 | 184 | 219 | 438 | 1936 | 2190 | 88% |
| | % | 0,0% | 0,0% | 8,0% | 42,0% | 50,0% | 100,0% | | | |
| I feel that the PLN Mobile application has advantages over other applications. | f | 0 | 0 | 23 | 172 | 243 | 438 | 1972 | 2190 | 90% |
| | % | 0,0% | 0,0% | 5,3% | 39,3% | 55,5% | 100,0% | | | |

## Table 6. Perceived Trust

| Statement | | STS | TS | CS | S | SS | Total | Actual Score | Optimal Score | % Score |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | *Perceived Trust* | | | | | | |
| I trust the PLN Mobile application to process payments accurately. | f | 23 | 4 | 1 | 186 | 224 | 438 | 1898 | 2190 | 87% |
| | % | 5,3% | 0,9% | 0,2% | 42,5% | 51,1% | 100,0% | | | |
| I am confident that my transaction data is secure when using the PLN Mobile application. | f | 14 | 7 | 0 | 228 | 189 | 438 | 1885 | 2190 | 86% |
| | % | 3,2% | 1,6% | 0,0% | 52,1% | 43,2% | 100,0% | | | |
| I am confident in the credibility of the PLN Mobile application in processing payment transactions. | f | 20 | 2 | 1 | 212 | 203 | 438 | 1890 | 2190 | 86% |
| | % | 4,6% | 0,5% | 0,2% | 48,4% | 46,3% | 100,0% | | | |

## Table 6. Perceived Security

| Statement | | STS | TS | CS | S | SS | Total | Actual Score | Optimal Score | % Score |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | **Perceived Security** | | | | | | |
| I believe that when I use the PLN Mobile application, my personal information is kept secure. | f | 0 | 0 | 9 | 225 | 204 | 438 | 1947 | 2190 | 89% |
| | % | 0,0% | 0,0% | 2,1% | 51,4% | 46,6% | 100,0% | | | |
| I feel safe using the PLN Mobile application. | f | 0 | 3 | 4 | 229 | 202 | 438 | 1944 | 2190 | 89% |
| | % | 0,0% | 0,7% | 0,9% | 52,3% | 46,1% | 100,0% | | | |
| I feel at ease when using the PLN Mobile application. | f | 0 | 3 | 4 | 231 | 200 | 438 | 1942 | 2190 | 89% |
| | % | 0,0% | 0,7% | 0,9% | 52,7% | 45,7% | 100,0% | | | |

**Table 7**. Intention to Use"

| Statement | | STS | TS | CS | S | SS | Total | Actual Score | Optimal Score | % Score |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | *Intention to Use* | | | | | | |
| I intend to use the PLN Mobile application in the future. | f | 0 | 0 | 0 | 110 | 328 | 438 | 2080 | 2190 | 95% |
| | % | 0,0% | 0,0% | 0,0% | 25,1% | 74,9% | 100,0% | | | |
| I plan to use the PLN Mobile application regularly. | f | 0 | 0 | 0 | 182 | 256 | 438 | 2008 | 2190 | 92% |
| | % | 0,0% | 0,0% | 0,0% | 41,6% | 58,4% | 100,0% | | | |
| I would prefer to use the PLN Mobile application over other applications. | f | 0 | 0 | 0 | 181 | 257 | 438 | 2009 | 2190 | 92% |
| | % | 0,0% | 0,0% | 0,0% | 41,3% | 58,7% | 100,0% | | | |

*3.3. Measurement Model Evaluation*

The convergent validity test showed that all constructs met the required thresholds. According to Hair et al. (2018), the criteria for convergent validity are an outer loading > 0.6 and AVE > 0.5. All indicators exceeded these benchmarks, as shown in Table 9, indicating strong convergent validity for each latent variable (Figure 5).

**Table 8.** Outer Loading and AVE Value

| Variable | Indicator | Outer loadings | AVE | Remarks |
|---|---|---|---|---|
| "Attractiveness of alternative" | AA1 | 0,786 | | |
| | AA2 | 0,851 | 0,643 | "Valid" |
| | AA3 | 0,767 | | |
| "Intension to Use" | IU1 | 0,708 | | |
| | IU2 | 0,872 | 0,683 | "Valid" |
| | IU3 | 0,889 | | |
| "Perceived Ease of Use" | PEU1 | 0,804 | | |
| | PEU2 | 0,849 | 0,662 | "Valid" |
| | PEU3 | 0,788 | | |
| "Perceived Security" | PS1 | 0,792 | | |
| | PS2 | 0,814 | 0,637 | "Valid" |
| | PS3 | 0,789 | | |
| "Perceived Trust" | PT1 | 0,815 | | |
| | PT2 | 0,851 | 0,705 | "Valid" |
| | PT3 | 0,853 | | |
| "Perceived Usefulness" | PU1 | 0,890 | | |
| | PU2 | 0,913 | 0,814 | "Valid" |
| | PU3 | 0,903 | | |
| "Perceived Value" | PV1 | 0,864 | | |
| | PV2 | 0,905 | 0,796 | "Valid" |
| | PV3 | 0,906 | | |
| "Social Influence" | SI1 | 0,869 | | |
| | SI2 | 0,777 | 0,673 | "Valid" |
| | SI3 | 0,812 | | |

Table 9 shows the outer loading and Average Variance Extracted (AVE) values for each construct, demonstrating that all measurement items meet the validity criteria. All indicators have outer loadings above 0.70, indicating strong correlations with their respective latent variables, while AVE values for all constructs exceed the threshold of 0.50, confirming adequate convergent validity. The highest AVE is observed for Perceived Usefulness (0.814) and Perceived Value (0.796), reflecting strong explanatory power of their indicators. These results confirm that the measurement model is valid and reliable for further structural analysis.
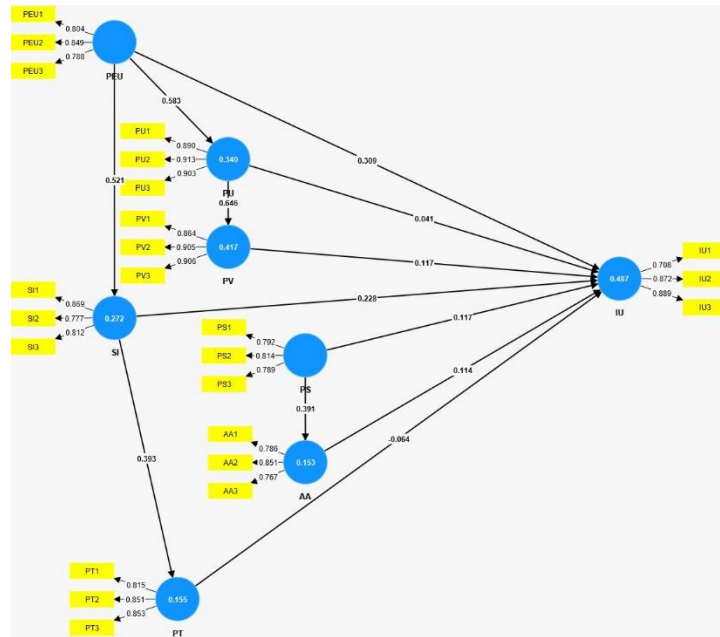

**Figure 5.** Outer Model PLS-Algorythm

### 3.4. Structural Model Results (Path Coefficient Analysis)

Path coefficient analysis was conducted to test the twelve hypotheses. The results, summarized in Table 10, are as follows:

- Perceived Ease of Use → Intention to Use: Significant (p = 0.000, t = 5.639), indicating strong influence.
- Social Influence → Intention to Use: Significant (p = 0.000, t = 4.382).
- Social Influence → Perceived Trust: Significant (p = 0.000, t = 11.215).
- Perceived Security → Intention to Use: Significant.
- Perceived Security → Attractiveness of Alternatives: Significant.
- Perceived Usefulness → Perceived Value: Highly significant (path coefficient = 0.646, t = 17.976, p = 0.000).
- Attractiveness of Alternatives → Intention to Use: Significant.
- Perceived Value → Intention to Use: Not significant (p = 0.099).
- Perceived Trust → Intention to Use: Not significant.
- Perceived Usefulness → Intention to Use: Not significant.

**Table 9.** Q-Square Test Result

|      | SSO       | SSE       | Q² (=1-SSE/SSO) |
|------|-----------|-----------|-----------------|
| **AA**  | 1.314,000 | 1.187,980 | 0,096           |
| **IU**  | 1.314,000 | 912,844   | 0,305           |
| **PEU** | 1.314,000 | 1.314,000 | 0,000           |
| **PS**  | 1.314,000 | 1.314,000 | 0,000           |

| | | | |
|---|---|---|---|
| **PT** | 1.314,000 | 1.174,136 | 0,106 |
| **PU** | 1.314,000 | 954,924 | 0,273 |
| **PV** | 1.314,000 | 886,655 | 0,325 |
| **SI** | 1.314,000 | 1.084,726 | 0,174 |

Table 10 presents the Q² test results, which assess the predictive relevance of the model's endogenous constructs using the blindfolding procedure. A Q² value greater than zero indicates that the exogenous variables possess predictive relevance for the corresponding endogenous construct. As shown, Intention to Use (0.305), Perceived Usefulness (0.273), Perceived Value (0.325), Attractiveness of Alternatives (0.096), Perceived Trust (0.106), and Social Influence (0.174) all have Q² values above zero, suggesting acceptable predictive relevance. Among them, Perceived Value shows the highest Q² value, indicating the strongest predictive relevance in the model. Conversely, Perceived Ease of Use and Perceived Security have Q² values of 0.000, meaning the model does not demonstrate predictive relevance for these constructs, which may be due to their role as exogenous variables rather than being predicted by other constructs in the model. Overall, the results support the model's capacity to predict most endogenous variables effectively.

### 3.5. Moderation by Generation

Age (generation) was used as a moderating variable in the study. The moderation analysis revealed that:
- Generation Y (26–44 years) showed the strongest moderating effect across most relationships.
- Generation X (45–60 years) appeared most responsive in the Perceived Value → Intention to Use path.
- Generation Z (10–25 years) had limited moderating impact in most constructs

### 3.6. Discussion

Perceived Ease of Use (PEOU) emerged as the strongest and most significant predictor of Intention to Use. This finding is consistent with the core proposition of Davis's Technology Acceptance Model (TAM) [10] and has been supported by recent studies such as Van [23], who found that interface simplicity and intuitive navigation enhance adoption in utility service applications. In Indonesia, Aditya et al. [22] similarly reported that ease of use significantly increased user retention in e-government apps. This suggests that in the context of PLN Mobile, an accessible and user-friendly interface is not merely a convenience but a central driver of continued engagement.

Perceived Security (PS) also showed a significant positive effect on Intention to Use, reinforcing the importance of safety perceptions in digital adoption. Security concerns, especially regarding data privacy and transaction safety, have been well-documented in adoption literature. For example, Cheahi et al. [24] demonstrated that perceived security was a decisive factor in Indonesia's QR-based payment systems. In the public utility context, England [25] found that explicit communication of security protocols improved trust and encouraged platform usage. Our findings indicate that users of PLN Mobile are more likely to engage with the app when they feel assured that personal and payment information is adequately protected.

Perceived Trust (PT), while positively related to Intention to Use, did not reach statistical significance. This contrasts with findings from Rose et al. [26] and Sarstedt et al. [27], where trust was a robust determinant in commercial mobile service contexts. One plausible explanation lies in PLN's institutional credibility as a state-owned utility provider. Trust in the organization may already be high and therefore functions as a baseline condition, reducing its incremental effect on adoption intention. This pattern echoes observations from Zulfiqar et al. [28] in public service app usage, where institutional trust was implicit and did not strongly influence behavioral decisions.

Perceived Usefulness (PU), despite being a central TAM construct, was not a significant direct predictor of Intention to Use in this study. This finding aligns with Sharma et al. [13], who argued that in mature technologies or essential service platforms, usefulness is often assumed and no longer a key

differentiator in adoption decisions. Given PLN Mobile's functional necessity for electricity-related transactions, users may take its utility for granted and base their adoption decisions on experiential attributes like ease of navigation and security assurances.

Perceived Value (PV) also did not have a significant direct effect on Intention to Use, diverging from past research in commercial and leisure app adoption where perceived value strongly influenced behavior [28]. In the public service context, value perception may be implicit due to the platform's essential function, making it less salient in decision-making. Instead, other experiential or assurance-based constructs, like PEOU and PS, appear to dominate.

Social Influence (SI) showed a notable positive effect on Intention to Use, particularly through its association with Perceived Trust. This aligns with Venkatesh and Davis [11] and has been echoed in recent research by Sarstedt et al. [27], who found that peer recommendations and group norms significantly influence technology adoption among younger cohorts. Our moderation results further reveal that Generations Y and Z are more responsive to social influence than Generation X, underscoring the potential for leveraging peer-driven promotional strategies in increasing PLN Mobile adoption.

Attractiveness of Alternatives (AoA) was significantly influenced by Perceived Security, highlighting that users consider competing platforms or offline service channels when they perceive security concerns. This finding is supported by studies on mobile payment switching behavior [17], which showed that security perceptions can directly shape user openness to alternatives. For PLN Mobile, this means that robust security assurances not only foster retention but also reduce the perceived attractiveness of competing solutions.

Finally, the moderation analysis confirmed that generational cohort membership, particularly Generation Y, plays a significant role in shaping the relationships between PEOU, PS, and Intention to Use. This is consistent with findings from Rose et al. [26] and Sarstedt et al. [27], which demonstrated that Generation Y users, due to their high digital literacy and balanced risk awareness, respond more strongly to usability and security cues compared to other cohorts. In contrast, Generation Z, while digitally adept, may prioritize novelty and entertainment in app usage, whereas Generation X may adopt more cautiously due to lower digital familiarity.

In sum, the results reinforce the enduring relevance of ease of use and security in digital adoption while revealing that traditional predictors like usefulness, trust, and perceived value may have diminished direct effects in contexts where institutional credibility and service necessity are high. The findings also highlight the critical role of generational segmentation in designing adoption strategies for public utility platforms. By tailoring interface design, communication of security measures, and leveraging peer influence for younger cohorts, PLN can strategically enhance both adoption rates and sustained engagement.

## 4.    Conclusion

By combining TAM and extended adoption constructs such as perceived ease of use, perceived security, perceived trust, perceived usefulness, perceived value, social influence, and attractiveness of alternatives with generational cohort as a moderating variable using PLS-SEM analysis, this study examined the factors influencing behavioral intention to use the PLN Mobile application. Perceived Usefulness, Perceived Trust, and Perceived Value do not have significant direct effects, indicating that in public utility contexts these factors may function as implicit expectations rather than active decision criteria. The results indicate that Perceived Ease of Use and Perceived Security are the strongest drivers of adoption, while Social Influence plays a significant role, especially among younger generations. By adding security and trust dimensions and empirically validating the moderating influence of generational cohorts in a public utility digital service scenario, the study expands on TAM and UTAUT-based research. Practical implications of the results, as they relate to PLN and similar providers, would be the need for a high degree of interface ease, security, and peer interaction strategies, which take a generation-specific approach, with a focus on security and ease of use for Generation Y, while also considering a socially driven approach for Generation Z. From a policy level, the results underscore the need for the integration of cybersecurity measures, as well as user experience, within public platforms, along with

the need for clear communication regarding data protection. Despite the limitations of the study being a cross-section survey with a geographically narrow sample population, the paper does offer some useful insights into the topic. It also recommends that other studies on the topic should consider using a longitudinal survey design, covering a broader sample population in terms of demographics, as well as other factors such as the role of habit formation, service quality, cultural aspects, among other things, including comparative studies in other public utility platforms in Southeast Asia.

## Author Contributions

Isce Kustiawan, a Master's student, was responsible for formulating the research framework, conducting data collection and analysis, and writing all sections of this journal article as part of the requirements for the completion of the master's thesis. Maria Apsari Sugiat, as the academic supervisor, provided overall direction and guidance throughout the research process, including conceptual development, methodological design, and critical revision of the manuscript. Both authors have read and approved the final version of the manuscript.

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