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THE EFFECT OF PERCEIVED EASE OF USE, PERCEIVED USEFULNESS, AND PERCEIVED RISK ON BEHAVIORAL INTENTION TO USE ESIM AMONG GENERATION Z IN JAKARTA

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Abstract:

The rapid growth of embedded SIM (eSIM) technology has not been matched by a proportional increase in adoption among Indonesian users, although Generation Z is globally recognized as the age cohort most receptive to this innovation. This study examines the effect of perceived ease of use, perceived usefulness, and perceived risk on the behavioral intention to use eSIM among Generation Z residing in DKI Jakarta, employing an extended Technology Acceptance Model (TAM) that incorporates perceived risk as an additional construct. A quantitative associative-causal design was used, with primary data collected through a Likert-scale questionnaire distributed to 154 respondents selected through purposive sampling. Data were analyzed using multiple linear regression with IBM SPSS Statistics. The results show that perceived ease of use ($\beta = 0.248$; $t = 2.888$; $p = 0.004$) and perceived usefulness ($\beta = 0.504$; $t = 5.840$; $p = 0.000$) have a positive and significant effect on behavioral intention, while perceived risk ($\beta = -0.170$; $t = -3.219$; $p = 0.002$) has a negative and significant effect. Together, the three variables explain 60.4% of the variance in behavioral intention (Adjusted $R^2 = 0.604$). These findings confirm the relevance of the extended TAM in explaining digital technology adoption and suggest that telecommunication operators should simplify activation processes, communicate tangible benefits, and strengthen data security to accelerate eSIM adoption among Generation Z.

Keywords:

eSIM; Perceived Ease of Use; Perceived Usefulness; Perceived Risk; Behavioral Intention; Technology Acceptance Model; Generation Z

BACKGROUND

Digital transformation has fundamentally reshaped the global telecommunications sector over the past decade, driving continuous innovation to improve efficiency, security, and convenience for users worldwide. Global mobile connections have surpassed eight billion, with the Asia-Pacific region recording the fastest growth (GSMA, 2024). Indonesia mirrors this

trend: the Association of Indonesian Internet Service Providers reported that internet users reached 221.56 million people, or approximately 79.5% of the population (APJII, 2024), while the number of active smartphone users rose from 54 million in 2015 to 209.3 million in 2023 (Goodstats.id, 2024).

Alongside this growth, the telecommunications industry has shifted from physical to fully digital identification, giving rise to embedded SIM (eSIM) technology. First introduced by the GSM Association in 2016, eSIM allows users to activate, switch, or add operator profiles digitally without a physical card (GSMA, 2024). Globally, the eSIM market was valued at USD 11.9 billion in 2025 and is projected to reach USD 17.67 billion by 2033, at a compound annual growth rate of 5.1%, with Generation Z accounting for 69% of users—making it the most receptive age cohort to this technology (Grand View Research, 2025; Zim Connections, 2026). In Indonesia, eSIM services were officially authorized in 2021 (Kementerian Komunikasi dan Informatika RI [Kominfo], 2021) and progressively rolled out by major operators; however, of roughly 25 million eSIM-compatible devices in circulation, only about 1.9 million users have migrated to the service, indicating a persistent gap between technology availability and actual adoption.

Generation Z, individuals born between 1997 and 2012 is particularly relevant to this issue, as they are considered true digital natives with a higher propensity to adopt technological innovations than previous generations (Seemiller & Grace, 2022; Arum et al., 2023). In Indonesia, this cohort represents approximately 27.94% of the population (Badan Pusat Statistik [BPS], 2023). DKI Jakarta, with the highest rate of mobile phone ownership in the country (82.47%) and the most advanced telecommunications infrastructure, provides a particularly relevant context for examining eSIM adoption intention, as residents in this region typically possess strong purchasing power and use newer, eSIM-compatible devices.

Despite this apparent potential, the high level of smartphone penetration among Jakarta's Generation Z has not translated into a correspondingly high level of intention to use eSIM. Behavioral intention to use is defined as an individual's cognitive readiness or willingness to perform a certain behavior and is regarded as the most direct antecedent of actual technology use (Davis, 1989). To explain this gap, this study draws on the Technology Acceptance Model (TAM) developed by Davis (1989), which identifies perceived ease of use and perceived usefulness as the two primary determinants of behavioral intention. Perceived ease of use refers to the degree to which a person believes that using a given technology requires little effort (Davis, 1989, as cited in Rodiah & Melati, 2020), while perceived usefulness reflects the degree to which a person believes that using the technology will enhance performance (Davis, 1989). Prior studies have consistently confirmed the positive influence of both constructs on the intention to adopt digital services (Rodiah & Melati, 2020; Kusumawati et al., 2023).

However, adoption decisions are not driven solely by perceived benefit and ease of use; potential users also weigh perceived risk—the subjective belief regarding possible loss associated with using a technology, encompassing financial, privacy, performance, and

psychological dimensions (Bauer, 1960; Featherman & Pavlou, 2003). Perceived risk has been shown to negatively and significantly affect the intention to use digital-based technology services (Kim & Park, 2023), and its inclusion strengthens the explanatory power of TAM, particularly in the context of avoiding digital risk (Featherman & Pavlou, 2003).

Although research on digital technology adoption in Indonesia has grown substantially, most studies concentrate on e-commerce, mobile banking, or digital health services, leaving eSIM adoption comparatively underexplored. Moreover, no prior Indonesian study has integrated perceived ease of use, perceived usefulness, and perceived risk within a single model to predict Generation Z's intention to use eSIM. This study addresses that gap by analyzing the effect of these three constructs on behavioral intention to use eSIM among Generation Z in DKI Jakarta, aiming to contribute both theoretically to the development of technology acceptance models and practically to the design of marketing and educational strategies by telecommunication operators.

THEORETICAL FRAMEWORK

Technology Acceptance Model (TAM)

The Technology Acceptance Model, introduced by Davis (1989) as an extension of the Theory of Reasoned Action, explains technology acceptance through two core constructs: perceived usefulness—the degree to which a person believes a system will enhance their performance—and perceived ease of use—the degree to which a person believes that using the system will be free of effort (Davis et al., 1989). Both constructs jointly shape an individual's behavioral intention to use a technology. Over time, TAM has been extended with external variables to strengthen its explanatory power, most notably perceived risk, based on the premise that users evaluate not only the benefit and simplicity of a technology but also its potential risk. Featherman and Pavlou (2003) demonstrated that perceived risk influences the acceptance of electronic services, and its inclusion has been shown to strengthen TAM's ability to explain acceptance behavior for online-based services. Building on this stream of research, the present study employs a modified TAM that incorporates perceived risk alongside perceived ease of use and perceived usefulness to explain behavioral intention to use eSIM.

Behavioral Intention to Use (Y)

Behavioral intention refers to an individual's tendency to continue using a particular technology (Davis et al., 1989) and functions as the most direct predictor of actual usage behavior. In this study, behavioral intention denotes the extent to which Generation Z users intend to adopt, activate, and continuously use eSIM as a substitute for the conventional physical SIM card. Following Davis (1989, as cited in Rodiah & Melati, 2020), behavioral intention was measured through four indicators: intention to use the system regularly, prediction of future use, recommendation to others, and enthusiasm for continued use.

Perceived Ease of Use (X1)

Perceived ease of use is defined as the degree to which an individual believes that interacting with a particular technology will be free of effort (Davis, 1989, as cited in Rodiah & Melati, 2020). In the context of eSIM, this construct pertains to the simplicity of the activation process, ease of managing operator profiles, and overall usability of eSIM features. This study adopts six indicators of perceived ease of use following Davis (1989, as cited in Rodiah & Melati, 2020): easy to learn, easy to control, clear and understandable, flexible, easy to become skillful, and easy to use.

Perceived Usefulness (X2)

Perceived usefulness reflects the degree to which an individual believes that using a system will enhance task performance (Davis, 1989, as cited in Rodiah & Melati, 2020). Within the eSIM context, perceived benefits include the convenience of switching operators without replacing a physical card, the flexibility of using multiple numbers on a single device, and efficiency when traveling abroad. Six indicators were adopted from Davis (1989, as cited in Rodiah & Melati, 2020): accelerates tasks, improves task performance, increases productivity, enhances effectiveness, simplifies tasks, and overall usefulness.

Perceived Risk (X3)

Perceived risk, first conceptualized by Bauer (1960), refers to consumers' subjective belief that using a product or service may generate unpredictable and potentially unfavorable consequences. Featherman and Pavlou (2003) further elaborated perceived risk as the uncertainty and undesirable consequences associated with using a product or service, encompassing financial, performance, privacy, psychological, social, time, and overall risk dimensions—all seven of which were adopted as indicators in this study.

Hypothesis Development

Drawing on TAM, prior empirical studies have consistently shown that perceived ease of use positively affects the intention to adopt digital services, particularly among Generation Z, who prioritize efficiency and practicality (Kusumawati et al., 2023; Wijaya et al., 2025). Perceived usefulness has likewise been established as a strong predictor of adoption intention across various digital services, including e-wallets and eSIM (Ginting et al., 2022; Zhang et al., 2023). Conversely, perceived risk has been found to negatively affect intention to use digital financial and technology services, as users become more cautious when technologies are associated with data security or financial threats (Rahmatika & Fajar, 2019; Ginting et al., 2022). Based on this theoretical and empirical foundation, the following hypotheses are proposed:

H1: Perceived ease of use has a positive and significant effect on behavioral intention to use eSIM among Generation Z in DKI Jakarta.

H2: Perceived usefulness has a positive and significant effect on behavioral intention to use eSIM among Generation Z in DKI Jakarta.

H3: Perceived risk has a negative and significant effect on behavioral intention to use eSIM among Generation Z in DKI Jakarta.

METHOD

This study employed a quantitative approach with an associative-causal design, aimed at testing the causal relationship between perceived ease of use, perceived usefulness, and perceived risk (independent variables) and behavioral intention to use eSIM (dependent variable) (Sugiyono, 2019; Creswell & Creswell, 2022). Primary data were collected through a structured Likert-scale questionnaire distributed via Google Forms to respondents who met the study's inclusion criteria.

The population comprised Generation Z individuals (born 1997–2012) residing in DKI Jakarta who had heard of or were aware of eSIM. Samples were drawn using non-probability purposive sampling, with inclusion criteria requiring respondents to (1) belong to Generation Z, (2) reside in DKI Jakarta, and (3) have heard of or shown interest in using eSIM. Following Hair et al.'s (2010) guideline that multivariate analysis requires 5–10 times the number of indicators, and using a multiplier of seven for the study's 22 indicator items, the minimum required sample size was 154 respondents (22 × 7), which was fully achieved (Sugiyono, 2022).

The questionnaire consisted of items measuring the four constructs (behavioral intention, perceived ease of use, perceived usefulness, and perceived risk) on a six-point Likert scale. Instrument testing conducted on 30 respondents confirmed that all items were valid, with corrected item-total (Pearson product-moment) correlations exceeding the r-table value of 0.361 at the 5% significance level, and reliable, with Cronbach's alpha coefficients ranging from 0.720 to 0.880—all above the recommended 0.70 threshold (Hair et al., 2014).

Prior to hypothesis testing, classical assumption tests were conducted, comprising normality (Kolmogorov–Smirnov test), multicollinearity (tolerance and Variance Inflation Factor), linearity (curve estimation), and heteroscedasticity (scatterplot and Spearman's rho). Hypotheses were tested using multiple linear regression analysis, with the coefficient of determination (R^2) used to assess the overall explanatory power of the model and the partial t-test used to examine the significance of each independent variable (Ghozali, 2021). All statistical procedures were performed using IBM SPSS Statistics.

RESULT

Of the 154 valid respondents, the majority were female (74.7%) and aged 14–17 years (55.2%), predominantly residing in East Jakarta (88.3%), with a senior high school education (93.5%) and student status (50.7%). Descriptive analysis revealed that respondents held a generally positive perception across the constructs studied: perceived ease of use recorded a grand mean of 4.761 and perceived usefulness 4.830 (both in the “agree” category), while behavioral intention recorded a grand mean of 4.480. Perceived risk recorded a comparatively moderate grand mean of 3.557, indicating that respondents held some, though not excessive, concern regarding the risks of using eSIM, particularly those related to data security.

The classical assumption tests confirmed that the regression model was appropriate for hypothesis testing. The Kolmogorov–Smirnov test yielded an Asymp. Sig. (2-tailed) of 0.086 (> 0.05), indicating normally distributed residuals. All independent variables recorded tolerance values above 0.10 and VIF values below 10 (ranging from 1.063 to 2.821), indicating the absence of multicollinearity. Curve estimation confirmed a significant linear relationship between each independent variable and behavioral intention (p = 0.001 for all pairs), and both the scatterplot pattern and Spearman's rho test (all significance values > 0.05) confirmed the absence of heteroscedasticity.

Table 1 presents the results of the coefficient of determination test. The Adjusted R^2 value of 0.604 indicates that perceived ease of use, perceived usefulness, and perceived risk jointly explain 60.4% of the variance in behavioral intention to use eSIM, while the remaining 39.6% is explained by factors outside the model.

Table 1. Coefficient of Determination (Model Summary)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.777	0.604	0.596	4.684

Table 2 presents the results of the multiple linear regression and partial t-test. All three independent variables were found to have a statistically significant effect on behavioral intention at the 5% significance level (t-table = 1.972).

Table 2. Multiple Linear Regression and Partial t-Test Results

Variable	B	Std. Error	Beta	t	Sig.
(Constant)	3.653	3.069	-	1.190	0.236
Perceived Ease of Use (X1)	0.196	0.068	0.248	2.888	0.004
Perceived Usefulness (X2)	0.420	0.072	0.504	5.840	0.000
Perceived Risk (X3)	-0.079	0.024	-0.170	-3.219	0.002

Perceived ease of use had a positive and significant effect on behavioral intention (B = 0.196; β = 0.248; t = 2.888; p = 0.004), supporting H1. Perceived usefulness had the strongest positive effect on behavioral intention (B = 0.420; β = 0.504; t = 5.840; p = 0.000), supporting H2. Perceived risk had a negative and significant effect on behavioral intention (B = –0.079; β = –0.170; t = –3.219; p = 0.002), supporting H3. All three hypotheses proposed in this study were therefore accepted.

DISCUSSION

The finding that perceived ease of use positively and significantly affects behavioral intention to use eSIM (H1 accepted) is consistent with the core proposition of TAM (Davis, 1989), which holds that individuals are more inclined to accept a technology the less effort it requires to learn and operate. This result aligns with Wijaya et al. (2025), who found that perceived ease of use significantly predicts Generation Z's behavioral intention toward digital services in the greater Jakarta area, reinforcing that even digitally fluent users continue to value

simplicity and efficient navigation when adopting new technology such as eSIM activation and profile management.

The finding that perceived usefulness exerts the strongest positive effect on behavioral intention (H2 accepted) confirms that Generation Z users are primarily motivated by tangible benefits—such as faster communication activities, operator-switching flexibility, and efficiency while traveling abroad—rather than novelty alone. This result corroborates Ginting et al. (2022) and Zhang et al. (2023), both of whom identified perceived usefulness as the strongest predictor of intention to adopt digital financial and communication technologies, suggesting that communicating concrete, everyday benefits is more persuasive than technical specifications when promoting eSIM.

Finally, the negative and significant effect of perceived risk on behavioral intention (H3 accepted) confirms that concerns about data security, privacy, and potential system disruption continue to inhibit the adoption of eSIM, consistent with Ginting et al. (2022) and Rahmatika and Fajar (2019). Although the mean risk score in this study (3.557) was only moderate rather than high, this finding indicates that unresolved security and privacy concerns remain a meaningful barrier even among a digitally native population, and that risk-mitigation efforts—such as clearer communication about eSIM's security mechanisms—may further accelerate adoption.

Taken together, these findings extend the applicability of TAM to a novel telecommunications context and confirm that the addition of perceived risk meaningfully improves the model's explanatory power (Adjusted $R^2 = 0.604$), consistent with prior TAM extensions incorporating risk-related constructs (Featherman & Pavlou, 2003).

CONCLUSION

This study demonstrates that perceived ease of use and perceived usefulness have a positive and significant effect, while perceived risk has a negative and significant effect, on Generation Z's behavioral intention to use eSIM in DKI Jakarta, collectively explaining 60.4% of the variance in intention. These findings extend the Technology Acceptance Model to the eSIM adoption context and confirm that adoption intention is shaped jointly by ease, benefit, and risk perceptions rather than by benefit and ease alone.

Theoretically, the study reinforces TAM's relevance for explaining digital technology adoption in Indonesia and supports the value of incorporating perceived risk as an external construct when studying emerging telecommunications technologies. Practically, the findings suggest that telecommunication operators should continue to simplify eSIM activation and profile-management procedures, actively communicate concrete benefits such as operator-switching flexibility and international roaming efficiency, and strengthen data security assurances and transparency to alleviate users' risk concerns, while device manufacturers and regulators can support these efforts through user-friendly interface design and clear consumer-protection policies, respectively.

This study is limited by its geographical scope (DKI Jakarta only), its focus on three predictor variables, and its reliance on self-reported survey data, which may be subject to response bias. Future research is encouraged to broaden the sample to other regions and generational cohorts, incorporate additional constructs such as trust, social influence, and device compatibility, and consider longitudinal or mixed-method designs to capture the evolving nature of eSIM adoption over time.

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