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UNDERSTANDING THE GOTRANSIT E-PAYMENT SYSTEM IN GREATER JAKARTA'S PUBLIC TRANSPORTATION: INSIGHTS FROM IDT AND UTAUT

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Abstract

The low adoption rate of GoTransit as a new e-payment method for KRL tickets highlights the need to understand the factors influencing users' intention to use the system. This study aims at examining these factors by integrating the IDT and UTAUT models. An online survey was conducted with 188 respondents of GoTransit Jabodetabek users, selected using a purposive sampling method. The results showed that relative advantage, complexity, and perceived security significantly influenced the intention to use, while facilitating conditions did not. Gender was found to moderate the effect of relative advantage, but not complexity, facilitating conditions, or perceived security. Age moderated the effect of complexity, but not relative advantage, facilitating conditions, or perceived security. These findings imply that efforts to promote GoTransit adoption should focus on enhancing perceived benefits, simplifying usage, and improving security assurance, especially among different age and gender groups.

INTRODUCTION

The transformation of traditional payment systems has been influenced by the development of modern payment systems. This is due in part to the growth of information technology (IT) across various domains, including the economic sector. The advancement of IT has enabled industries to automate their operations, one of which is the use of electronic wallets. The use of electronic wallets is part of the IT-based revenue cycle within accounting information systems (Bodnar & Hopwood, 2013:5).

E-wallet usage has grown rapidly alongside digital transformation. According to data by Dhapte (2024), the size of the electronic wallet market in 2022 was valued at USD 85.5 billion and was projected to grow to USD 105.5 billion in 2023. Data from Kaissi (2024) indicated that, in terms of electronic wallet user growth in Southeast Asia during the 2020–2025 period, Indonesia ranked second after Singapore, with a projected growth rate of 218%.

The development of electronic payment technology in Indonesia also extends to the transportation sector. One example is the payment system used in the Kereta Rel Listrik (KRL). Currently, the KRL payment system includes the Kartu Multi Trip (KMT) and electronic money (e-money) cards issued by banks, such as Flazz, Brizzi, and TapCash (Zaenuddin, 2023). In addition to these two payment systems, a new payment method has been introduced: GoTransit, which is connected to GoPay. On June 22, 2022, Gojek collaborated with PT Kereta Commuter Indonesia (PT KCI) to make it easier for users to purchase KRL Commuter Line tickets through the GoTransit feature in the Gojek application (Goto, 2022). When purchasing KRL tickets using GoPay via the GoTransit page in the app, users receive a QR (quick response) code, which functions as a tap-in ticket to enter and a tap-out ticket to exit the Commuter Line station gates.

All Jabodetabek KRL stations have been implemented as electronic money stations since September 3, 2022 (Berita Trans, 2022). This development has contributed to the rapid growth in the number of transactions using electronic wallets. Supporting data show that KMT users accounted for 57.06% or 170 million transactions, e-money card users contributed 37.05% or 110 million transactions, and GoTransit users made up 5.89% or 17 million transactions (Alfarizi, 2024).

The emergence of GoTransit connected to GoPay offers several advantages over previous payment systems. It allows users to store personal and financial information securely, using passwords and PINs. In addition, users can check KRL ticket prices and view transaction histories directly within the application, making it easier to monitor their expenses. Balance checking can also be done through the Gojek application without the need to queue or rely on the NFC feature on smartphones. Furthermore, users no longer need to carry multiple physical cards, which are at risk of being lost or damaged (Anwar et al., 2020; Langgeng, 2023; Zaenuddin, 2023). The advantages offered by using GoTransit connected to GoPay provide a solution to the weaknesses found in the KMT and e-money payment systems. Topping up the balance on KMT and e-money cards requires a dedicated machine or must be done at station counters, which often leads to queues. In addition, these cards are not equipped with a PIN or the owner's name, making them easy to switch or lose accidentally. They are also prone to physical damage, which can disrupt access and usability (Nabila et al., 2018). Such issues related to topping up e-money occurred in early 2023, when users complained about problems purchasing balances through Tokopedia, as the purchased amounts were not credited to their accounts (Elisabeth, 2023).

This research is important because it addresses the low adoption rate of GoTransit, a new payment system that integrates GoPay for purchasing KRL tickets. Although GoTransit is designed to modernise and simplify the ticketing process for public transportation, the limited number of active users suggests a gap in user acceptance and behaviour. Understanding the factors that influence the intention to use this system is essential, particularly concerning the efficiency offered by this new payment option. Intention to use refers to the desire or willingness of an individual to perform a certain action (Kaur et al., 2020). As a newly introduced system, GoTransit connected to GoPay requires broad dissemination and user acceptance to foster a stronger intention to use among potential users.

This research integrates the Innovation Diffusion Theory (IDT) and the Unified Theory of Acceptance and Use of Technology (UTAUT) models. The study conducted by Kaur et al. (2020) aimed to identify the determinants of mobile wallet acceptance and diffusion in India. It employed constructs from IDT, including relative advantage, compatibility, complexity, observability, and trialability. However, the present study focuses specifically on relative advantage and complexity. These two constructs were selected because, in the context of GoTransit connected to GoPay as a newly introduced system, users are particularly concerned with how it compares to previous payment systems (KMT and e-money) in terms of perceived benefits and ease of use, which ultimately influence their intention to use the system.

Further research by Yang et al. (2021), which used the UTAUT model, aimed to identify the factors influencing the use of electronic wallets in Indonesia. The research model included variables such as perceived usefulness, perceived ease of use, social influence, facilitating conditions, lifestyle compatibility, and perceived trust. It also incorporated moderating variables, including age, gender, and education. This study focuses solely on the facilitating conditions construct, as elements that support users, such as infrastructure and user knowledge, are crucial in increasing the intention to use new systems like GoTransit connected to GoPay.

As an additional construct to the UTAUT model, this study adds the variable of perceived security. The perceived security variable was added because electronic payment systems are prone to crimes such as the theft of users' data. Therefore, security is an important factor in determining interest in use. This was also done in the study of Widyanto et al. (2022). The study aims to identify the determinants that affect users' behavioural intentions in using mobile payments in Indonesia. The constructs used include social influence, facilitating conditions, performance expectancy, trust, perceived risk, and perceived security. According to Venkatesh et al. (2003), security issues are critical in technology adoption, especially in e-payment systems, where financial transaction information is stored and managed.

Several previous studies using the IDT and UTAUT models in the context of digital payments have shown mixed results. Research by Jung et al. (2020), Sutanto et al. (2018), Ruangkanjanases & Sirikulprasert (2018), and Palash et al. (2022) on digital payment systems reported varying findings. This inconsistency highlights the need for further research to explore the relationship between IDT and UTAUT constructs and the intention to use digital payment systems, particularly in the context of public transportation in Indonesia.

Although the original UTAUT model includes social influence as a key construct, this study focuses on individual perceptions, specifically facilitating conditions and perceived security. In the context of GoTransit usage, the decision to adopt the system is likely driven more by personal experience and system-related factors than by peer influence. Additionally, while trust is often considered important in the adoption of financial technology, this study incorporates trust implicitly through the perceived security construct.

This study also includes gender and age as moderating variables. According to Kasilingam (2020), e-payment systems represent a new technology in society, and therefore, technology adoption may vary based on users' gender and age. Data presented by the President Director of PT Kereta Api Indonesia (Persero), Didiek Hartantyo, indicated that KRL passengers are evenly split, with approximately 50 per cent male and 50 per cent female users. Furthermore, the majority of KRL users fall within the age range of 18–30 years (Tempo, 2020). The inclusion of gender and age as moderating variables in the context of KRL ticket purchases is based on the diverse demographic of its users. This demographic diversity in gender and age may influence the strength or weakness of users' intention to adopt e-payment technology through the GoTransit feature connected to GoPay.

The electronic payment system is an essential component in supporting the digital transformation of the public transportation sector, including the GoTransit service, which is connected to GoPay. However, the usage level of the GoTransit service remained at 5.89% in 2023, which was lower than that of KMT (37.05%) and e-money (57.06%). Previous studies tended to focus on the use of electronic wallets in general (Kaur et al., 2020; Widyanto et al., 2022; Yang et al., 2021), while research on the acceptance of e-payment systems in public transportation remains limited. In addition, previous research has applied the IDT and UTAUT models separately and has rarely explored their integration to explain the intention to use in transportation payment systems. Furthermore, inconsistencies have persisted in the moderating effects of gender and age, particularly in the context of transport-based technology adoption. Therefore, by integrating the IDT and UTAUT models in examining intention to use, this study addresses the gap with a novel approach. The novelty of this study lies not only in its specific context focusing on the GoTransit feature connected to GoPay for purchasing KRL tickets, but also in its theoretical and methodological contributions. Unlike previous studies that applied the UTAUT model in general e-payment settings, this study incorporates perceived security. Additionally,

the inclusion of gender and age as moderating variables through multigroup analysis (MGA) offers a more nuanced understanding of differences in user behaviour.

This study uses the IDT and UTAUT models to examine the factors that influence users' intentions to adopt GoTransit. Relative advantage, which reflects the benefits of using the system, is expected to positively influence the intention to use. Conversely, complexity, or the perceived difficulty of using the system, is predicted to have a negative effect. Facilitating conditions, such as the availability of support and ease of access, along with perceived security in transactions, are expected to positively influence the intention to use the system. In addition to these direct effects, the UTAUT model suggests that demographic characteristics such as gender and age can act as moderating variables. Research by Venkatesh et al. (2003) The research indicates that men are more influenced by functional benefits, such as relative advantage (RA), while women are more sensitive to aspects of convenience, support, and security. This strengthens the influence of complexity (COMP), facilitating conditions (FC), and perceived security (PS). Younger users are generally more open to innovation and tend to focus on RA, whereas older users are typically more concerned with system complexity, the availability of support, and security when making decisions about technology use.

Based on the explanation above, the hypotheses proposed in this study are as follows. Relative advantage (RA) is hypothesised to have a positive effect on intention to use (IU), while complexity (COMP) is expected to have a negative effect. Facilitating conditions (FC) and perceived security (PS) are both predicted to have positive effects on IU. In terms of moderating variables, gender is expected to moderate the relationship between RA and IU, with a stronger impact on men. Gender is also predicted to moderate the relationships between COMP, FC, and PS and IU, with a stronger impact on women in each case. Similarly, age is hypothesised to moderate the relationship between RA and IU, with a stronger influence on younger users, while the relationships between COMP, FC, and PS and IU are expected to be more strongly influenced by older users (Figure 1).

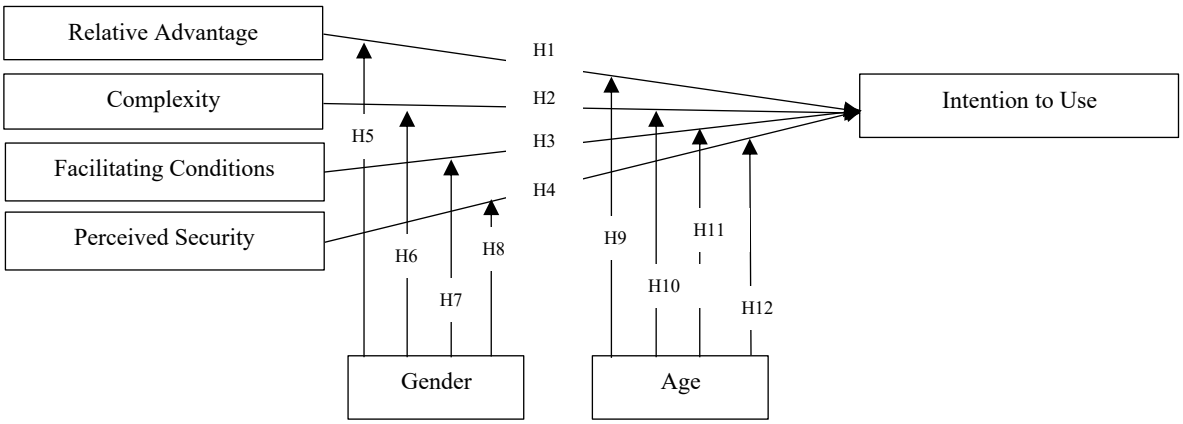

Figure 1. Conceptual Model

METHOD

This study employed a quantitative approach. The research method involved surveying by distributing questionnaires to respondents (Bougie & Sekaran, 2020:105). In this study, the questionnaires were distributed online through various platforms, including social media (e.g., Instagram and X [formerly Twitter]) and broadcast messaging services such as WhatsApp.

The population of this research consists of all users of the Kereta Rel Listrik (KRL) in the Jabodetabek area. KRL Jabodetabek was selected as the object of study because it is one of the preferred modes of transportation for the community in this region. This is supported by data showing that the number of Jabodetabek KRL users continued to increase, reaching a total volume of 290,890,677 users in 2023. This figure represented a 35% increase compared to 2022 (Kencana, 2024). The average age

of users ranges between 18 and 30 years old (Tempo, 2020). There is a good balance between male and female users. In addition, Jabodetabek KRL users are accustomed to using the electronic payment systems that have been previously implemented, namely the Kartu Multi Trip (KMT), e-money cards, and GoTransit connected to GoPay. This familiarity is due to the implementation of all Jabodetabek KRL stations as electronic money stations since September 3, 2022 (Berita Trans, 2022).

The sample in this study was determined using a purposive sampling method. The criterion for respondents was that they must be KRL users aged over 18 years. According to survey data from KCI, the majority of KRL users are between 18 and 30 years old (Tempo, 2020). The data obtained in this study is considered more representative and relevant to the experiences and preferences of KRL users, as they are the primary users of public transportation services. The criteria for respondents also include: (2) currently using or having used GoTransit services connected to GoPay for KRL ticket payment transactions more than once, as such users are considered capable of providing informed opinions or assessments of the study's indicators based on their experience with the service; and (3) using the Gojek application through a personal account, which allows users to experience firsthand how the GoTransit service connected to GoPay functions when purchasing KRL tickets. The total population in this study is unknown due to the unavailability of exact data. Therefore, the number of research samples was determined based on analytical techniques using the Partial Least Squares Structural Equation Model (SEM-PLS). SEM-PLS can be applied with a relatively small sample size. The sample size was determined using the rule of thumb, which suggests a minimum of ten times the number of causal relationship paths between latent variables (Hair et al., 2017). There are twelve causal relationship paths in this study. Therefore, the minimum sample size was calculated by multiplying the number of paths by ten, resulting in a minimum of 120 respondents. To ensure response quality during data collection, the questionnaire included negatively worded questions to check for answer consistency and to reduce the likelihood of careless responses. Data collection was carried out using a questionnaire method, with responses measured on a seven-point Likert scale ranging from 1 to 7 (Table 1).

Table 1. Operational Definition of Variables

Variables	Indicator	Source
Relative Advantage	Superior. More efficient. More effective. Faster transactions. Transaction tracking.	Kaur et al. (2020), Kapoor et al. (2022), and Mombeuil (2020).
Complexity	Longer time. User effort. More complicated. Frustration in making payments. The user's technical skills	Palash et al. (2022) and Coskun et al. (2022).
Facilitating Conditions	Resources. Knowledge. Suitability of technology or tools used. Assistance.	Venkatesh et al. (2003)
Perceived Security	Sense of security. Transaction protection. User identity verification. Protection of personal information.	Johnson et al. (2018) and Mombeuil (2020)
Intention to Use	Propensity to use the system. Intention to increase system usage. Consistency of system use.	Kaur et al. (2020) and Yang & Koenigstorfer (2021)

Partial Least Squares-Structural Equation Model (PLS-SEM) was used to analyse the data. To evaluate the PLS model, the outer and inner models must be assessed. The outer model was evaluated through validity and reliability tests, with the following criteria: loading factor value > 0.7, AVE value > 0.5, cross-loading value > 0.7, and Cronbach's Alpha and Composite Reliability > 0.7. The inner model used the value of R^2. Finally, hypothesis testing was conducted with t-statistics > 1.64 or p-values < 0.05.

RESULTS

The research data was collected over approximately two weeks, from December 14, 2024, to December 30, 2024. Respondents consisted of 188 Jabodetabek KRL users. Data was gathered by distributing open-ended questions via social media (Twitter) and messaging applications (WhatsApp) to determine how many individuals had used GoTransit to purchase KRL tickets. Respondents who indicated that they had used the feature were then sent a questionnaire link via Google Forms to be completed voluntarily. Inconsistent data, such as responses displaying extreme answer patterns, identical responses to all questions, or indications of bias, were eliminated through a data cleaning process. This process was carried out to ensure data quality and validity. After verification, the invalid responses were removed using a listwise deletion approach, ensuring that only valid and reliable data were used in the final analysis. The respondents were primarily female (55%), aged between 18–30 years (55%), from Jakarta (44%), students (52%), and had used GoTransit services connected to GoPay for <1 year on average (50%), with a usage frequency of 1–3 times (34%) (Table 2).

Table 2. Respondent Demographic Data

	Description	N	%
Gender	Male	83	44.15
	Female	105	55.85
Age	18-30 years old	105	55.85
	31-60 years old	83	44.15
Domicile	Jakarta	83	44.15
	Bogor	24	12.77
	Depok	20	10.64
	Tangerang	29	15.43
	Bekasi	32	17.02
Jobs	Student	99	52.66
	Public Servant	11	5.85
	Private Employee	65	34.57
	Entrepreneur	8	4.26
	More	5	2.66
Length of Use	<1 year	96	50.06
	1-2 years	51	27.13
	>2 years	41	21.81
Frequency of Use	1-3 times	64	34.04
	3-6 times	49	26.06
	7-10 times	21	11.17
	>10 times	54	28.72

Before performing the PLS-SEM analysis, the data were screened for missing values and normality. No significant missing data were detected, and cases with inconsistent or biased responses were removed during the cleaning process. Normality was not assumed, as PLS-SEM does not require multivariate normal data. The results of the convergent validity test showed that each variable indicator had an outer loading value > 0.7 and an AVE value > 0.5. Therefore, the constructs and indicators met the requirements for convergent validity (Figure 2 & Table 3).

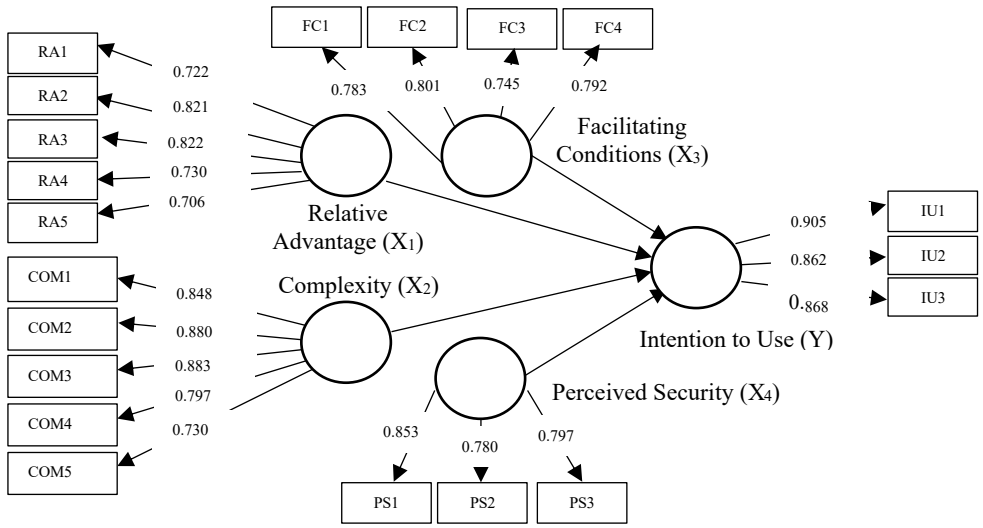

Figure 2. Outer Model

Table 3. The result of AVE

	Average Variance Extracted (AVE)	Descriptions
Relative Advantage (X_1)	0.581	Valid
Complexity (X_2)	0.689	Valid
Facilitating Conditions (X_3)	0.609	Valid
Perceived Security (X_4)	0.657	Valid
Intention to Use (Y)	0.772	Valid

Table 4 shows the results of the discriminant validity test.

Table 4. Discriminant Validity Test Results

Indicator	Variables				
	Relative Advantage (X_1)	Complexity (X_2)	Facilitating Conditions (X_3)	Perceived Security (X_4)	Intention to Use (Y)
RA1	0,722	-0,178	0,324	0,451	0,333
RA2	0,821	-0,254	0,144	0,287	0,412
RA3	0,822	-0,297	0,257	0,382	0,488
RA4	0,730	-0,543	0,356	0,390	0,452
RA5	0,706	-0,281	0,466	0,402	0,319
COM1	-0,363	0,848	-0,243	-0,198	-0,317
COM2	-0,402	0,880	-0,327	-0,162	-0,295
COM3	-0,366	0,883	-0,392	-0,210	-0,273
COM4	-0,339	0,797	-0,393	-0,194	-0,228
COM5	-0,244	0,730	-0,344	-0,091	-0,187
FC1	0,310	-0,357	0,783	0,290	0,179
FC2	0,311	-0,290	0,801	0,376	0,143
FC3	0,323	-0,345	0,745	0,349	0,171
FC4	0,277	-0,241	0,792	0,315	0,157
PS1	0,512	-0,270	0,378	0,853	0,453
PS2	0,311	-0,103	0,299	0,780	0,278
PS3	0,340	-0,102	0,343	0,797	0,367
IU1	0,478	-0,306	0,198	0,420	0,905
IU2	0,482	-0,256	0,135	0,394	0,862
IU3	0,455	-0,283	0,221	0,412	0,868

The Cronbach's Alpha and Composite Reliability values met the predetermined parameters, as confirmed by the reliability tests. Both values were above 0.7, indicating that the study instruments are reliable. Table 5 shows the results of the reliability testing.

Table 5. Cronbach's Alpha and Composite Reliability

Variables	Composite Reliability	Cronbach's Alpha
Relative Advantage (X_1)	0.873	0.820
Complexity (X_2)	0.917	0.887
Facilitating Conditions (X_3)	0.862	0.787
Perceived Security (X_4)	0.852	0.745
Intention to Use (Y)	0.910	0.852

Inner model testing was conducted to predict the causal relationships between latent variables. The evaluation of the inner model was performed using R^2 (R-square), which categorises the model's predictive power as strong, moderate, or weak (Chin, 1998).

Table 6 shows that the R-square value is 0.363. This result can be classified as a moderate model. It indicates that the constructs of relative advantage, complexity, facilitating conditions, and perceived security explain 36.35% of the variation in intention to use, while the remaining variation is explained by other constructs not included in the research model.

Table 6. R-square

	R-square	Adjusted R-square
Intention to Use (Y)	0.363	0.350

The effect size (f^2) value for relative advantage is 0.141 and for complexity is 0.027, indicating a moderate influence on intention to use. Meanwhile, the values for facilitating conditions (0.017) and perceived security (0.099) indicate a weak influence on intention to use (Table 7).

Table 7. F-square analysis

	Complexity (X_2)	Facilitating Conditions (X_3)	Intention to Use (Y)	Perceived Security (X_4)	Relative Advantage (X_1)
Complexity (X_2)			0.027		
Facilitating Conditions (X_3)			0.017		
Intention to Use (Y)					
Perceived Security (X_4)			0.099		
Relative Advantage (X_1)			0.141		

Before interpreting the structural relationships, collinearity statistics were examined. Table 8 show the VIF values for all predictor constructs were below the threshold of 3.3, indicating the absence of multicollinearity issues and ruling out potential common method bias (Kock, 2015).

Table 8. Inner VIF Values

	COM	FC	IU	PS	RA
COM			1.327		
FC			1.409		
IU					
PS			1.453		
RA			1.556		

The path coefficient test indicates the level of significance in hypothesis testing. This study used the bootstrapping method with one-tailed testing, where a t-statistic value greater than 1.64 indicates acceptance of the hypothesis. The threshold of 1.64 was applied due to the directional nature of each research hypothesis. Table 9 shows the results of the path coefficient test.

Table 9. Path Coefficient

Variables	Original Sample (O)	T-Statistics (|O/STDEV)	p-Values
Relative Advantage→ Intention to Use	0,374	5,004	**0,000**
Complexity→ Intention to Use	-0,150	2,297	**0,011**
Facilitating Conditions→ Intention to Use	-0,125	1,575	0,058
Perceived Security→ Intention to Use	0,302	3,845	**0,000**

The path coefficient test shows that the values for Relative Advantage and Perceived Security are positive, while the values for Complexity and Facilitating Conditions are negative. The path coefficient for Relative Advantage is 0.374 with a P-Value = 0.000 < 0.05, indicating a positive and significant effect on Intention to Use. Complexity has a path coefficient of -0.150 and a P-Value = 0.011 < 0.05, indicating a negative and significant effect on Intention to Use. Facilitating Conditions has a path coefficient of -0.125 and a P-Value = 0.058 > 0.05, which means its effect on Intention to Use is not significant. Perceived Security has a path coefficient of 0.302 and a P-Value = 0.000 < 0.05, indicating a positive and significant effect on Intention to Use. This study also tested the moderating effects using multigroup analysis (MGA). Multigroup analysis was conducted by comparing the path coefficients for each sample group and evaluating the significance of the p-values (α = 5%) obtained through the bootstrapping procedure (Ghozali & Latan, 2015:211). Multigroup analysis in this study was conducted on the moderating variables, namely gender and age. The gender variable consisted of two groups: gender group 1 (male) and gender group 2 (female). The age variable was divided into the young age group (18–30 years old) and the old age group (31–60 years old).

Table 10. Gender Moderation Multigroup Analysis (MGA)

Variables	Path Coeff (Male)	Path Coeff (Female)	Path Coefficients – diff (M vs F)	P-value (M vs F)
RA→ IU	0.252	0.513	-0.261	**0.044**
COM→ IU	-0.124	-0.178	0.054	0.339
FC→ IU	-0.135	-1.122	-0.013	0.467
PS→ IU	0.331	0.267	0.064	0.329

Based on Table 10, the relative advantage construct for female users has a p-value of 0.044 or <0.05, indicating a significant difference between male and female users in terms of relative advantage concerning intention to use. The path coefficients show that the value for females is 0.513, which is greater than the value for males, which is 0.252. For the complexity construct, both male and female groups have a p-value of 0.339 > 0.05, indicating that the difference is not statistically significant. Similarly, the facilitating conditions construct for both gender groups has a p-value of 0.467 > 0.05, also indicating an insignificant difference. The perceived security construct shows a p-value of 0.329 > 0.05 for both male and female users, suggesting that the results are not significant.

Table 11. Age Moderation Multigroup Analysis (MGA)

Variables	Path Coeff (Young)	Path Coeff (Old)	Path Coefficients – diff (Y vs O)	P-value (Y vs O)
RA→ IU	0.370	0.342	0.028	0.430
COM→ IU	-0.255	-0.049	-0.206	**0.049**
FC→ IU	-0.157	0.003	-0.160	0.180
PS→ IU	0.224	0.391	-0.167	0.165

The relative advantage construct based on Table 11 in both age groups, young and old, has a p-value of 0.430 > 0.05, indicating no significant difference. Complexity in the older age group has a p-value of 0.049 < 0.05, indicating that there is a difference between young and old users in the relationship between complexity and intention to use. The path coefficient values for the younger age group were -0.255 and -0.049 for the older age group. Facilitating Conditions in both age groups,

younger and older, had a p-value of 0.180 > 0.05, indicating that the results were not significant. Perceived Security in both age groups, younger and older, had a p-value of 0.165 > 0.05, also indicating that the results were not significant.

DISCUSSION

The results show that relative advantage has a strong and positive impact on the intention to use the GoTransit e-payment system. This suggests that, as a new technological innovation in the payment system for KRL transportation modes, the relative advantage of GoTransit plays a crucial role in promoting its adoption and increasing users' intention to use it. These findings are consistent with the Innovation Diffusion Theory (IDT), which posits that if individuals perceive a new idea, innovation, or technology as beneficial, their intention to adopt it increases. As an innovative payment method connected to GoPay, GoTransit offers users a significant advantage over the previously used card-based payment system, thereby encouraging their intention to use it. The study's findings are in line with previous research by Kaur et al. (2020), Palash et al. (2022), and Ompusunggu & Anugrah (2021), who also found that relative advantage positively affects the intention to use.

Complexity negatively impacts the intention to use the GoTransit e-payment system. This implies that the lower a user's perception of difficulty in understanding and using the GoTransit system, the higher their intention to use it. These findings support the Innovation Diffusion Theory (IDT), which posits that when an innovation is perceived as complex or difficult to use, individuals are less likely to adopt it. As a new payment system, the perceived complexity of GoTransit emerges when users interact with the ticket purchasing process via the application, particularly when they must ensure sufficient GoPay balance to complete transactions. Additional factors contributing to complexity include the requirement for internet connectivity to scan QR code tickets and identity verification steps, such as logging into the Gojek app and entering a password during payment. To increase adoption among KRL users, it is essential to minimise these complexities. The study's findings align with those of Kaur et al. (2020) and Kaabachi & Obeid (2016), who also found that complexity negatively affects the intention to use. These results suggest that users who are more familiar with digital systems perceive new systems as less complicated and are more likely to adopt them.

The results showed that facilitating conditions did not significantly affect the intention to use GoTransit, supporting the UTAUT theory that such conditions are less influential when users are already familiar with technology. Venkatesh et al. (2003). The relationship between the facilitating conditions construct and intention to use becomes insignificant when the effort expectancy construct is included in the research model, which in this study is reflected through the complexity construct. Users tend to be familiar with QR code-based electronic payment systems in their daily lives. As a result, the need for supporting facilities does not significantly influence intention to use. Users perceive that facilities such as station gates, QR code scanning machines, and internet access for processing QR codes are essential components that should be readily available at KRL stations to support the usage process. The respondents in this study, the majority of whom are aged 18–30 years (Generation Z), are individuals who actively engage with technology and therefore already possess the knowledge required to use the GoTransit feature connected to GoPay. These findings align with the study by Okumus et al. (2018), Lee et al. (2019), and Demir et al. (2024), who found that facilitating conditions did not affect intention to use.

The findings showed that perceived security positively affects the intention to use the GoTransit e-payment system. This suggests that the more users perceive the system as secure and low-risk, the higher their intention to use it. Technology use is often accompanied by risks such as identity theft and data breaches. These results support the UTAUT theory, which posits that when users perceive an innovation as safe and free from risks, their likelihood of accepting and adopting it increases. As a system potentially vulnerable to data-related crimes, GoTransit requires a robust security framework. This includes ensuring seamless transactions and minimising errors or bugs, which will enhance users' sense of security and encourage greater adoption. These findings are consistent with previous studies

by Widyanto et al. (2022) and Liébana-Cabanillas et al. (2018). The perceived security construct has a significant positive effect on intention to use.

The results indicate that the moderation effect of gender on the relative advantage construct has a positive influence on the intention to use the GoTransit e-payment system among female users. Female users tend to consider the practicality and financial benefits of adopting new technology. In the context of this study, female users perceive the GoTransit e-payment system, which is connected to GoPay, as more efficient because it eliminates the need for a physical card to purchase KRL tickets, facilitates GoPay top-ups, and enables faster access through KRL gates using a QR code. The system also provides financial benefits, which appear to be more appealing to female users who are generally more responsive to promotions, discounts, or cashback offers provided by Gojek. These advantages and benefits contribute to strengthening the intention to use the GoTransit e-payment system among female users. The findings did not support the UTAUT theory, which stated that the performance advantage of technology significantly affected males but not females (Venkatesh et al., 2003). The findings support Terblanche & Kidd (2022), Raman et al. (2024), and Alam et al. (2020) findings that the relative advantages were greater for women.

The analysis suggests that the gender moderation of the complexity construct on intention to use is not supported. This indicates that there is no significant difference between male and female users regarding the perceived complexity of the GoTransit e-payment system in influencing their intention to use it. This may be attributed to the Gojek application interface for accessing GoTransit features, which has been designed to be user-friendly for all user groups, thereby minimising usability disparities across genders. Although the use of GoTransit connected to GoPay involves certain challenges, such as topping up GoPay balance, verifying identity through password or face ID during the payment process, and ensuring a stable signal to scan the QR code at the KRL gate, these factors do not appear to lead to different perceptions between male and female users. These findings do not support the UTAUT theory, which stated that women are more sensitive to perceived complexity when adopting technology compared to men. The results of this study support research by Palau-Saumell et al. (2019), Jain & Jain (2022), and Wu et al. (2016), who found that gender does not moderate the relationship between complexity and intention to use.

The findings show that gender does not moderate the influence of facilitating conditions on intention to use, meaning that there is no difference between male and female users in terms of the support provided by the GoTransit e-payment system concerning their intention to use it. These results do not support the UTAUT theory by Venkatesh et al. (2012), who stated that the female gender tends to consider external supporting factors more than the male gender. This result is due to the equality between male and female users in terms of access to technology, such as smartphone ownership, internet connectivity, and the Gojek application, which supports the use of the GoTransit feature for purchasing KRL tickets. In addition, both male and female users are familiar with how digital payments work and are accustomed to using applications to book transportation. Other factors include the availability of supporting facilities such as gates or QR code scanners and internet access for processing QR codes at KRL stations. These supporting facilities are considered basic or non-critical factors that do not significantly influence the intention to use among either male or female users. The study's findings support previous research by Ambarwati et al. (2020) and Muhammad et al. (2023), which found no moderating effect of gender on the relationship between facilitating conditions and intention to use.

Gender is not shown to moderate the influence of perceived security on intention to use, meaning that there is no difference between male and female users in terms of their perception of the security of the GoTransit e-payment system and their intention to use it. These results do not support the UTAUT theory, which states that when using a technology, women tend to pay more attention to the level of security of the technology than men. This finding is due to the increasing equality of digital literacy between male and female users. Data show that there is no significant difference in information technology skills between the two genders, so their understanding of digital security systems is also increasingly equal. The frequency of using electronic payment systems is also increasingly familiar to both gender groups, so the perception of security in digital systems is not a foreign concept. The security system implemented by Gojek, as the provider of the GoTransit feature connected to GoPay, which

includes data authentication via password, Face ID, or one-time password (OTP), is designed to be easy to use for all users, both male and female. This results in no difference in the perception of security from the use of GoTransit connected to GoPay between the two gender groups. The results of this study support the findings of Kumalasari & Algifari (2024) and Joshi & Chawla (2024), who found no moderating effect of gender on the relationship between security perceptions and intention to use.

Age was not found to moderate the influence of relative advantage on intention to use, meaning that there is no difference between young and older users in terms of their perception of the advantages of the GoTransit e-payment system on their intention to use it. This result is because both young and older users are currently balanced in their use of digital payments. Databoks (2022) Data from 2021 shows that 60% of Gen Z, 54% of Gen Y, and 39% of Gen X were classified as digitally literate. Based on this data, both young and older users have been sufficiently exposed to digitalisation, including in the transportation sector. Therefore, the advantages of using GoTransit, which is connected to GoPay, such as not requiring a physical card to purchase KRL tickets, the ease of topping up GoPay, the availability of information related to KRL schedules and routes, and the speed of tapping in and out of KRL gates via QR codes, are important for both age groups. These findings did not support the UTAUT theory, which stated that younger users tend to focus on a technology's benefits and features to support their mobility. The findings of this study supported the research by Palau-Saumell et al. (2019), Garg (2022), and Alduais & Al-Smadi (2022), who found no age moderation in the relationship between relative advantage and intention to use.

The data suggest that the moderating effect of the complexity construct on age negatively influenced younger users' intention to use the GoTransit e-payment system. This result is attributed to Generation Z, a generation that interacts extensively with internet technology and integrates it into their daily lives. Young people who have grown up in the digital era also tend to have high expectations that GoTransit features will offer a user-friendly interface, improve efficiency, and minimise obstacles or disruptions during use. Complexity that may arise when using GoTransit to purchase KRL tickets, such as technical difficulties when scanning QR codes at KRL gates or complicated transaction processes, can reduce younger users' intention to use the system. This is because effort and difficulty in using a technology have a stronger influence on older users (Venkatesh et al., 2003). The results of this study support the research by Merhi et al. (2019), Yang & Koenigstorfer (2021), and Kim et al. (2024) who stated that the moderating effect of younger age is stronger in the relationship between complexity and intention to use.

There is no moderating effect of age on the influence of facilitating conditions on intention to use, meaning that there is no difference between young and older users in terms of the support provided by the GoTransit e-payment system for their intention to use it. This result is because the use of smartphones, online transportation applications, and digital payment systems has become part of everyday life (Anggraeni et al., 2023). Therefore, supporting facilities for using a technology such as GoTransit, which is connected to GoPay, have been equally accessible to users of all age groups. The use of GoTransit features, designed to be user-friendly for all ages with clear guidelines, makes it easier for users to purchase KRL tickets through the GoTransit feature connected to GoPay. In addition, external factors related to infrastructure, such as QR code scanners at KRL stations, internet connectivity at the stations, technical support from Gojek, and collaboration between GoTransit and KAI to ensure real-time data on train schedules and ticket validation, have become minimum service standards that support the smooth use of the GoTransit feature for purchasing KRL tickets. The UTAUT theory posited that the influence of facilitating conditions on technology use tends to be stronger for older users (Venkatesh et al., 2003), is not supported by the results of this study. The findings of this study support the research by Ambarwati et al. (2020), Fitriana & Kurniawan (2023), and Muhammad et al. (2023) who found that there is no moderating role of age in the relationship between facilitating conditions and intention to use.

Age does not significantly moderate the influence of security perceptions on usage intention, meaning that there is no difference between younger and older users in terms of their perceptions of the security of the GoTransit electronic payment system and their intention to use it. This is because both younger and older users are accustomed to using digital technology, including e-payment systems.

Based on the demographic data in this study, the majority of users were from Generation Y and Generation Z, who had generally used the GoTransit features more than three times. Therefore, the high frequency of use indicates that both age groups share similar security perceptions. Additionally, security features are now considered essential for all users, regardless of age. The security features implemented by Gojek in GoTransit, which is connected to GoPay, such as OTP code authentication, passwords, and Face ID, are already familiar to both younger and older users. The results of this study did not support the UTAUT theory, which stated that older users are more concerned about security when using technology. Instead, the findings support research by Ghosh (2024) and Hadikusuma & Thamrin (2024), who found that age does not moderate the relationship between perceived security and intention to use.

CONCLUSION

Based on the research findings, three main hypotheses were accepted and supported the IDT and UTAUT theories: relative advantage positively impacts intention to use, complexity negatively impacts intention to use, and perceived security positively impacts intention to use. Meanwhile, one hypothesis was not accepted and did not support the UTAUT theory, namely, the effect of facilitating conditions on the intention to use the GoTransit e-payment system connected to GoPay. The moderating effect of gender, as proposed by the UTAUT theory, was supported in the relationship between relative advantage and intention to use, with the effect found to be stronger among women. However, gender moderation was not supported in the relationships between complexity, facilitating conditions, and perceived security on intention to use. Furthermore, age moderation, as outlined in the UTAUT theory, was supported in the relationship between complexity and intention to use, with the effect found to be stronger among younger users. The UTAUT theory, however, did not support the moderating role of gender in the relationships between relative advantage, facilitating conditions, and perceived security and intention to use.

This research contributes to supporting the theories used, namely the Innovation Diffusion Theory (IDT) and the Unified Theory of Acceptance and Use of Technology (UTAUT). It also provides a theoretical model development regarding the diffusion and acceptance of information technology in the context of purchasing KRL tickets through the GoTransit electronic payment system connected to the GoPay digital wallet.

This study has several limitations. First, it could not determine the actual population of GoTransit users for purchasing KRL tickets; therefore, the sample size was determined using the ten-times rule based on SEM-PLS analysis. The respondents in this study were predominantly female and young users, which may have biased the results toward certain gender and age groups. This imbalance has the potential to affect the model estimation, particularly in the moderation tests for gender and age. Additionally, the R-squared value in this study is considered relatively low. Furthermore, since data were collected through online self-reported questionnaires with a cross-sectional design, there may be potential biases such as self-report bias and limited participation from users with lower digital literacy. These factors may impact the generalizability of the findings. Future research is recommended to identify the actual population of GoTransit users by obtaining data through formal permission from Gojek or PT KAI Commuter to achieve a more accurate representation. It is also suggested that future studies distribute questionnaires more evenly across gender and age groups and apply more balanced sampling strategies or weighting techniques to improve generalizability and the accuracy of model estimations. Additionally, future research could incorporate relevant constructs to strengthen the research model. This study focused on GoTransit users in the Jabodetabek area, which may limit the generalizability of the findings to other public transportation systems or regions. Future studies are encouraged to explore other regions or compare different public transport payment systems to enhance generalizability. Combining self-reported data with observational or system-generated usage data is also recommended to reduce potential response bias. Moreover, distributing surveys both online and offline would help obtain a more representative sample of public transportation users. Longitudinal or experimental research designs are also encouraged to strengthen causal inference and improve data reliability.

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