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Evaluating User Acceptance of KAI Access: A Comparison of TAM and UTAUT

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ABSTRACT

This study aims to analyze and compare two technology acceptance models Technology Acceptance Model (TAM) and Unified Theory of Acceptance and Use of Technology (UTAUT) in measuring user acceptance of the KAI Access mobile application in Surabaya. The research adopts a quantitative approach, using questionnaires distributed to 200 active users of the KAI Access app. Data were analyzed using Partial Least Square-Structural Equation Modeling (PLS-SEM) with SmartPLS software. Results show that all variables in the TAM model significantly influence behavioral intention, particularly perceived usefulness and perceived ease of use. Meanwhile, in the UTAUT model, only effort expectancy and facilitating conditions have a significant effect. The R-square and Q-square values indicate that TAM has stronger predictive capability than UTAUT in this context. These findings offer useful insights for improving the KAI Access application and can serve as a reference for future research on technology acceptance in public digital services.

Keyword: Technology Acceptance Model, Unified Theory of Acceptance and Use of Technology, User Acceptance, KAI Access, SmartPLS, Mobile Application, Public Service Technology.

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1. INTRODUCTION

The advancement of information technology has significantly transformed how individuals and organizations interact with digital platforms, particularly in the public service sector. PT Kereta Api Indonesia (Persero), a state-owned enterprise operating in Indonesia's railway transportation, developed the KAI Access mobile application in 2014 to provide users with practical access to train ticketing services. Through KAI Access, users can perform various functions including booking, cancellation, and rescheduling of train tickets, as well as accessing logistics and other railway-related services. As of 2022, the application has recorded over ten million downloads, reflecting a broad user base.

Despite its extensive usage, the application still faces several challenges regarding user satisfaction and acceptance. The app currently holds a rating of 3.3 out of 5 on the Google Play Store, which suggests that while many have downloaded the application, not all users are fully

satisfied with its performance or functionality. Therefore, understanding the factors that influence user acceptance is essential for further development and optimization of the app.

To evaluate technology acceptance, models such as the Technology Acceptance Model (TAM) and Unified Theory of Acceptance and Use of Technology (UTAUT) are widely adopted. TAM, introduced by Davis [1], emphasizes perceived usefulness and perceived ease of use as the primary determinants of behavioral intention to use a system. On the other hand, UTAUT, developed by Venkatesh et al. [2], integrates constructs from eight previous models and includes performance expectancy, effort expectancy, social influence, and facilitating conditions.

The consistent performance of TAM and UTAUT across various digital services reinforces their suitability for this study. Research on TAM in mobile banking contexts such as the study by Wulandari et al. on Indonesian users using PLS-SEM, demonstrated that perceived usefulness, ease of use, and user attitude significantly influence behavioral intention [3]. Meanwhile, UTAUT has demonstrated adaptability in e-government contexts, such as in Malaysian rural settings (2021), where performance expectancy, effort expectancy, and facilitating conditions significantly influenced adoption, although social influence was found less impactful [4].

These findings justify employing both models to assess user acceptance in public transportation services. This study therefore employs a comparative approach to examine which model TAM or UTAUT better explains behavioral intention among KAI Access users in Surabaya, offering insights into the most effective framework for evaluating acceptance of mobile-based transportation applications.

2. METHODS

The flow of this study is illustrated in Figure 1, which outlines the sequential stages from problem formulation to data analysis and conclusion.

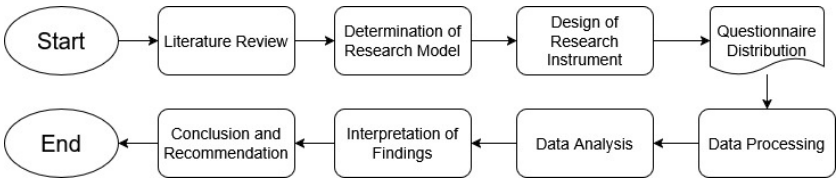

Figure 1. Research Flow Diagram

The research flow, as illustrated in Figure 1, outlines the systematic steps taken in conducting this study. It begins with a literature review to identify relevant theories and previous studies, followed by the determination of the appropriate research model. After defining the model, the research instrument was designed and the questionnaire was distributed to selected respondents. The collected data were then processed and analyzed using the PLS-SEM method. The results were interpreted to generate findings, which ultimately formed the basis for the conclusions and recommendations provided at the end of the study.

The research methodology is further detailed in the following subsections, which outline the research design, sampling method, and instrument used in this study.

2.1 Research Design

This study applied a quantitative survey, commonly used to examine user behavior through standardized questionnaires [5]. The research focused on analyzing user acceptance of the KAI Access mobile application by comparing two theoretical frameworks: TAM and

UTAUT. Both models have been widely adopted in evaluating technology usage behavior and user intentions in various information systems and digital service platforms. Data analysis was carried out using PLS-SEM, which is recommended for its suitability in exploratory studies involving complex models and relatively small sample sizes [6].

2.2 Conceptual Framework

This study adopts and presents two separate conceptual frameworks, namely TAM and UTAUT, as illustrated in Figures 2 and 3. The conceptual framework of this study integrates the core constructs from both TAM and UTAUT models. TAM consists of four primary constructs: perceived ease of use, perceived usefulness, attitude toward using, and behavioral intention. These variables are structured in a causal flow where ease of use influences perceived usefulness and attitude, which subsequently shape behavioral intention.

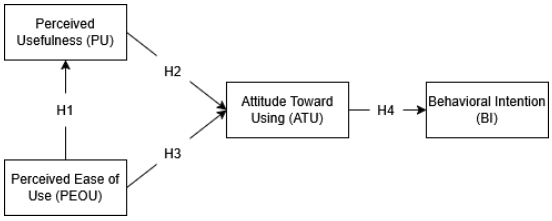

Figure 2. Conceptual Framework of TAM

TAM Hypotheses

H1: Perceived ease of use significantly influences perceived usefulness.
H2: Perceived ease of use significantly influences attitude toward using.
H3: Perceived usefulness significantly influences attitude toward using.
H4: Attitude toward using significantly influences behavioral intention.

On the other hand, the UTAUT model comprises performance expectancy, effort expectancy, social influence, and facilitating conditions, which are theorized to directly affect behavioral intention.

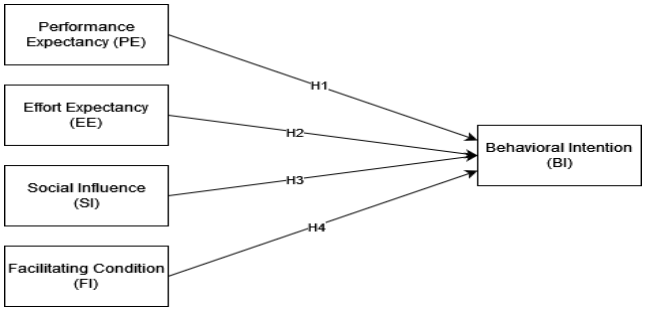

Figure 3. Conceptual Framework of UTAUT

UTAUT Hypotheses

H1: Performance expectancy significantly influences behavioral intention.
H2: Effort expectancy significantly influences behavioral intention.
H3: Social influence significantly influences behavioral intention.
H4: Facilitating conditions significantly influence behavioral intention.

Both models share behavioral intention as the ultimate outcome variable, enabling comparative evaluation of their explanatory strength in the context of mobile application adoption.

2.3 Population and Sample

The population in this study consisted of residents in Surabaya who are active users of the KAI Access application. The sampling technique used was purposive sampling with a minimum sample calculation based on the rule of thumb proposed by Hair et al. [7], which recommends 5–10 times the number of indicators. With 25 indicators used in this study, the minimum sample required was 130 respondents. To ensure sufficient statistical power, the sample size was increased to 200 respondents. This decision is also supported by Wong [8], who suggests that an appropriate sample size for SEM ranges between 100 and 200 respondents. In total, around 208 to 210 responses were collected via online and offline questionnaires, of which 200 valid responses were retained after screening for completeness and consistency.

2.4 Research Instrument

The research instrument consisted of 25 statements representing 9 variables, which were adapted from validated instruments used in prior TAM and UTAUT studies [1], [2]. Each statement was measured using a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). These indicators covered perceived usefulness, perceived ease of use, attitude toward using, and behavioral intention (TAM). The remaining 13 indicators were developed from the UTAUT model, covering performance expectancy, effort expectancy, social influence, and facilitating conditions. In addition, two separate indicators measured behavioral intention as a common variable in both models [2]. The following tables provide the measurement indicators used for each model construct.

Table 1 shows the indicators and items adapted for the TAM model, including perceived usefulness, perceived ease of use, and attitude toward using.

Table 1. Indicators and Statements of TAM Variables

Variable	Code	Indicator	Statement	Source
Perceived Usefulness	PU1	Increases effectiveness	Using KAI Access improves ticket booking effectiveness	[9]–[11]
	PU2	Makes tasks easier	Using KAI Access makes booking tickets easier	
	PU3	Speeds up the process	KAI Access speeds up the ticket booking process	
	PU4	Useful	KAI Access is useful in the booking process	
Perceived Ease of Use	PEOU1	Easy to understand	KAI Access is easy to understand	[10], [12]
	PEOU2	Easy to learn	KAI Access is easy to learn	
	PEOU3	Easy to use	KAI Access is easy to use	
Attitude Toward Using	ATU1	Interesting	I am interested in using KAI Access	[10], [13]
	ATU2	Enjoyable to use	I enjoy using KAI Access	
	ATU3	Usable anytime and anywhere	I can use KAI Access anytime and anywhere	

Table 2 presents the indicators developed for the UTAUT model, covering performance expectancy, effort expectancy, social influence, and facilitating conditions.

Table 2. Indicators and Statements for UTAUT Variables

Variable	Code	Indicator	Statement	Source
Performance Expectancy	PE1	Useful	KAI Access is useful for the ticket booking process	[2], [14], [15]
	PE2	Provides conveniences	KAI Access provides many conveniences for users	
	PE3	Improves effectiveness	KAI Access makes ticket booking more effective	
	PE4	Efficient	KAI Access helps save time in booking tickets	
Effort Expectancy	EE1	Easy to learn	Learning to use KAI Access is easy	[2], [14], [16]
	EE2	Simple to operate	Operating KAI Access is simple and straightforward	
	EE3	Understandable	Using KAI Access is easy to understand	
	EE4	Easily become skillful	I can become skillful at using KAI Access easily	
Social Influence	SI1	Social expectation	People important to me think I should use KAI Access	[15], [17]
	SI2	Encouragement from others	People around me encourage the use of KAI Access	
Facilitating Conditions	FC1	Technical knowledge	I have the knowledge needed to use KAI Access	[2], [14], [17]
	FC2	User device readiness	I have adequate devices to use the KAI Access application	
	FC3	Organizational support	KAI provides adequate support for KAI Access users	

In addition, behavioral intention was measured using two common indicators applicable to both models, as shown in Table 3.

Table 3. Indicators and Statements for Behavioral Intention Variable

Variable	Code	Indicator	Statement	Source
Behavioral Intention	BI1	Continued use intention	I intend to continue using KAI Access in the future	[12], [14]
	BI2	Frequent usage plan	I plan to frequently use KAI Access going forward	

2.5 Data Analysis Technique

Data were analyzed using PLS-SEM with the support of SmartPLS software. The analysis consisted of two primary stages: the evaluation of the measurement model (outer model) to test the reliability and validity of constructs, and the evaluation of the structural model (inner model) to examine the hypothesized relationships. Bootstrapping was used to determine the significance of path coefficients, while R^2 was employed to measure the model's explanatory power. In addition, the Q^2 value was calculated to assess the predictive relevance, following the guideline by Hair et al. [18].

3. RESULTS AND DISCUSSION

This section presents the results of data analysis and the interpretation of findings based on the proposed models. The results include the evaluation of the measurement model (outer model), the structural model (inner model), hypothesis testing, and a discussion of the findings.

3.1 Respondent Demographics

A total of 200 valid responses were obtained from KAI Access users in Surabaya. As shown in Table 4, most respondents were female, aged 20–30 years, and predominantly students. While many had used the application for more than a year, most reported using it less than five times per month.

Table 4. Respondent Demographic Profile

Characteristic	Category	Frequency	Percentage (%)
Gender	Male	61	31%
	Female	179	69%
Age	< 20 years	42	21%
	20–30 years	142	71%
	30–40 years	6	3%
	> 40 years	10	5%
Occupation	Student	133	66%
	Private Employee	47	23%
	Government Employee (PNS)	3	2%
	Entrepreneur	10	5%
	Others	7	4%
Duration of Application Usage	> 1 year	93	47%
	6–12 months	48	19%
	1–6 months	38	24%
	< 1 month	21	10%

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Characteristic	Category	Frequency	Percentage (%)
Usage Frequency (in a month)	< 5 times	121	60%
	5–10 times	56	28%
	> 10 times	23	12%

3.2 Measurement Model Results (Outer Model)

The evaluation of the measurement model considered convergent validity, discriminant validity, and construct reliability. Convergent validity was demonstrated as all item loadings exceeded 0.70, and the AVE values were above the 0.50 threshold. Reliability was also confirmed, with both Cronbach's Alpha and Composite Reliability (CR) values surpassing 0.70. As shown in Table 5, all constructs fulfilled the required measurement criteria.

Table 5. Measurement Model Summary: Validity and Reliability

Construct	No. of Items	Loading Range	AVE	Alpha	CR
TAM					
Perceived Usefulness	4	0.765–0.845	0.669	0.834	0.890
Perceived Ease of Use	3	0.893–0.903	0.808	0.882	0.927
Attitude Toward Using	3	0.798–0.841	0.669	0.753	0.859
Behavioral Intention	2	0.895–0.853	0.764	0.693	0.866
UTAUT					
Performance Expectancy	4	0.773–0.827	0.650	0.821	0.882
Effort Expectancy	4	0.708–0.875	0.687	0.845	0.895
Social Influence	2	0.569–0.941	0.604	0.408	0.764
Facilitating Conditions	3	0.731–0.828	0.630	0.706	0.821
Behavioral Intention	2	0.853–0.894	0.764	0.693	0.879

Note: *Most indicators met the recommended thresholds. Social Influence had a loading of 0.569 and Cronbach's Alpha of 0.408, while Behavioral Intention showed an Alpha of 0.693. Both constructs were retained due to acceptable AVE and CR values, as well as theoretical relevance (Hair et al., 2017).*

Discriminant validity was assessed using the Fornell-Larcker criterion, where the square roots of AVE for each construct were higher than their correlations with other constructs, indicating sufficient discriminant validity across all latent variables.

The path diagrams of the measurement model for both TAM and UTAUT are presented in Figure 4 and Figure 5, respectively, illustrating the relationships among latent variables and their observed indicators.

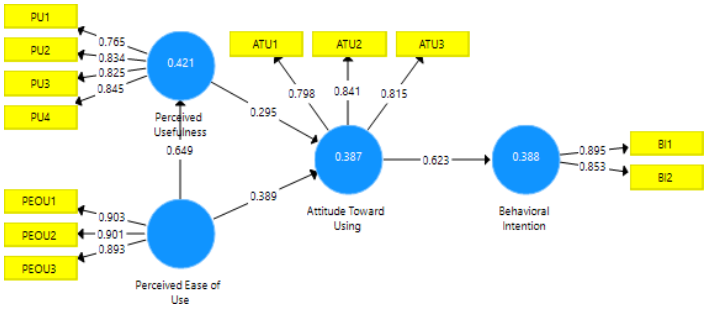

Figure 4. Path Diagram of the TAM Outer Model

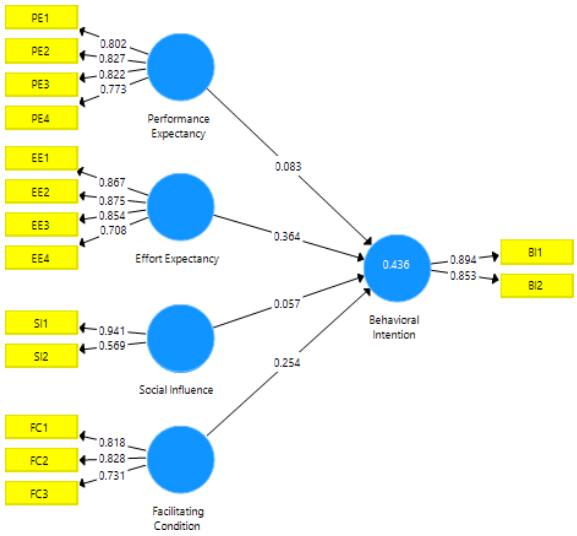

Figure 5. Path Diagram of the UTAUT Outer Model

3.3 Structural Model Results (Inner Model)

The structural model was assessed using R-square (R^2) and Q-square (Q^2) values. R^2 values indicate the explanatory power of the independent variables on the dependent constructs, while Q^2 values represent the predictive relevance of the model. As shown in Table 6, both TAM and UTAUT models demonstrated moderate explanatory power, with Q^2 values exceeding 0, confirming acceptable predictive relevance.

Table 6. R-Square and Q-Square Results

Model	Dependent Variable	R^2	Q^2	Interpretation
TAM	Perceived Usefulness (PU)	0.387	0.246	Moderate explanatory power
	Attitude Toward Using (ATU	0.388	0.288	Moderate explanatory power
	Behavioral Intention (BI)	0.421	0.274	Moderate explanatory power
UTAUT	Behavioral Intention (BI)	0.436	0.311	Moderate explanatory power

Note: *R^2 interpretation based on Hair et al. (2017): 0.25 = weak, 0.50 = moderate, 0.75 = substantial. $Q^2 > 0$ indicates predictive relevance (Hair et al., 2014).*

Figures 6 and 7 display the structural models for TAM and UTAUT, respectively, showing the hypothesized relationships among constructs and their significance.

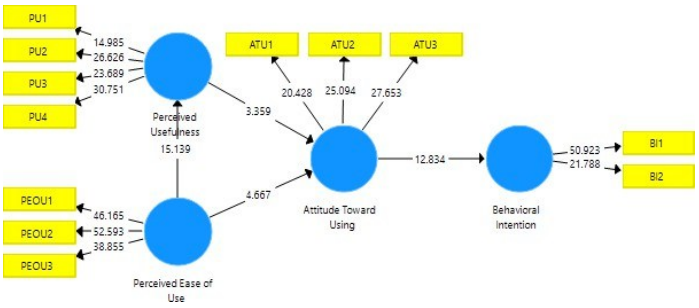

Figure 6. Path Diagram of the TAM Inner Model

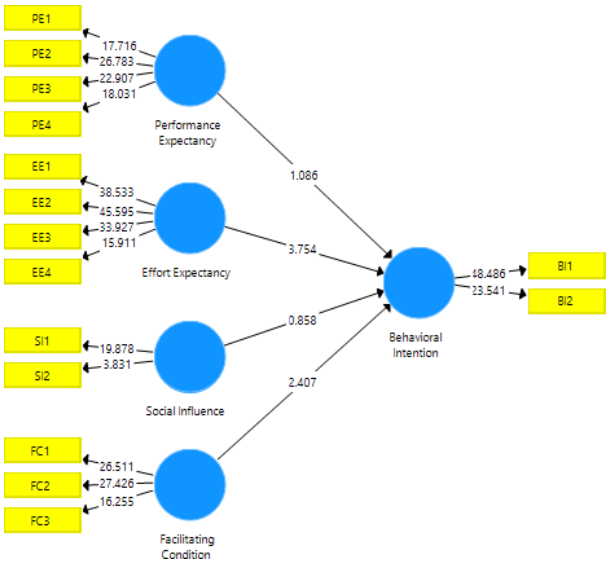

Figure 7. Path Diagram of the UTAUT Inner Model

3.4 Hypothesis Testing

The significance of the relationships between constructs was evaluated through bootstrapping, using the path coefficient, t-statistic, and p-value. Within the TAM framework, all proposed hypotheses were supported. Perceived ease of use significantly influenced both perceived usefulness (H1) and attitude toward using (H2), while perceived usefulness also had a significant impact on attitude (H3). Additionally, attitude toward using was found to have a significant effect on behavioral intention (H4), suggesting that user perceptions and attitudes play a key role in shaping their intention to use the KAI Access application.

In contrast, the UTAUT model showed mixed results. Effort expectancy (H2) and facilitating conditions (H4) were found to significantly influence behavioral intention, indicating that ease of use and available support are critical factors. However, performance expectancy (H1) and social influence (H3) did not show a statistically significant effect on behavioral intention. This suggests that expectations of performance outcomes and social encouragement may not be strong predictors of use intention in the context of KAI Access.

A detailed summary of these findings is presented in Table 7 below.

Table 7. Summary of Hypothesis Testing Results

Hypothesis	Path	Coefficient	T-Statistics	P-Value	Result
		TAM			
H1	PEOU → PU	0.649	15.139	0.000	Accepted
H2	PU → ATU	0.295	3.359	0.001	Accepted
H3	PEOU → ATU	0.389	4.667	0.000	Accepted
H4	ATU → BI	0.623	12.834	0.000	Accepted
		UTAUT			
H1	PE → BI	0.083	1.086	0.278	Rejected
H2	EE → BI	0.364	3.754	0.000	Accepted
H3	SI → BI	0.057	0.858	0.391	Rejected
H4	FC → BI	0.254	2.407	0.016	Accepted

3.5 Discussion

The results indicate that the TAM model provides a stronger explanation for user acceptance of the KAI Access application. All TAM variables had a significant impact on behavioral intention, indicating that ease of use, perceived usefulness, and positive attitudes are essential in influencing users' willingness to adopt the KAI Access application. Users perceive the application as functional and easy to operate, which fosters favorable attitudes toward its continued use.

In contrast, the UTAUT model yielded mixed results. Only effort expectancy and facilitating conditions showed significant influence, suggesting that ease of effort and availability of resources play a role in acceptance. However, performance expectancy and social influence showed no meaningful effect on behavioral intention. This may indicate that users perceive the app as meeting only basic expectations and are less influenced by peer or social opinion.

These findings suggest that the TAM model is more effective in this context for understanding the behavior of KAI Access users. The simplicity and directness of TAM constructs appear to align better with how users evaluate and engage with the application in everyday use.

CONCLUSION

Based on the results, this study concludes that TAM offers a more effective explanation of user acceptance toward the KAI Access mobile application compared to UTAUT. The findings successfully address the research questions, showing that the key variables in TAM, such as perceived ease of use, perceived usefulness, and attitude toward using, have a significant influence on users' behavioral intention.

Theoretically, this research contributes to the body of knowledge in technology acceptance by affirming the continued relevance and robustness of the TAM model in the context of public

service applications. The consistent significance across all TAM variables reinforces its utility in capturing user behaviour in mobile app environments.

In contrast, the UTAUT model revealed partial explanatory power, suggesting that its applicability may depend on context-specific factors. Future research may explore modifying or extending the UTAUT framework with external variables to enhance its predictive capability.

These results also open opportunities for further investigation into other influencing factors such as trust, user satisfaction, or perceived risk. Applying this comparative framework in different regions or platforms could offer more generalizable insights into user acceptance of digital services.

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