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Investigation of the Students Behavior in Using Ride-Hailing Applications: Perspectives of Perceived Risk and Environmental Awareness in Technology Acceptance Model (TAM)

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ABSTRACT:

This study aims to provide an analysis of the influence of personal innovativeness on perceived ease of use and perceived risk, the influence of perceived ease of use and perceived risk on behavioral intention, and the influence of environmental awareness on behavioral intention. This study uses the Technology Acceptance Model (TAM) and was conducted on students in the Office Administration Education program from the 2021-2024 cohort, with a sample size of 274 students. Data analysis techniques employed Structural Equation Modeling (SEM)-Generalized Structured Component Analysis (GSCA) using the GSCA-pro software version 1.2.1.0. The results of this study indicate that personal innovativeness has a significant positive influence on perceived ease of use and perceived risk, perceived ease of use has a significant positive influence on behavioral intention, but perceived risk does not have a significant positive influence on behavioral intention, and environmental awareness has a significant positive influence on behavioral intention. This study contributes to the development of ride-hailing applications, particularly Gojek, in evaluating the determinants of behavior that influence user intent, as well as providing relevant supplementary learning material, particularly in related courses such as management information systems, organizational behavior, and office technology.

INTRODUCTION

The rapid development of information and communication technology has driven significant transformations across various sectors, including transportation. One of the most prominent innovations is app-based ride-hailing services, which enable users to book transportation quickly, flexibly, and efficiently through mobile devices. These services have not only reshaped mobility patterns but have also influenced consumer behavior and the dynamics of the transportation market (Rafique et al., 2018; Oktaria et al., 2024). In Indonesia, ride-hailing platforms such as Gojek offer integrated services ranging from transportation and goods delivery to digital payment systems, making them an essential part of daily activities in urban communities, particularly among university students.

University students represent a user group that is relatively adaptive to technology and characterized by high mobility. Their need for efficient, accessible, and affordable transportation has led to the widespread use of ride-hailing applications as an alternative mode of transport. However, despite the relatively high adoption rate, variations in usage intention and behavior remain evident among students. This suggests that technology acceptance is influenced not only by functional benefits but also by users' psychological and perceptual factors.

To explain technology adoption behavior, the Technology Acceptance Model (TAM) was developed by Davis (1989) and has been widely applied in various technological contexts. The model emphasizes that perceived ease of use plays a crucial role in shaping users' behavioral intention toward adopting a technology. In the context of ride-hailing applications, ease of use is a key factor that encourages users to adopt and continuously use these services (Davis, 1989; Irawati et al., 2020).

Nevertheless, the classical TAM framework has been considered insufficient to fully capture the complexity of user behavior in modern digital services. One important factor that needs to be considered is perceived risk, which refers to users' perceptions of potential negative consequences arising from technology use, such as security, privacy, and financial risks (Lee, 2013). In the ride-hailing context, perceived risk may influence users' attitudes and intentions toward using the application, even when the technology offers high levels of convenience and usefulness (Weina & Yanling, 2022).

In addition to perceived risk, growing attention to sustainability issues has made environmental awareness an increasingly relevant factor in transportation-related behavior. Environmental awareness reflects the extent to which individuals understand and consider the

environmental impacts of their activities (Gunasinghe et al., 2018; Sanjaya et al., 2023). Previous studies indicate that individuals with higher levels of environmental awareness tend to be more receptive to technologies and services perceived as environmentally friendly, including app-based transportation services (Mitra et al., 2019).

Beyond external factors, individual characteristics also play a significant role in technology adoption. Personal innovativeness describes an individual's tendency to try and accept new technologies. Individuals with higher levels of personal innovativeness are generally more open to new technologies, perceive them as easier to use, and are more tolerant of potential risks (Paganin & Simbula, 2021). Among university students, personal innovativeness is an important factor that may influence both perceived ease of use and perceived risk related to ride-hailing applications.

Previous studies on ride-hailing adoption have reported mixed results. Several studies have found that perceived ease of use and personal innovativeness positively influence behavioral intention, while perceived risk shows a negative or insignificant effect depending on the research context (Wang et al., 2020; Goel & Haldar, 2020). Moreover, empirical studies integrating environmental awareness into the Technology Acceptance Model (TAM) within the context of ride-hailing services in Indonesia remain limited, indicating the presence of a conceptual and empirical research gap.

Based on this background, this study aims to investigate university students behavior toward ride-hailing applications by extending the Technology Acceptance Model (TAM) through the inclusion of personal innovativeness, perceived risk, and environmental awareness. The study was conducted among students of the Office Administration Education Program at State University of Surabaya using a Structural Equation Modeling–Generalized Structured Component Analysis (SEM-GSCA) approach. The findings are expected to contribute theoretically to the development of technology acceptance models and practically to provide insights for ride-hailing service providers in designing services that align with the needs and characteristics of young users.

METHOD

This research is an explanatory type, with a focus on hypothesis testing and analyzing the relationship between variables to gain an in-depth understanding of the causal factors and reasons for the occurrence of a phenomenon (Boru, 2018). Explanatory research is research that explains the causal relationship between variables by testing hypotheses (Ngatno, 2019).

Quantitative data is obtained from the results of filling out questionnaires distributed using google form. This study applies a 5-level Likert scale as a measurement instrument, which serves to assess respondents' perceptions, opinions, and attitudes towards social phenomena through a range of values from low to high (Sugiyono, 2019). This research was conducted at the Office Administration Education Study Program, Faculty of Economics and Business, Surabaya State University. The population in this study were students of the Office Administration Education Study Program batch 2021-2024, Surabaya State University through purposive sampling technique, taking into account certain criteria to match the objectives and characteristics of the population under study (Sugiyono, 2019). From a total population of 943 students, based on the Krejcie & Morgan (1970) table with a significance level of 0.5%, it was determined that the number of samples used in this study was 274 samples.

The independent variables in this study are Personal Innovativeness and Environmental Awareness. The dependent variables are Perceived Ease of Use, Perceived Risk and Behavioural Intention. The Generalized Structured Component Analysis (GSCA) method is used by researchers to analyze data using Structural Equation Modeling (SEM). According to Ngatno (2019), Generalized Structured Component Analysis (GSCA) is a technique that can produce an overall goodness of fit measure without requiring the assumption of multivariate normal distribution. The questionnaire instrument in this study was tested through validity and reliability tests, which were analyzed using the JASP (Jeffreys's Amazing Statistics Program) application. The reliability test used Cronbach's alpha, while the validity test used person product moment. The questionnaire will be given to the selected sample if the results are valid and reliable. After data collection, the following provisions are the SEM-GSCA test stages using the GSCA Pro application version 1.2.1.0 (Hwang et al., 2021). The research design can be seen in Figure 1.

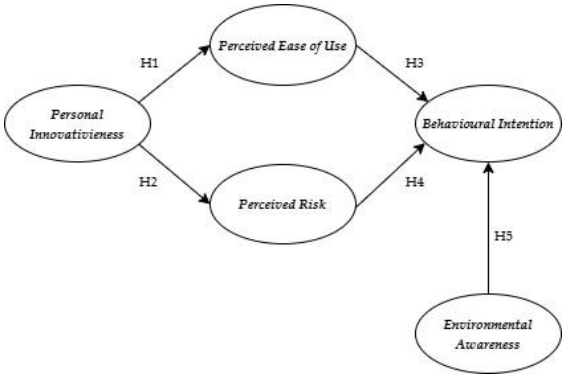

Figure 1. Research Design

RESULTS

Respondents filled out a questionnaire distributed via Google form based on the sample size determined by the Krejcie table with a significance level of 5%. Based on the results of descriptive analysis, all respondents (100%) are Gojek application users. The composition of respondents based on gender consists of 16% male (44 people) and 84% female (230 people). Based on class year, 40 respondents (16%) came from the class of 2021, 39 respondents (14%) from the class of 2022, 139 respondents (51%) from the class of 2023, and 56 respondents (20%) from the class of 2024. In terms of age, 12 students (4%) were < 18 years old, 260 students (95%) were 19-23 years old, and 2 students (1%) were > 23 years old. 47% of respondents (130) have experience 1-5 times a year using the Gojek application, 53% of respondents (144) have experience > 5 times a year using the Gojek application. The number of respondents based on the batch of Office Administration Education study program can be seen in Table 1.

Table 1. Characteristics of Respondents

Information	Respondent	Total	%
Gender	Male	44	16
	Female	230	84
Total		**274**	**100**
Batch	2021	40	15
	2022	39	14
	2023	139	51
	2024	56	20
Total		**274**	**100**
Age	< 18 years old	12	4
	19-23 years	260	95
	> 23 years	2	1
Total		**274**	**100**
Usage of Gojek Application	1-5 times	130	47
	> 5 times	144	53
Total		**274**	**100**

Table 2 presents the Indicators of Loading on Components values in this study. Referring to the opinion of Hair et al. (2019), an indicator is declared qualified if the loading value is ≥ 0.7. However, a different view is conveyed by Chin (1998) which states that a loading value of 0.5 to 0.6 is still acceptable. Based on the research results, all indicators have a loading value ≥ 0.6, so it can be concluded that the model has met the eligibility criteria for these indicators. For the personal innovativeness variable, the indicator with the highest value is PI2 (0.875), while the lowest value is in indicator PI5 (0.747). In the perceived ease of use variable, the PEOU4 indicator shows the highest value of 0.863, and PEOU3 is the lowest with a value of 0.791. Meanwhile, in the perceived risk variable, the PR3 indicator has the highest value of 0.863, and

PR1 is the lowest with 0.751. The behavioral intention variable recorded the highest value in BI3 (0.805), while the indicator with the lowest value was BI4 (0.653). As for the environmental awareness variable, the EA4 indicator has the highest loading value of 0.876, and EA1 has the lowest value of 0.671.

Table 2. Indicators Of Loading Assessment

Indicators	Estimate	SE	95%CI(L)	95%CI(U)
PI				
PI1	**0.809**	0.026	0.755	0.849
PI2	**0.875**	0.017	0.836	0.902
PI3	**0.826**	0.023	0.782	0.871
PI4	**0.863**	0.021	0.818	0.908
PI5	**0.747**	0.034	0.689	0.81
PEOU				
PEOU1	**0.848**	0.021	0.808	0.882
PEOU2	**0.817**	0.024	0.771	0.86
PEOU3	**0.791**	0.036	0.729	0.851
PEOU4	**0.863**	0.021	0.82	0.903
PEOU5	**0.835**	0.025	0.79	0.882
PR				
PR1	**0.751**	0.034	0.681	0.81
PR2	**0.786**	0.033	0.718	0.838
PR3	**0.863**	0.019	0.821	0.892
PR4	**0.852**	0.019	0.804	0.88
BI				
BI1	**0.796**	0.021	0.762	0.836
BI2	**0.799**	0.024	0.734	0.84
BI3	**0.805**	0.026	0.755	0.849
BI4	**0.653**	0.047	0.542	0.728
BI5	**0.771**	0.026	0.72	0.813
EA				
EA1	**0.671**	0.038	0.595	0.733
EA2	**0.796**	0.025	0.752	0.845
EA3	**0.834**	0.029	0.77	0.882
EA4	**0.876**	0.018	0.839	0.907
EA5	**0.862**	0.015	0.824	0.889

According to Hair et al. (2019), to ensure convergent validity, internal consistency, and composite reliability, the PVE (Proportion of Variance Extracted) value should be at least 0.50 in measuring construct quality measures or indicator reliability. This is in line with the findings of Ali et al. (2021), which states that the good Alpha and Rho values are above 0.70, and the ideal dimensionality value is 1.0 as described by Meneau and Moorthy (2022). Based on table 3 shown, all PVE values for PI, PEOU, PR, BI, and EA variables are above the 0.50 threshold. In addition, the Alpha and Rho values for each of these variables also exceed 0.70. Thus, all variables in this model have met the criteria of convergent validity, internal consistency, and composite reliability.

Table 3. Construct Quality Measures

Construct Quality Measures					
	PI	**PEOU**	**PR**	**BI**	**EA**
PVE	0.681	0.691	0.663	0.588	0.658
Alpha	0.882	0.888	0.829	0.824	0.867
Rho	0.914	0.918	0.887	0.876	0.905
Dimensional	1.0	1.0	1.0	1.0	1.0

The diagonal values showing the square root of the AVE are all greater than the correlation between factors, as indicated by the *Fornell-Lacker criterion values* (Fornell & Larcker, 1981). To conclude that the measurement model has adequate psychometric features, this establishes discriminant validity in the study (Adu et al., 2020). All variables in table 4 below have an HTMT ratio ≤ 0.90, which indicates discriminant validity (Ali et al., 2021). According to Henseler et al., (2015), the absence of discriminant value is indicated by an HTMT value greater than 0.90 (see Table 5).

Table 4. Fornell-Larcker Criterion

	PI	**PEOU**	**PR**	**BI**	**EA**
PI	0.825				
PEOU	0.595	0.831			
PR	0.128	0.152	0.814		
BI	0.718	0.566	0.176	0.767	
EA	0.589	0.498	0.222	0.503	0.811

Table 5. HTMT Criterion

Variables	**Score**
PI ↔ PEOU	0.663
PI ↔ PR	0.145
PI ↔ BI	0.837
PI ↔ EA	0.679
PEOU ↔ PR	0.172
PEOU ↔ BI	0.651
PEOU ↔ EA	0.563
PR ↔ BI	0.202
PR ↔ EA	0.264
BI ↔ EA	0.589

In accordance with table 6, the value of the PEOU variable is 0.354 or 35.4%. This means that 35.4% of the PEOU variable is explained by the independent variables in this study, while the remaining 64.6% is influenced by other factors outside the model. For the PR variable, the recorded value is 0.016 or 1.6%, which indicates that only a small part, namely 1.6%, of the PR variation can be explained by the independent variables, while 98.4% is influenced by other external factors. Meanwhile, the BI variable has a value of 0.388 or 38.8%, indicating that the independent variables in this study contribute 38.8% to BI, and the remaining 61.2% is influenced by variables outside the model. In general, the model used has

met the validity and reliability criteria, so it is feasible to proceed to the structural model evaluation stage.

Table 6. R Square

PI	PEOU	PR	BI	EA
0.0	0.354	0.016	0.388	0.0

The FIT value is in the range of 0 to 1, which indicates the proportion of total variance of all variables in the model. The greater the FIT value, the more variance is successfully explained by the model (Hwang et al., 2021). Based on table 7, the FIT value is 0.569, which indicates that the model can explain 56.9% of the total variance. The AFIT value has a similar concept to FIT, but considers the complexity of the model structure. With an AFIT value of 0.565, this means that the model is able to explain 56.5% of the variance by taking into account its complexity. Furthermore, the FITs value, which is also in the 0-1 range, describes the total variance of all components in the structural model, and was recorded at 0.152, indicating that 15.2% of the variance in the model structure was successfully explained. The FITm value of 0.656 indicates that 65.6% of the variance in the measurement model has been covered by the model. According to Hwang et al. (2021), for a sample size of more than 100, the model is declared suitable if the GFI value is more than 0.93 and the SRMR is less than 0.08. Based on table 6, the GFI value is 0.984 and the SRMR is 0.052, which means that both values meet the criteria for model *fit*.

Table 7. Structural Model Fit Measure

FIT	AFIT	FITs	FITm	GFI	SRMR	OPE	OPEs	OPEm
0.569	0.565	0.152	0.656	0.984	0.052	0.438	0.858	0.351

The path coefficient value can be found in table 8. According to Hwang et al. (2021), the path coefficient is considered significant if it is within the 95% confidence interval and has a positive value, meaning that it does not include zero because the statistical estimate is declared significant at the 0.05 significance level if the confidence interval does not involve zero. The relationship between Personal Innovativeness (PI) and Perceived Ease of Use (PEOU) shows a path coefficient of 0.595 (lower CI = 0.526; upper CI = 0.657), so the first hypothesis is accepted, indicating a positive influence of PI on PEOU. Meanwhile, PI on Perceived Risk (PR) has a coefficient value of 0.128 (lower CI = 0.002; upper CI = 0.259), which also rejects the second hypothesis, indicating a positive influence of PI on PR. Furthermore, the effect of PEOU on Behavioral Intention (BI) produces a coefficient of 0.417 (lower CI = 0.302; upper CI = 0.519), so the third hypothesis is accepted because it shows a positive relationship. In contrast, the relationship between PR and BI shows a path coefficient of 0.049 (lower CI = -0.050; upper CI = 0.165). Since the interval includes zero, the fourth

hypothesis is accepted, which means that there is no significant positive effect of PR on BI. Finally, Environmental Awareness (EA) on BI obtained a coefficient of 0.285 (lower CI = 0.184; upper CI = 0.423), which indicates a positive and significant effect.

Table 8. Path Coefficient

Variables	Estimate	SE	95%CI(L)	95%CI(U)	Kesimpulan
PI→PEOU	0.595	0.035	0.526	0.657	Accepted H1
PI→PR	0.128	0.070	0.002	0.259	Rejected H2
PEOU→BI	0.417	0.053	0.302	0.519	Accepted H3
PR→BI	0.049	0.050	-0.050	0.165	Accepted H4
EA→BI	0.285	0.059	0.184	0.423	Accepted H5

DISCUSSIONS

The effect of personal innovativeness on perceived ease of use

This study shows that the higher the level of courage and desire of students to try new technology, the greater the perceived ease of using the Gojek application. Personal innovativeness is an important factor in influencing user attitudes towards the ease of use of technology-based systems. Personally innovative individuals tend to have a high curiosity about technology, which in turn reduces the perceived barriers to the complexity of using the application. Therefore, it is important for application developers such as Gojek to consider the innovative aspects of its user segment in the technology adoption and deployment strategy. The results of this study are reinforced by previous research from Al-Maroof et al., (2021), which shows that personal innovativeness has a positive and significant impact on perceived ease of use. Similar results were also obtained in the research of Alfaisal et al., (2024), which concluded that the level of personal innovativeness significantly affects perceived ease of use. In addition, research conducted by JS et al. (2022) and Wang et al. (2020) also provides evidence that there is a positive and significant relationship between personal innovativeness and perceived ease of use.

The effect of personal innovativeness on perceived risk

This study shows that personally innovative students tend to be more confident and open in using the technological features offered by Gojek. Students are not easily worried about potential risks such as booking system errors, travel safety with drivers, digital transactions through GoPay, or personal data protection, because students have confidence that technology is reliable and continues to develop to answer these challenges. The results of this study do not support the research of Wang et al, (2020), Lin et al, (2021), and Vo & Wu, (2022) which are used in hypothesis development which state that personal innovativeness has no significant

effect on perceived risk. Based on the results of the hypothesis analysis in this study, it can be concluded that the innovative level of students does not directly affect users' perceptions of the risks that may arise when using the Gojek application. However, the results of this study are more inclined with research conducted by Duan & Deng, (2022), which found a significant influence between personal innovativeness and perceived risk. Research from Triwijayati et al., (2020) supports similar findings, which state that personal innovativeness contributes significantly to risk perception.

The effect of perceived ease of use on behavioral intention

This study supports the Technology Acceptance Model (TAM) framework, which states that a person's perception of the ease of use of a technology is one of the main determinants in the formation of behavioral intention. When students feel that the ride-hailing application (Gojek) is easy to access, easy to learn, and efficient to use, then students will be more likely to maintain its use as a daily transportation solution. Hypothesis testing in this study shows that perceived ease of use has a significant influence on students' intention to use the Gojek ride-hailing application. In other words, the easier the Gojek application is to understand and use, the greater the tendency of students to continue using it in the future. These results are in line with the results of research conducted by Goel & Haldar, (2020), which state that perceptions of ease of use have a positive impact on behavioral intentions. Similar research was also conducted by Na et al., (2023), Wahyuni et al., (2021), and Wang et al., (2020), all of which concluded that perceived ease of use affects behavioral intention.

The effect of perceived risk on behavioral intention

Although students may have certain concerns regarding the risks of using services such as travel safety, personal data protection, or potential system errors, it does not significantly affect students' intention to continue using the Gojek application. This research shows that most students who use Gojek are quite familiar and trust the services offered. Gojek as an established ride-hailing platform in Indonesia has built a reputation and system that is considered reliable, ranging from real-time driver tracking features, driver ratings and reviews, secure digital payment methods (GoPay), to responsive customer service. The results of this study support research conducted by Lee & Song, (2013) which states that perceived risk has an influence on behavioral intention. Similar results were also shown by Wang et al., (2020), which found that perceptions of risk do not contribute to behavioral intention. Support for this finding also comes

from research by X. Wang et al., (2022) and Zaigham et al., (2022), both of which show that perceived risk has no significant effect on behavioral intention.

The effect of environmental awareness on behavioral intention

This research shows that students who care about environmental impacts are more likely to consider sustainability aspects in choosing transportation services and there is an alignment between students' personal values and environmentally friendly features or policies implemented by Gojek. Some aspects of the Gojek application that are relevant to environmental issues include the GoRide and GoCar Hemat features**,** which encourage fuel efficiency through a ride-sharing system. In addition, Gojek has also run various environmentally friendly campaigns, such as the use of electric vehicles (GoBluebird EV), promotion of the use of digital payments (GoPay) to reduce paper waste from cash and receipts, and active participation in the GoGreener program, which invites users to support a sustainable lifestyle and become a positive consideration for students who have a high level of environmental awareness. The results of the analysis in this study show that environmental awareness has a significant influence on behavioral intention. This means that the higher the student's awareness of environmental issues, the greater the student's intention to use the Gojek ride-hailing application as an alternative transportation. This is in line with research conducted by García-Salirrosas et al., (2023) which explains environmental awareness has a significant positive effect on behavioral intention. Other research conducted by (Duan et al., 2023; Liu & Zhang, 2024; Wang et al., 2020) states that there is a significant influence between environmental awareness on behavioral intention.

CONCLUSION

Based on the results and discussion, it can be concluded that personal innovativeness has a significant positive effect on perceived ease of use and perceived risk, perceived ease of use has a significant positive effect on behavioral intention, but perceived risk does not have a significant positive effect on behavioral intention, environmental awareness has a significant positive effect on behavioral intention. This is because the presence of Gojek as a ride-hailing service is not only an innovation in the transportation sector, but also part of the digital transformation of the platform-based economy (platform economy). This innovation combines advances in information technology, artificial intelligence, and GPS navigation systems in providing a fast, safe, and affordable transportation experience. Ride-hailing

services such as Gojek contribute to the achievement of Sustainable Development Goals (SDGs), such as SDGs 11 (Sustainable Cities and Communities) by providing inclusive, safe, and sustainable transportation, SDGs 8 (Decent Work and Economic Growth) by creating employment opportunities for driver-partners, and SDGs 13 (Climate Action) through environmentally friendly initiatives such as the use of electric vehicles and ride-sharing features that reduce carbon emissions. The sample scope only involves students from one study program with theoretical courses. This condition can limit the diversity of respondents' perceptions and experiences of using ride-hailing applications such as Gojek. For future research, it is recommended that other models such as the Unified Theory of Acceptance and Use of Technology (UTAUT), Theory of Planned Behavior (TPB), or Innovation Diffusion Theory (IDT) be used and can be expanded by adding other variables such as trust, user satisfaction, or social influence.

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