Stakeholder Acceptance Analysis of Smart Parking System at University of Mataram Using TAM

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Abstract. The rapid advancement in science and technology has transformed modern life, introducing smart devices and systems to enhance convenience. To ensure parking security, research has been conducted on smart parking systems that can determine whether a person is using their own vehicle or not, using camera sensors processed with AI. However, the implementation of new technology may not be immediately accepted by users. Therefore, it is essential to conduct an analysis of whether this new technology will be accepted by potential users. In this research, the Technology Acceptance Model (TAM) is used to analyze the intentions of potential users to use the system in the future. This study also observes the factors influencing the acceptance of the smart parking technology. Additionally, a new variable, Enjoyment, is introduced, which is predicted to influence the variables of Usefulness and Ease of Use. The research results indicate that variable Perceived of Enjoyment is the dominant factor influencing the acceptance of potential users. This research is crucial for making future policy decisions related to parking at University of Mataram.

Keywords: Technology Acceptance Model (TAM), Smart Parking System, User Acceptance, AI Processing, Enjoyment Variable.

1 Introduction

The rapid advancements in science and technology have transformed modern life with the creation of smart devices, automation, and intelligent systems, making daily routines more convenient. However, the rapid increase in vehicle numbers in Indonesia has led to a demand for effective parking management systems[1]. Additionally, rising motorcycle theft cases, often due to inadequate security measures and negligence of vehicle owners, have raised concerns in cities like Mataram. To address these challenges, smart parking systems, utilizing technology and sensors, are being developed to reduce congestion and optimize resource utilization. The Technology Acceptance

Model (TAM) plays a role in predicting technology adoption by assessing the variables of Perceived Ease of Use and Perceived Usefulness toward Perceived Enjoyment This research chose the TAM Model because of its meaningfulness, completeness, and efficiency in predicting and analyzing the acceptance and use of technology in various situations [2].

2 Study Literacy

Table 1. Related Works.

No	Journal	Related Works
1	Factors Influencing Online Shopping Intentions: The Mediating Role of Perceived Enjoyment	This study integrates the Technology Acceptance Model (TAM) with an emphasis on enjoyment value in measuring customers' online shopping intentions [3].
2	User Acceptance Analysis using Methods Technology Acceptance Model (TAM)	This research focuses on using the Technology Acceptance Model (TAM) to analyze the factors that influence user acceptance of ShopeePay based on their perceptions of the system's ease of use and usability[4].
3	Continuance Intention to Use Facebook: A Study of Perceived Enjoyment and TAM	This research highlights that Perceived Enjoyment has a major influence on Facebook users' Attitudes and influences their continued intention to use the platform[5]
4	Measuring the Impact of Ease of Use, Usefulness, Attitude, and Enjoyment toward Intention to Play PUBG Mobile	This research revealed that the Technology Acceptance Model (TAM) was used effectively to analyze PUBG Mobile playing intentions, emphasizing ease of use, usefulness, attitudes, and enjoyment [6] .
5	Difference between Leisure and Work Contexts: The Roles of Perceived Enjoyment and Perceived Usefulness in Predicting Mobile Video Calling Use Acceptance	This research uses TAM to assess video calling technology acceptance in leisure and work, emphasizing Perceived Usefulness and enjoyment's impact, with implications for technology promotion [7].

The research explored the integration of TAM with various applications, such as online shopping, digital payment, social media, and mobile gaming, to understand user acceptance and the role of enjoyment in technology adoption and usage.

3 Methodology

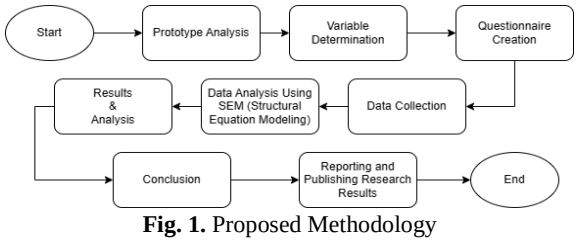

Fig. 1. Proposed Methodology

Based on Fig. 1. The methodology starts with prototype analysis, variable determination, questionnaire creation, data collection, data analysis using SEM (Structural Equation Modeling), reults and analysis, conclusion, reporting and publishing research results.

3.1 Prototype Analysis

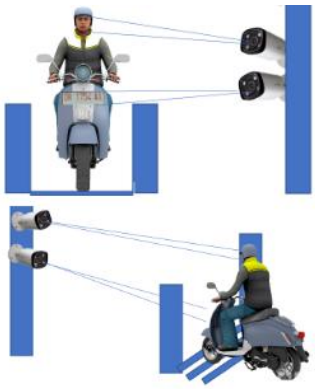

Fig. 2. Prototype Analysis

Based on Fig. 2. The Motorcycle Parking Security System based on Artificial Intelligence (AI) is a modern solution to optimize the management and security of motorbike parking at the University of Mataram. The aim is to improve efficiency, security and user experience on campus. Users only need to pass by and open their helmet visor, and the system will identify them by synchronizing their faces and number plates according to the data inputted by the user on system.

3.2 Variable Determination

In this research, five variables have been determined that will be used to test the rela tionship between factors that influence the adoption of Smart Parking System technol ogy. These five variables include Perception of Use, Ease of Use, Attitude towards Use, Behavioral Intention to Use, and Perceived Enjoyment of using Smart Parking System technology. The variables used in this research are user perceptions, attitudes and ease of use used by with the research title "Continuance Intention to Use Facebook: A Study of Perceived Enjoyment and TAM" [5]. Meanwhile, intentions and Perceived Enjoyment of behavior are found in research by entitled "Differences between Leisure Time and Work Context: The Role of Perceived Enjoyment and Perceived Usefulness in Predicting Acceptance of Using Mobile Video Calls"[7]. In the study, researchers observed users' enjoyment of how video calls were useful to users and how video calls helped communicate.

Meanwhile, behavioral intentions are observed by how respondents intend to use video calls in the future. These variables will be analyzed in depth to understand how each variable influences respondents' intention to use Smart Parking System

technology. This research will also explain the relationship between these variables to provide deeper insight into the factors that influence the adoption of Smart Parking System technology in society.

3.3 Questionnaire Creation

This research uses a questionnaire consisting of two parts: the first part is about the respondent's profile, while the second part assesses their acceptance of the Smart Parking System. The level of satisfaction was measured using a 5-point Likert scale, ranging from 5 (strongly agree) to 1 (strongly disagree). These scales are commonly used in research and surveys, providing ordinal data suitable for statistical analysis of respondents' preferences, opinions and satisfaction. The list of questions related to the user profile of this research consists of 4 questions. The list of questions related to user acceptance used in this research consists of 25 questions. The list of questions can be accessed via the following link: https://bit.ly/3PT5lbz.

3.4 Data Collection

The data used in this research are the results of a questionnaire. Data collection was carried out at the Faculty of Engineering, University of Mataram in October 2023 using online Google Form. The data taken is the level of satisfaction of Smart Parking System users. Data collection was carried out on 108 respondents. From this data collection, we succeeded in getting 108 answers to the questionnaire. Data can be accessed via the following link: https://bit.ly/46DyNJ8.

3.5 Data Analysis Using SEM (Structural Equation Modeling)

SEM is a versatile statistical analysis approach, combining various aspects of research such as instrument validity, testing relationships between variables, and developing predictive models. PLS-SEM is useful for research that focuses more on theoretical exploration, and SmartPLS 3 is a tool used to carry out data analysis and hypothesis testing in SEM.

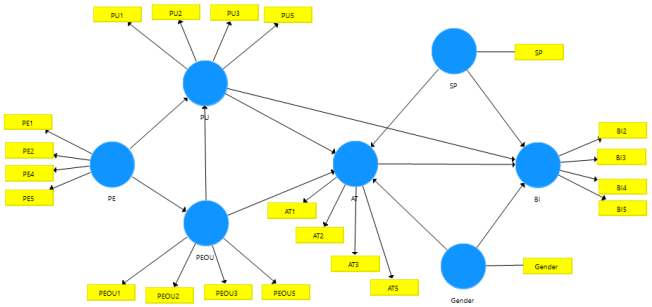

Fig. 3. Path Diagram

In Fig. 3. there is a path diagram, where some indicators have been removed to facilitate analysis and improve the quality of the structural model.

4 Results and Analysis

4.1 Common Method Bias (CMB)

In this research, the factors that influence the acceptance of smart parking systems at University of Mataram are evaluated using various variables. Usually Multicollinearity Collinearity (CMB) measurements are carried out with the Variance Inflation Factor (VIF). The VIF test results show that most of the variables in the model have a VIF below the 3.3 limit accepted in regression analysis, indicating that there is no significant multicollinearity problem between the variables. The Gender and Study Program (SP) variables have a VIF of 1,000, indicating the absence of multicollinearity problems with other variables. Some variables have slightly higher VIFs, such as BI2, BI4, BI5, PE1, PE2, and PE5, but are still within acceptable limits. Results can be seen via the following link: https://bit.ly/3ZVLIUN.

4.2 Reliability and Validity

In the reliability test, all indicators show good quality with Cronbach's alpha val-ues above 0.7, Composite Reliability (CR) above 0.5, and Average Variance Ex-tracted (AVE) above 0.7. In fact, the minimum Cronbach's alpha value of 0.720, minimum CR of 0.824, and minimum AVE of 0.544 have been achieved. This indicates that the construct validity in this research is very strong, providing con-fidence that the measuring instruments used are credible and reliable for further analysis.

On the other hand, in the Discriminant Validity test with Cross Loading, the main focus is to ensure that the correlation between similar indicators is higher than the correlation between different indicators. The test results show that the cross loading indicator value for each variable has the highest correlation with constructs from other blocks, which contains the principle of construct validity. In other words, these indicators effectively measure the different constructs in this research, and the measuring instruments used can be considered valid and reliable for further analysis. Fornell-Larcker analysis shows that the square root of the Average Variance Extracted (AVE) for each variable in the Final Test is greater than the correlation between other variables. This strengthens the discriminant validity of the model in the Final Test. This suggests that discrimination has a sufficient degree of validity. Results can be seen via the following link: https://bit.ly/3ZVLIUN.

4.3 Structural Model

By looking at Table 2, the results of the path coefficient test provide different insights from this research. The findings show that stakeholders at this university have very positive attitudes towards the use of smart parking systems. This can be seen from the magnitude of T-Stats = 11,316 (***) Attitude Toward Use (AT) to Behavioral Intention to Use (BI). Gender and Study Program (SP) are proven to have no effect on a person's attitudes or intentions in using this new technology, this confirms that the application

of this system applies to all gender groups and study programs. The new variable Perceived of Enjoyment (PE) is proven to have a strong influence on both PEOU with T-Stat = 10.738(***) and also PU with T-Stat = 3.103(**), showing the important role of Perceived Enjoyment (PE) in form perceptions of usefulness (PU) and ease of use (PEOU). These results provide insight into how PE contributes to stakeholders' positive attitudes toward the system.

Table 2. Path Coefficients

Hypothesis	(β)	STDEV	T-Stats	P Values
AT -> BI	0.690	0.061	11.316	0.000
Gender -> AT	0.000	0.078	0.003	0.499
Gender -> BI	-0.039	0.058	0.681	0.248
PE -> PEOU	0.681	0.063	10.738	0.000
PE -> PU	0.393	0.127	3.103	0.001
PEOU -> AT	0.505	0.095	5.326	0.000
PEOU -> PU	0.235	0.137	1.708	0.044
PU -> AT	0.222	0.096	2.321	0.010
PU -> BI	0.172	0.073	2.347	0.010
SP -> AT	0.053	0.088	0.606	0.272
SP -> BI	0.010	0.058	0.171	0.432

Based on the results of the indirect effect tests in Table 3, the new variable, Perceived Enjoyment (PE), is found to significantly influence Attitude Toward Using (AT) indirectly through the Perceived Ease of Use (PEOU) and also indirectly affect Behavioral Intention to Use (BI) through Perceived Ease of Use (PEOU) and Attitude Toward Using (AT) with a T-Stat of 3.794(***). However, Perceived Enjoyment (PE) is shown to have no direct effect on Attitude Toward Using (AT) or Behavioral Intention to Use (BI) through Perceived Usefulness (PU).

These two conditions indicate that the Perceived Enjoyment (PE) variable has a strong influence on changing individuals' attitudes and intentions to adopt the smart parking system because it is perceived as easy to use. While in Table 2, it is evident that Perceived Usefulness (PU) has an impact on both Attitude Toward Using (AT) and Behavioral Intention to Use (BI), the influence of Perceived Enjoyment (PE) through Perceived Usefulness (PU) on Attitude Toward Using (AT) is not as significant with a T-Stat of 1.510(*). Similarly, its impact on the Behavioral Intention to Use (BI) through Perceived Usefulness (PU) has a T-Stat of 1.469(*).

In conclusion, the Enjoyment Principle has a more dominant influence on Behavioral Intention to Use (BI) and Attitude Toward Using (AT) through the Perceived Ease of Use (PEOU) compared to the Perceived Usefulness (PU) variable. These results provide in-depth insights into the factors influencing the acceptance of the smart parking system and provide a strong foundation for designing more effective strategies to enhance technology adoption in the university environment.

Table 3. Indirect Effects

Hypothesis	(β)	STDEV	T-Stats	P Values
PE -> PEOU -> AT	0.344	0.080	4.271	0.000
PE -> PU -> AT	0.087	0.058	1.510	0.066
PEOU -> PU -> AT	0.052	0.037	1.409	0.080
PE -> PEOU -> PU -> AT	0.036	0.026	1.389	0.083
Gender -> AT -> BI	0.000	0.052	0.004	0.499
PEOU -> AT -> BI	0.349	0.073	4.794	0.000
PE -> PEOU -> AT -> BI	0.237	0.063	3.794	0.000
PE -> PU -> AT -> BI	0.060	0.041	1.469	0.071
PU -> AT -> BI	0.154	0.070	2.187	0.015
PEOU -> PU -> AT -> BI	0.036	0.026	1.409	0.080
PE -> PEOU -> PU -> AT -> BI	0.025	0.018	1.379	0.084
SP -> AT -> BI	0.037	0.062	0.595	0.276
PE -> PU -> BI	0.068	0.042	1.599	0.055
PEOU -> PU -> BI	0.040	0.032	1.245	0.107
PE -> PEOU -> PU -> BI	0.027	0.023	1.179	0.120
PE -> PEOU -> PU	0.160	0.095	1.674	0.047

5 Conclusion

In conclusion, this research highlights the significant role of Perceived Enjoyment (PE) in shaping the Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) of the smart parking system. The notably strong Attitude Toward Using (AT) toward Behavioral Intention to Use (BI) reflects the strong acceptance of this technology by stakeholders. Gender and study program do not exert direct significant influence, emphasizing the system's relevance across user groups. Indirect effects, primarily through Perceived Enjoyment (PE), underscore the importance of a positive user experience. Thus, focusing on enhancing Perceived Enjoyment (PE) emerges as a key strategy to fortify positive attitudes and intentions toward the adoption of the smart parking system at the University of Mataram.

References

[1] A. Fahim, M. Hasan, and M. A. Chowdhury, "Smart parking systems: comprehensive review based on various aspects," *Heliyon*, vol. 7, no. 5. Elsevier Ltd, May 01, 2021. doi: 10.1016/j.heliyon.2021.e07050.

[2] H. A. Alfadda and H. S. Mahdi, "Measuring Students' Use of Zoom Application in Language Course Based on the Technology Acceptance Model (TAM)," *J Psycholinguist Res*, vol. 50, no. 4, pp. 883–900, Aug. 2021, doi: 10.1007/s10936-020-09752-1.

[3] A. A.-T. Hasan, S. M. Sumon, Md. T. Islam, and M. S. Hossain, "Factors influencing online shopping intentions: The mediating role of perceived enjoyment," *Turkish Journal of Marketing*, vol. 6, no. 3, pp. 239–253, Dec. 2021, doi: 10.30685/tujom.v6i3.132.

[4] T. J. QOMARIAH, "User Acceptance Analysis using Methods Technology Acceptance Model (TAM)".

[5] P. K, "Continuance Intention to Use Facebook: A Study of Perceived Enjoyment and TAM," *Bonfring International Journal of Industrial Engineering and Management Science*, vol. 4, no. 1, pp. 24–29, Feb. 2014, doi: 10.9756/bijiems.4794.

[6] B. D. L. Dewi, "Measuring the Impact of Ease of Use, Usefulness, Attitude, and Enjoyment toward Intention to Play PUBG Mobile," *Journal of Business, Management, and Social Studies*, vol. 2, no. 4, pp. 204–217, Sep. 2023, doi: 10.53748/jbms.v2i4.61.

[7] R. Zhou and C. Feng, "Difference between leisure and work contexts: The roles of perceived enjoyment and perceived usefulness in predicting mobile video calling use acceptance," *Front Psychol*, vol. 8, no. MAR, Mar. 2017, doi: 10.3389/fpsyg.2017.00350.