

Consumer Acceptance of Shared E-Scooter Ser- vices for Short-Distance Mo- bility

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ABSTRACT

With the information and communications technology (ICT) development, the e-scooter sharing services have been launched on the Taiwanese market since 2018. This study forms an investigation into the Unified Theory of Acceptance and Use of Technology evaluation method based on empirical research and survey studies to investigate the factors that may influence the user acceptance of the shared e-scooters. A questionnaire has been designed to obtain subjective feedback after using the shared service from the participants. 157 individuals participated in the experiment and completed the subjective rating. The results indicate that the model constructs of performance expectancy, social influence, price value, and habit are useful predictors of the consumer behavioral intention towards using shared e-scooters. In addition, consumer perceived "I prefer to use shared e-scooters rather than private scooters" is a moderate variable that affects the relationship between the performance expectancy, social influence, price value, and habit and the consumer behavioral intention.

Keywords: Consumer acceptance, Shared e-scooters, Short-distance mobility, Sharing economy

INTRODUCTION

Shared micromobility is tend to be sharing economy that is primarily focused on services connecting consumers. The shared micromobility enables consumers to have short-term access to the shared use of transportation, including bicycle, scooter, standing scooter, electric two-wheeler, and others, on an as-needed basis. The related services are bike-sharing, car-sharing, scooter sharing, and ride-sharing. The impacts of these shared services include economic development, reduced greenhouse gas emissions (Shaheen et al., 2020). To reduce the air pollution and create new business model, more and more two-wheeler manufacturers introduce their products into shared vehicle services. In Taiwan, there are bike-sharing (e.g., YouBike), car-sharing (e.g., iRent and Smart2go), and electric scooter (e-scooter) sharing (e.g., WeMo, GoShare, and iRent) services for consumers' short-distance mobility. These services provide corresponding mobile application (app) services to drive the keyless vehicles for consumers. The app services between the vehicle product and the vehicle driver are crucial in facilitating the driver-product interaction. This emphasizes the importance of user acceptance of the app for completing multiple service requirements, including to locate shared vehicle, reserve and pickup a vehicle, unlock the keyless vehicle, return the vehicle, and pay the rental fee. This study aims to experimentally explore user acceptance using the app service of shared e-scooter. The unified theory of acceptance and use of technology (UTAUT2) was employed to investigate the factors that may influence the user acceptance of shared e-scooter service.

LITERATURE REVIEW

With the Information and communications technology (ICT) development, e.g., GPS-enabled mobile devices, mobile payment, and cloud computing, economic models have emerged a based-on sharing consumption of resources, named sharing economy. This resource sharing allows consumers accessing products without the burden of fixed ownership costs and the greater environmental impacts of personal ownership (Botsman and Rogers, 2010). The sharing economy has penetrated the markets of the transportation. Shared micromobility that is an innovative and sustainable transportation strategy. The shared micromobility includes various service models and transportation modes that meet the diverse needs of travelers, such as station-based bikesharing (a bicycle picked-up from and returned to any station or kiosk) and dockless bikesharing and scooter sharing (a bicycle or scooter picked up and returned to any location) (Shaheen et al., 2020). Since 2018, the scooter sharing, e-scooter sharing, and electric bike (e-bike) sharing services have been launched on the Taiwanese market. The shared vehicle system consists a fleet of vehicles that are used by one or more travelers on each day. Shared vehicles offer the convenience of the private vehicle and more flexibility than public transportation alone. Sharing concepts provide a cost-effective and efficient utilization of vehicles, and reduce parking requirements. This paper concerns the dockless e-scooter sharing service in the Taiwan context. Many businesses are applied mobile

app into their service process to increase consumer satisfaction. Here, smartphones app technology was used in the e-scooter sharing service as a medium to operate the e-scooter product that consumers would like to rent. App service enables accessibility for all consumers who have with a driver's license to complete the e-scooter rental, usage, and payment via mobile apps replacing the original scooter rental procedure, e.g., paper-based work and scooter key. The shared e-scooters meet mobility needs to replace the private use of individual scooters or e-scooters. Therefore, consumers of the e-scooter sharing gain the benefits of a private scooter without the costs and burdens of its ownership. Such service creates a new mobile-as-a-service market model and an opportunity for travelers to have a scooter ride.

This study forms an investigation into the Unified Theory of Acceptance and Use of Technology (UTAUT2) evaluation method based on empirical research and survey studies for further evaluating. It is to investigate the factors that may influence the user acceptance of the shared e-scooters. An experimental design was employed to evaluate the user acceptance of the e-scooter sharing service that located at Asia Eastern University of Science and Technology that provides faculty, students, and nearby residents with free services of short-distance mobility. UTAUT2 is a conceptual model (Venkatesh et al., 2012) and has been used to understand the intentions and acceptance of products and mobile app use, e.g., Madigan et al. (2017). This model is specifically proposed to clarify the technology acceptance from the customer perspective (Venkatesh et al., 2012). In this study, UTAUT2 was utilized in determining Taiwanese consumer adoption and intention of the e-scooter sharing service. The variables, including performance expectancy (PE), effort expectancy (EE), social influence (SI), hedonic motivation (HM), price value (PV), and habit (HA), as main constructs in influencing consumer behavioral intention (BI) towards shared e-scooter use. BI was identified as key predictors of adoption behavior of shared e-scooters.

METHOD

One hundred and fifty-seven individuals participated in the experiment to experience the use of shared e-scooter services and completed the surveys. This an empirical and survey study was conducted to provide a dockless e-scooter sharing service with electronic fence technology that is located at the campus of Asia Eastern University of Science and Technology in Taiwan and to elicit users' subjective responses on shared e-scooter usage for understanding how the service affects the BI. After the completion of shared e-scooter usage, the participant had to fill out a subjective rating. The subjective rating contained two sections— (1) UTAUT2: it utilizes twenty-three items that were designed to collect categorical data on PE, EE, SI, HM, PV, HA, and BI, assessed on a seven-point Likert scale, ranging from strongly agree to strongly disagree; (2) Satisfaction: it was designed to gauge the satisfaction level of the participant on overall user satisfaction, assessed on a seven-point Likert scale, ranging from strongly agree to strongly disagree. The Research Ethics Committee of National Tsing Hua University approved this study (IRB protocol number 10906EC065).

RESULTS

The results indicated that approximately 105 respondents (66.9%) were satisfied with shared e-scooters' overall services. In addition, approximately 88 respondents (56.1%) tended to use shared e-scooters rather than to have ownership of a private scooter. In addition, the internal consistency of the UTAUT2 score was high (Cronbach's α on the pooled values: PE, $\alpha=.945$; EE, $\alpha=.956$; SI, $\alpha=.957$, HM, $\alpha=.954$; PV, $\alpha=.924$; HA, $\alpha=.932$). The sampling for satisfaction (Kaiser-Meyer-Olkin (KMO) value=.950; $p = .000$) is adequate.

Hierarchical multiple regression was used to predict BI towards using shared e-scooter model (Y1). Results indicated that none of the predicted moderated relationships reached significance for Y1. Table 1 lists the main predictor variables for model Y1. R2 was significant in step 1 ($F(6, 150) = 202.673, p < 0.001$), accounting for 89.0% of the variance, whereas in step 2, there was an improvement over the earlier model, with an R2 change of 0.895. Therefore, the change in R2 was significant ($F(7, 149) = 180.637, p < 0.001$), indicating that the second set of predictors "I prefer to use shared e-scooters rather than private scooters" could predict BI. Among these, PE, SI, PV, and HA significantly influenced BI to use shared e-scooter. The correlation analytical results showed that among PE, SI, PV, HA, and BI were positively correlated with each other ($r = 0.643\text{--}0.925, p < 0.001$).

Table 1. Hierarchical multiple regression results for Y₁

Model		β	VIF	R ²	ΔR^2
Step 1	PE	-0.268**	8.844	0.890	0.885***
	EE	-0.074	3.953		
	SI	0.540***	9.069		
	HM	-0.102	7.878		
	PV	0.187*	6.988		
	HA	0.653***	5.894		
Y ₁ Step 2	PE	-0.257**	8.868		
	EE	-0.060	3.965		
	SI	0.504***	9.330		
	HM	-0.130	8.032		
	PV	0.178**	7.006		
	HA	0.598***	6.518		
	Prefer shared e-scooters	0.110*	3.154	0.895	0.890*

Notes: 1. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

2. VIF (variance inflation factor)

DISCUSSION

The influence of user experience in using shared e-scooters on users' acceptance of e-scooter sharing service was investigated. Significant support was found for the model and goodness of fit. The results indicated that model Y1 was successful in predicting BI towards using the e-scooter sharing services. Four of the predicted relationships of model Y1 were supported by PE, SI, HA, and PV, all contributing uniquely to the consumers' BI.

HA is the strongest predictor. HA is defined as the extent to which people tend to perform behaviors automatically through learning (Limayem et al., 2007). That is because they believe that habits are set in routine after some degree of repetition (Orbell et al., 2001). HA can be activated in the memory in an autonomous manner without requiring executive control (Evans and Stanovich, 2013). The e-scooter sharing service is developed based on mobile app as the main platform. Habitual responses are activated while the consumers observe familiar indications from the app and e-scooter product environments. With the rapid growth in the app's development, most consumers may acquire the habit of app usage from the repetitive use of multiple apps via mobile devices. The results indicated that most of the participants accept the shared e-scooters based on app service. Creating more opportunities for consumers to use shared e-scooter service should be one of the solutions to create more automatic behavioral responses.

SI is the strongest predictor on BI as well. SI is defined as the extent to which an individual care about the opinions and perceptions of others who are important (Venkatesh et al., 2012) and assumes that an individual's behavior is influenced by the way in which they believe others will view them as a result of having used the technology (Venkatesh et al., 2003). SI may be represented as subjective norm, social factors, and impression. The SI is crucial to the formation of intrinsic motivation to adopt and use new technology or service (Shen et al., 2011). This means that applying the global popular mobile app technology in the e-scooter sharing service may be easily to get consumers' acceptance. Therefore, the shared e-scooter based on mobile app has been regarded as in line with the needs of social processes for most of the participants.

PV had a positive impact on the BI to use the shared e-scooters. PV is defined as the consumers' cognitive trade-off between the perceived benefits of the application and the monetary costs for using them (Venkatesh et al., 2012). Consumers typically bear the expenses themselves. Here, price issues were found to be critical and received particular interest from customers when they were in the process of accepting or rejecting e-scooter sharing services. With regard to pricing, it is necessary to consider the charging and service modes of alternative means of transportation, e.g., private vehicles, public transportation, shared cars, etc., and then formulate a price that meets consumer acceptance and increase his/her acceptance of the e-scooter sharing services.

However, PE had a negative impact on the BI towards shared e-scooters. PE is defined as the extent of benefits that a technology can provide to the consumers while performing certain activities (Venkatesh et al., 2003). Three factors that affect the PE are perceived usefulness, extrinsic motivation, and job suitability (Shin, 2009). It means that consumers are motivated to accept and use sharing e-scooter services if they perceive that the shared e-scooter is more advantageous and useful in their daily lives. It can be seen that the e-scooter sharing service should pay attention to the service density of e-scooter products and the convenience of parking. It is to increase consumers' awareness of the benefits of the shared e-scooter services, and thereby increase consumers' willingness to use the shared e-scooters.

Finally, consumer-perceived "I prefer to use shared e-scooters rather than to have a private scooters" is a moderate variable that affects the relationship between the PE, SI, PV, and HA and the consumer BI towards using shared e-scooters. It means that consumer-perceived "I prefer to use shared e-scooters rather than private scooters", the BI towards shared e-scooters will increase.

CONCLUSION

The study successfully verified that providing customers with e-scooter sharing services can yield a positive influence on users' BI. Also, consumers' perceived the benefits of e-scooter sharing services, feeling of the connections with people who are close to them, cognitive the value between the perceived benefits of the shared e-scooters and the monetary costs for using them, and automatic responses on shared e-scooter usage all appear to be important factors in consumers' desire to use the sharing e-scooter service again. Moreover, the higher levels of consumer-perceived "I prefer to use shared e-scooters rather than private scooters", the BI towards shared e-scooters will increase.

ACKNOWLEDGMENTS

This research was funded by the Ministry of Science and Technology (Taiwan), grant number: MOST 109-2221-E-161-002-.

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