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Article

Benefits, barriers and willingness to pay for bike-sharing service in tourism context

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Abstract: This study explores benefits, barriers and willingness to pay for bike-sharing service in tourism context. Based on a sample of 800 individuals who visited Da Nang, Vietnam between July and August 2023, trends in the barriers and benefits related to bike-sharing service from tourists' point-of-view were explored. The results show that bike-sharing is appreciated for many reasons, notably for its fun/relaxing, cost saving, ease of city exploration, and promotion of better physical and mental health. However, bike-sharing services are considerably less likely to be viewed as options for faster transportation to a destination or reducing traffic hazards. Notably, eighty-six percent of non-riders indicated contentment with their existing transportation options and a lack of interest in bike-sharing services, a proportion significantly higher than any other group. Predictably, barriers related to the availability of bike-sharing and infrastructure, such as lack of sufficient number of shared bikes, far destination, and poor road conditions were notably more likely to be selected by one-time riders. The results are also evident that a significant portion of tourists is willing to pay to enhance their tourist experience with a bike-sharing service. On average, tourists were willing to pay $0.92 per hour (with a standard deviation of $0.24). This amount reflects the tourists' recognition of the value added to their mode experience. These findings suggest that bike-sharing service play a significant role in fulfilling an essential transportation niche and have the potential to contribute to enhance tourists' experience. Efforts aimed at addressing barriers associated with bike-sharing usage could further enhance their contribution to improve tourist satisfaction and boost attraction demand.

Keywords: bike-sharing service; tourism context; benefits; barriers; willingness to pay

1. Introduction

The demand for sustainable transport modes has increased relative to the need to improve physical health and decrease emissions in addition to reducing traffic congestion. One such service is a bike-sharing in addition to traditional public transport. Bike-sharing offers advantages for both individual users and society in terms of safety, individual financial savings, flexible mobility, accessibility and gap narrow between lower-income and higher-income populations.

Bike-sharing services have evolved through at least three generations (Yang et al., 2021). The first program was established in 1965 in Amsterdam, the Netherlands. The second generation took place in Denmark in the 1990s. The evolution of smart technologies in the early 2010s, which popularized the concept of the sharing economy (Martin, 2016), also led to the third generation of bike-sharing services. Over the last decade, bike-sharing services experienced a sharp increase in many cities worldwide

(DeMaio, 2009; Fukushige et al., 2022; Kabra et al., 2020; Radzimski and Dzięcielski, 2021; Yang et al., 2021; Zhang et al., 2023). Today, the number of cities offering bike-sharing services has surpassed 1600 with over 2100 bike-sharing service platforms currently in operation (Chu et al., 2021; Wang and Wang, 2021). Additionally, bike-sharing has gained popularity in the context of tourism because it provides tourists with spatial and temporal accessibility. The adoption of bike-sharing in tourist spots offers significant benefits in terms of sustainability, attractiveness, and increased tourism revenue. This mode of transportation is particularly appealing to environmentally conscious tourists seeking sustainable travel options.

Academic research on trends in in bike-sharing within the tourism context is limited, and most relevant studies have focuses on travelers' behavioral characteristics in terms of cycle tourism (Bai et al., 2020; Çelebi et al., 2018; Fishman et al., 2012; Fuller et al., 2011; Roman and Roman, 2014; Watthanaklang et al., 2016). Others investigate the psychological factors behind tourists' intentions to use bike-sharing (Kaplan et al., 2015; Liu et al., 2018). These studies have addressed several aspects related to the benefits and barriers of using bike-sharing from the tourists' point-of-view. For example, Kaplan et al. (2015) reveals that tourists express interest in several benefits of bike-sharing, including its environmentally-friendly nature, promotion of physically activity, cost saving, convenience, and comfort. These items have been formulated into factors that have positively influence tourists' intentions to rent electric bikes. Similarly, Liu et al. (2018) shows that perceived benefits have direct impact on experience and indirect impact on tourist satisfaction, increase their interests in tourist destinations. While these findings are interesting, they do not allow for understanding different perspectives between experienced and unexperienced tourists. Specifically, there is a lack of analysis segmenting tourists based on their ridership frequency to examine perspectives from varying levels of user experience. In addition, although the concept of willingness to pay (WTP) has been explored in various studies over time, the specific application of WTP within the context of tourist behavior towards bike-sharing service is relatively new, and most relevant studies have focused on tourism products and/or the experience enjoyed at the destination (Durán-Román et al., 2021). Yet remarkably little research is known about bike-sharing use, including the motivations behind tourist usage and the perceived advantages and obstacles related to bike-sharing services from tourists with different experience on ridership frequency. This information is particularly important given concerns about safety and vandalism within the tourism context. Addressing this gap holds both practical and managerial significance. Therefore, the present study aims to provide insights into the positive and negative impacts of bike-sharing.

The remainder of this paper is organized as follows. Previous studies regarding bike-sharing benefits and barriers as well as WTP are summarized in section 2. Section 3 discusses data and method. The findings based on the estimation results are discussed in section 4. In section 5, we make our concluding remarks and note our plan for future research.

2. Literature review

The transport study of tourists helps destination managers and transport planners

can tailor their offerings to better meet tourists' needs and preferences. In accordance to Lew and McKercher (2006), tourists' transport selection depends on either available transport options or perceived benefits and costs of different transport choices. Several scholars explored that travel characteristics such as travel style, duration and purpose contribute as the key determinants of tourists' transport modes within a destination (Becken and Schiff, 2011; Gross and Grimm, 2018). Meanwhile, others considered the role of travel budget, accessibility and the availability of transport modes at tourist spots on mode choice (Gross and Grimm, 2018; Nutsugbodo et al., 2018).

In today's world, the rapid advancement of technology in information and communication has greatly facilitated the shared economy. Smartphone applications and online marketplaces have made it possible to provide peer-to-peer services efficiently. These advancements have led to the success of shared economy concepts in various sectors such as transport, tourism, hospitality, household items, and office spaces. Big players like Uber and Airbnb exemplify the scale of this phenomenon. Botsman and Rogers (2010) expanded on the concept of the sharing economy as a model of peer-to-peer sharing, emphasizing the collaborative redistribution of goods and information. In the context of tourism and hospitality, transport-sharing initiatives such as bike/car sharing have improved tourists' mobility, showing promise for policymakers (Yang et al., 2021).

From a tourist perspective, perceived barriers and benefits of bike-sharing services have been explored across several factors. Motivations for bike-sharing use includes cycling culture, environmental friendliness, physical health, time and cost savings, convenience, comfort (Kaplan et al., 2015; Liu et al., 2018). Bike-sharing services are enjoyed not only by tourists but also by general population for many reasons, but particularly for convenience (Fuller et al., 2011), time and cost savings (Buehler and Hamre, 2014), as well as pickup and delivery options (Hernández-Pérez and Salazar-González, 2004). However, low traffic safety and inadequate cycling infrastructure stand out as notable barriers associated with bike-sharing services in general (Bakogiannis et al., 2019). Kaplan et al. (2015) identified specific obstacles in tourism context, such as the positioning of bike docking stations, the payment system, security concerns, and language barriers, which reduce tourists' attentions to use the bike-sharing system. These findings highlight the significance of addressing perceived barriers and enhance benefits to encourage wider adoption of bike-sharing services in the tourism context. In light of this, conducting comprehensive investigations into users' perception of bike-sharing service, specifically in less studied areas like tourists, holds considerable research implications. Understanding the barriers and benefits associated with bike-sharing service from the tourists' perspective can offer valuable insights for policymakers, destination managers and service providers.

Willingness-to-pay (WTP) for sustainable transportation mode is a critical concept in the realm of transportation economics and sustainability. WTP refers to the maximum amount of money that an individual or group of individuals is willing to spend on adopting or using sustainable transportation options. WTP is often regarded as a dependent variable influenced by a range of sociodemographic and psychographic factors present within the tourist population (Durán-Román et al., 2021; Lee et al., 2019; Pulido-Fernández and López-Sánchez, 2016). Factors influencing WTP in the realm of tourism including income, nationality, age, education level, gender,

profession, environmental awareness, moral responsibility, and transparency and public credibility (Durán-Román et al., 2021).

3. Materials and methods

3.1. Data and case study

To address the research questions regarding the benefits, barriers and WTP for bike-sharing service in tourism context, we designed a survey focusing on tourists in Da Nang city, a famous coast-based tourist destination in Vietnam.

On July 2023, we administered a survey to the 800 tourists visiting Da Nang city, Vietnam. Respondents were segmented based on their ridership frequency to gain insights into user perspectives. Following similar studies on e-scooter (Sanders et al., 2020), respondents were categorized based on their experience with bike riding. Non-riders are defined as tourists who have never utilized a bike-sharing service. On the other hand, riders are defined as tourists who have used a bike-sharing service in Da Nang city.

The survey was carried out by a third transport consulting company located in Da Nang city. Considering that the statistical data for the main demographic factors of tourists were not available, no specific quota was enforced for respondents. Details regarding the selected demographic characteristics of respondents are given in **Table 1**. Gender distribution in the survey showed minimal variance, with no significant difference between male and female proportions. Majority of respondents are domestic visitors, reflecting a substantial representation compared to Da Nang statistics. About 80% of respondents were less than 30 years old, with incomes ranging between $350 to $1500, accounting for around 80% of the sample. Furthermore, over 95% of the respondents reported travelling with companions.

Table 1. Descriptive analysis of survey sample.

Variable		**Survey**		**Statistics**
		Sample	**%**	
Gender	Male	343	42.9%	N/A
	Female	457	57.1%	N/A
Tourist	Domestics	534	66.8%	65.4%
	Foreigners	266	33.3%	34.6%
Age group	Less than 20	399	49.9%	N/A
	20–30	243	30.4%	N/A
	30–40	103	12.9%	N/A
	40–50	40	5.0%	N/A
	50–60	15	1.9%	N/A
	Above 60	0	0.0%	N/A

Table 1. (*Continued*).

Variable		Survey		Statistics
		Sample	%	
Income	Less than $350	132	16.5%	N/A
	$350–500	361	45.1%	N/A
	$500–1000	263	32.9%	N/A
	$1000–1500	31	3.9%	N/A
	$1500–2000	8	1.0%	N/A
	$2000–2500	5	0.6%	N/A
	Above $2500	0	0.0%	N/A
Number of companions	1	5	0.6%	N/A
	2	22	2.8%	N/A
	3	773	96.6%	N/A

3.2. Methodology

The study applied Chi^2 and Kruskal Wallis tests and a multivariate logit model to address the research questions regarding the benefits, barriers and WTP for bike-sharing service. The Chi^2 test is used to determine whether there is a significant association between categorical variables. The Kruskal-Wallis test is a non-parametric alternative to one-way ANOVA and is used to determine whether there are statistically significant differences between the medians of independent groups.

The multivariate logit model is proposed to predict the probability of a positive WTP. In this model, the odds (the ratio between the probability of a tourist being willing to pay and the probability of a tourist not being willing to pay) are modeled as a function of one or more independent variables:

$$P(Y = 1/X) = \frac{1}{1 + e^{-(\beta_o + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_k X_k)}} \quad (2)$$

where:

$P(Y = 1/X)$ is the probability of a tourist being willing to pay given the value of the independent variables X_1, X_2, …, X_k.

e is the base of the natural logarithm.

b_0, b_1, …, b_k are the coefficients estimated by the logit regression model.

X_1, X_2, …, X_k are the independent variables.

In logit regression model, the coefficients represent the change in the log-odds of the outcome variable (e.g., willingness to pay) associated with a one-unit increase in the independent variable.

Assessing the goodness of fit of the logistic regression model involves examining probability and assumptions of estimated parameters. Probability of the results involves assessing whether the observed outcomes are likely under the model's assumptions and parameters. Techniques like likelihood ratio tests and Hosmer-Lemeshow tests can help evaluate the model's fit to the data. Logit regression model assumes that the relationship between the independent variables and the log-odds of the outcome variable is linear. Assumptions related to multicollinearity, independence of observations, and absence of influential outliers are also checked.

4. Key findings

Of a total of 800 tourists surveyed, 465 (58.13%) stated that they had never used a bike-sharing service in Da Nang. Additionally, 116 (14.5%) respondents reported using a bike-sharing service in Da Nang once, while the remaining portion (27.37%) confirmed that they have used a bike-sharing service multiple times.

Table 2 shows a pattern of bike-sharing service usage with regard to gender, age, income, tourist type and number of companions. The results show that there were no significant differences in riding frequency by demographic characteristics of survey population.

Table 2. Survey population characteristics, by bike-sharing usage.

	Non-riders (*n* = 465), %	**Riders for once (*n* = 116), %**	**Riders for several (*n* = 219), %**
Gender			
Male	44%	45%	39%
Female	56%	55%	61%
Total	100%	100%	100%
	Chi^2 not significant		
Tourist			
Domestics	67%	49%	76%
Foreigner	33%	51%	24%
Total	100%	100%	100%
	Chi^2 not significant		
Age group			
Less than 20	51%	34%	55%
20–30	31%	31%	29%
30–40	12%	22%	11%
40–50	4%	9%	5%
50–60	2%	3%	0%
Above 60	0%	0%	0%
Total	100%	100%	100%
	Chi^2 not significant		
Income			
Less than $350	16%	18%	13%
$350–500	44%	33%	49%
$500–1000	34%	41%	33%
$1000–1500	4%	6%	2%
$1500–2000	1%	2%	1%
$2000–2500	1%	0%	1%
Above $2500	0%	0%	0%
Total	100%	100%	100%
	Chi^2 not significant		

Table 2. (*Continued*).

	Non-riders (*n* = 465), %	**Riders for once (*n* = 116), %**	**Riders for several (*n* = 219), %**	
Number of companions				
1	0%		2%	0%
2	3%		3%	3%
3	97%		95%	97%
Total	100%		100%	100%
	Chi^2 not significant			

4.1. Benefits of using bike-sharing services

Tourists were requested to outline the benefits they perceived in utilizing a bike-sharing service. They had the option to choose multiple responses. **Figure 1** shows that bike-sharing is appreciated for many reasons, notably for its fun/relaxing, cost saving, ease of city exploration, and promotion of better physical and mental health. However, bike-sharing services are considerably less likely to be viewed as options for faster transportation to a destination or reducing traffic hazards.

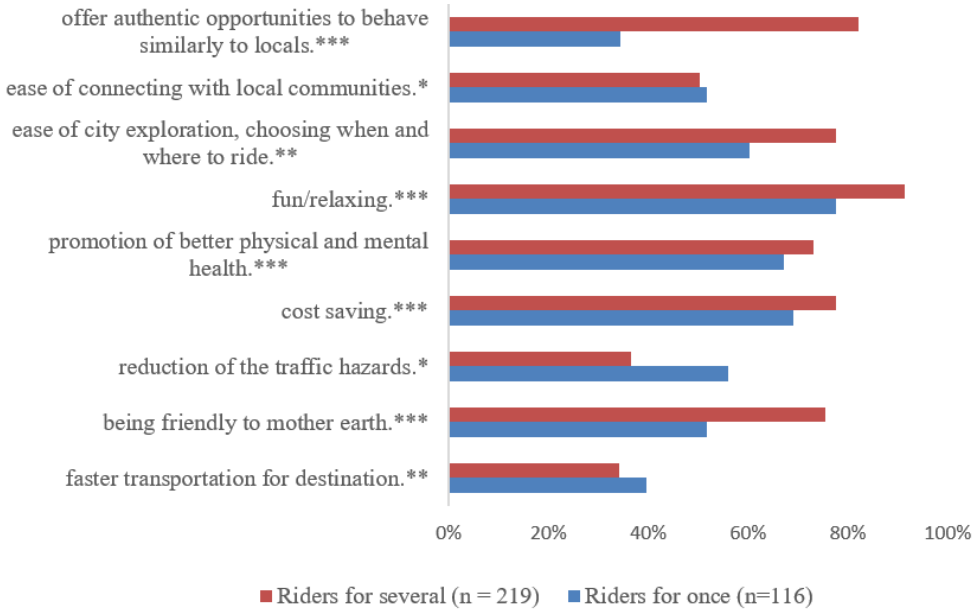

Figure 1. Benefits of using bike-sharing services. Significance indicated by the following: *$p \leq 0.1$; **$p \leq 0.05$; ***$p \leq 0.01$.

Responses exhibited significant variability based on the frequency of use. For instance, being fun/relaxing was the most commonly selected among each tourist group, yet experienced riders were notably ($p \leq 0.01$) more inclined to choose this option compared to other groups. Furthermore, those who frequently utilized bike-sharing services were more inclined to select all benefits except for 'reduction of traffic hazards' and 'faster transportation to destination', which were slightly less favored by riders who using bike-sharing services for once.

4.2. Barriers of using bike-sharing services

Respondents were also surveyed about the barriers they encountered or perceived regarding using bike-sharing services, with distinctions made between those who had ridden and those who hadn't. Similarly, respondents could select multiple barriers from a provided list. The data depicted in **Figure 2** reveal significant variations in barriers based on experience. Notably, eighty-six percent of non-riders indicated contentment with their existing transportation options and a lack of interest in bike-sharing services, a proportion significantly higher than any other group. Predictably, barriers related to the availability of bike-sharing and infrastructure, such as lack of sufficient number of shared bikes, far destination, and poor road conditions were notably more likely to be selected by one-time riders.

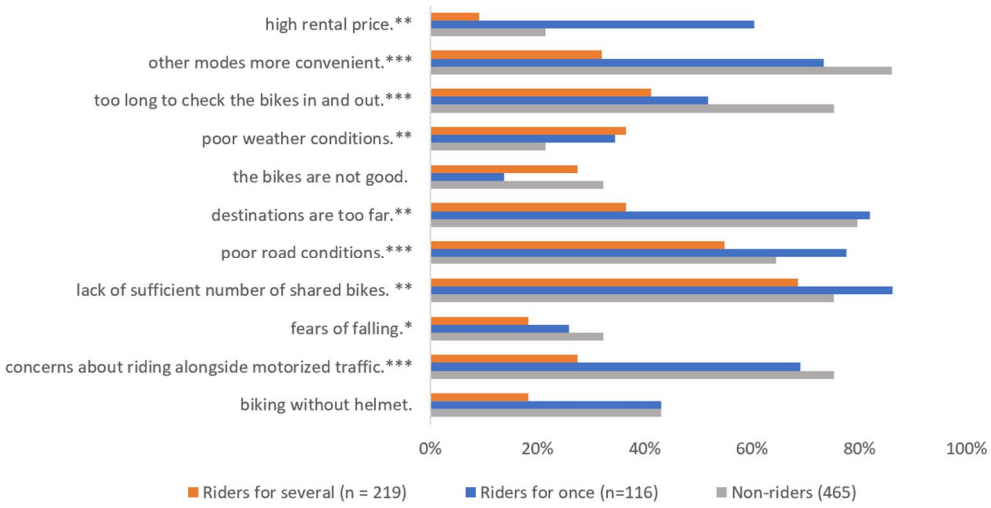

Figure 2. Barriers of using bike-sharing services. Significance indicated by the following: *$p \leq 0.1$; **$p \leq 0.05$; ***$p \leq 0.01$.

Safety-related barriers, on the other hand, were much more evenly selected between the groups, although they differed according to experience. For example, non-riders were significantly ($p \leq 0.01$) more likely than riders to state that they worry about riding alongside motorized traffic or other modes more convenient, whereas experienced riders were significantly ($p \leq 0.01$) more likely to state that poor weather conditions are the main barriers for choosing a bike-sharing services. Over 75% of non-riders, about 86% of one-time riders, and 68% of experienced riders indicated that they worried about lack of sufficient number of shared bikes.

4.3. Willingness to pay

This section delves deeper into the findings by assessing the WTP for sociodemographic characteristics. Based on the responses gathered from the 335 tourists who have used a bike-sharing service at least once, it is evident that a significant portion of them is willing to pay to enhance their tourist experience with a bike-sharing service. On average, they were willing to pay $0.92 per hour (with a standard deviation of $0.24). This amount reflects the tourists' recognition of the value added to their mode experience. A prediction model has been calculated as shown in **Table 3**.

Table 3. Logit model for variables relevant to WTP.

	Coef.	**Sig.**	**95% conf. interval**	
			Lower	**Upper**
Gender				
Male	Base outcome			
Female	0.087	0.586	−0.23	0.40
Tourist				
Domestics	Base outcome			
Foreigner	−0.66	0.000	−1.00	−0.32
Age group				
Less than 20	Base outcome			
20–30	−0.03	0.885	−0.398	0.34
30–40	−0.46	0.036	−0.895	−0.03
40–50	−0.581	0.108	−1.289	0.13
50–60	−5.65	0.972	−326.09	314.78
Income				
Less than $350	Base outcome			
$350–500	0.461	0.046	0.008	0.914
$500–1000	0.042	0.855	−0.410	0.494
$1000–1500	−0.283	0.548	−1.206	0.640
$1500–2000	−0.205	0.736	−1.392	0.982
$2000–2500	5.012	0.980	−394.23	404.25
Number of companions				
1	Base outcome			
2	−5.19	0.975	−325.63	315.25
3	−4.96	0.976	−325.39	315.48
Rental price	−0.994	0.004	−1.675	−0.312
Model fit estimation				
Number of OBS	335			
Init. log likelihood	−216.11			
Final log likelihood	−187.71			
R^2	0.525			
p-value	0.667			

Based on the analysis, several factors have been identified as significant in determining tourists' WTP for enhancing bike-sharing services. Foreign tourists demonstrate lower WTP compared to domestic tourists. This suggests that foreign tourists may be less inclined to pay higher rental costs for bike-sharing services, potential due to differences in preferences, financial considerations, or familiarity with bike-sharing services. Tourists aged between 30 and 40 exhibit lower WTP compared to other age groups. This age cohort may be less willing to contribute to rental costs, possibly due to financial constraints, differing priorities, or perceptions of value associated with bike-sharing services. Tourists with incomes ranging between $350 and $500 express higher WTP. This indicates that individuals with higher income levels are more willing to pay for enhanced sustainable transportation options, such as

bike-sharing services. Higher income levels may afford these individuals greater flexibility and willingness to invest in environmentally friendly transportation alternatives. The hourly rental cost of bike-sharing services also influences tourists' WTP. While not explicitly stated in the analysis summary, it's inferred that as the rental cost increases, tourists' WTP decreases. This suggests that there may be a threshold beyond which tourists are unwilling to pay higher rental fees for bike-sharing services. Factors such as gender and number of companions were not found to be relevant in analysis.

The prediction model demonstrates an optimal R^2 of 52.5%, indicating that the included factors collectively explain 52.5% of the variability in tourists' WTP for bike-sharing service. The Hosmer-Lemeshow test suggests that the model adequately fits the data, as evidenced by a non-significant *p*-value ($p = 0.667$), indicating that the observed and predicted WTP values align well. Therefore, the model provides valuable insights into the determinants of tourists' WTP for bike-sharing services.

5. Discussions and conclusions

This study highlights the significance of comprehending the benefits, barriers and tourists' willingness to pay for the bike-sharing services in response to the requests from urban transport planning, destination management, as well as equity consideration in the realms of tourism.

The survey results unequivocally suggest that bike-sharing services are fulfilling a specific role under the tourism context. This finding aligns with previous studies (Buehler and Hamre, 2014; Fuller et al., 2011; Hernández-Pérez and Salazar-González, 2004) and underscores the necessity for additional transportation alternatives for green transport in tourism context. Moreover, this study indicates that the perceived benefits of bike-sharing services are widely recognized, while barriers to bike usage vary among different demographic groups. For instance, respondents across all groups acknowledged bike-sharing for its fun/relaxing, cost saving, ease of city exploration, and promotion of better physical and mental health. Conversely, barriers to bike-sharing, primarily concerning the availability of bike-sharing and infrastructure, such as lack of sufficient number of shared bikes, far destination, and poor road conditions. Furthermore, our study reveals that non-riders demonstrate a significantly higher likelihood of intending to try bike-sharing, coupled with a decreased satisfaction with current transportation options. These insights regarding transportation options underscore the potential of bike-sharing to bridge gaps in tourist-oriented transportation modes and enhance mobility equity. Lastly, while bike-sharing possess a larger environmental footprint and are less physically active compared to motorized vehicles, they still present a more environmentally friendly and active alternative to motorized transport (Durán-Román et al., 2021). Addressing the identified barriers in this study may enable tourists to promote transportation equity and reduce their carbon footprint by accommodating bikes effectively.

This study also discusses the importance of understanding tourist' WTP. Destination manager need to anticipate tourism demand's WTP for bike-sharing services to contribute to sustainability initiatives. This understanding is crucial for estimating the economic value of resources and attractions and for considering the

viability of implementing alternative transportation modes. During measuring WTP, we found that sociodemographic variables such as income, age, rental price and foreign tourists play significant role in determining tourists' WTP. These variables shape tourists' preference and behaviors.

Techniques such as Chi^2, Kruskal Wallis tests and logistic regression are employed to identify predictive variables related to frequency of using bike-sharing services and WTP. Age, income emerge as crucial factors influencing the amount tourists are willing to pay in response to potential price increases.

Effective communication strategies should precede the implementation of price scheme to tourism activities to ensure tourists' acceptance. The ultimate goal is to enhance sustainability and the overall tourism experience while maintaining destination attractiveness.

5.1. Theoretical implication

This study contributes to the existing body of knowledge in benefits, barriers and willingness-to-pay towards bike-sharing service from tourists' perspectives. First, the findings shed light on the behavior and preferences of tourists in relation to advantages and disadvantages of bike-sharing services that are useful to promote sustainable tourism. Second, by applying principles of behavioral economics, scholars can explore factors such as perceived benefits and barriers that influence the adoption and usage of bike-sharing services in tourism context. Third, by examining usage patterns across different demographic tourism groups, scholars can explore issues of equity, access, and social inclusion in transportation planning and policy-making for sustainable tourism. Fourth, this study contributes to the theoretical understanding of bike-sharing's role in mitigating environmental impacts. Researchers can analyze the environmental benefits of bike-sharing, such as reducing greenhouse gas emissions, alleviating traffic congestion, and promoting active transportation modes as part of a broader sustainable urban mobility strategy.

5.2. Practical implication

Analyzing benefits and barriers of bike-sharing services requires implementing supportive policies and regulations, and allocating resources to expand bike-sharing services in tourist destinations. In addition, this study provides insights for bike-sharing operators on how to optimize their services to better cater to the needs of tourists. This might involve recommendations for bike fleet management, station placement, pricing strategies, marketing efforts, and partnerships with tourism stakeholders. Furthermore, this study proposes practical strategies for enhancing the tourist experience through bike-sharing services. This could include initiatives such as guided bike tours, integration with mobile apps for navigation and trip planning, and provision of safety equipment.

In conclusion, understanding benefits, barriers and tourists' WTP and the factors influencing it is crucial for destination management, policy formulation, and sustainable tourism development. This requires comprehensive analyses and effective communication strategies to align stakeholders' interests and enhance destination competitiveness.

5.3. Limitation

The study acknowledges limitations such as the lack of interviews in other departure spots, the absence of psychographic factors, and the reliance on intentions rather than actual payment behavior. Incorporation data on actual payment behavior could potentially enhance the robustness and depth of this study because actual payment behavior offers concrete evidence of real-world actions. By capturing data on payment behavior, the intentions expressed by participants were validated, ensuring that they align with actual decisions. Future research could explore WTP across tourist clusters.

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