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ENVIRONMENTAL PLANNING AND DESIGN: EXPLORING URBAN RESILIENCE THROUGH E-HAILING

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Abstract

Sustainable cities strive for balance in environmental health, economic vitality and social equity through efficient and resilient urban planning. Crucial to this balance, sustainable transportation systems reduce carbon emissions, ease traffic congestion and promote clean energy. Among various sustainable transportation options, e-hailing has gained global popularity, offering convenient rides through smartphone apps. This quantitative research focuses on exploring the usage patterns of e-hailing services among university students at the main campus of Universiti Sains Malaysia. A total of 392 university students were surveyed using stratified random sampling, and SPSS analysis revealed a moderate positive correlation between attitudes towards e-hailing and satisfaction with safety, price, convenience and availability. Furthermore, regression analysis confirmed significant relationships between attitude and satisfaction levels. By investigating how travel behaviour patterns and attitudes towards e-hailing influence student satisfaction, the study aims to understand e-hailing's role as an alternative mode of transportation in enhancing overall transportation service satisfaction. These insights offer valuable guidance for transport planners, e-hailing companies and university administrations seeking to improve transportation options and student satisfaction.

***Keywords**:* Transportation, E-Hailing, Satisfaction, University Students, Travel Behaviour

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INTRODUCTION

In the 21st century, the pervasive influence of internet-based technologies, particularly mobile technology, has fundamentally altered consumer behaviour, spurring the emergence of diverse online and mobile platforms to meet evolving customer demands. In response to global imperatives for sustainable development, governments have introduced initiatives to promote eco-friendly transportation options, aimed at diminishing reliance on private vehicles (Nasrudin et al., 2017). These transportation options include enhanced public transport accessibility, walking and cycling. E-hailing services are a pivotal development in the transportation landscape. Facilitated by the integration of information and communication technologies, these services have revolutionised travel by connecting passengers with drivers using their own vehicles. Popularised by industry giants like Uber, Lyft and Grab, e-hailing services have disrupted traditional taxi models. They offer users a more convenient, cost-effective mode of transportation by leveraging GPS and electronic payment systems.

Malaysia's rapid urbanisation over the past three decades has necessitated substantial investments in transport infrastructure, primarily in road networks and parking facilities, to accommodate escalating automobile dependency (Othman & Ali, 2020). In this context, e-hailing services have emerged as a sustainable alternative, potentially mitigating private car reliance.
This study investigates how travel behaviour patterns and attitudes towards e-hailing influence students' satisfaction levels. By scrutinising the factors shaping students' decision-making processes, whilst considering their demographics, the research aims to pinpoint the key determinants influencing the utilisation of e-hailing services as a public transportation mode. Safety, pricing, convenience and availability are emphasised vis-à-vis students' demographics.

E-hailing service users without private vehicles are often members of racial or ethnic minority groups, younger individuals and highly educated adults (Lim et al., 2022). These findings raise questions about potential disparities in e-hailing service selection among students in the main campus of Universiti Sains Malaysia (USM). Investigating the demographic variables significantly influencing e-hailing service choices among USM students is imperative to rectify possible inequalities and ensure equitable transportation access. Identifying these variables can inform measures promoting equal access and enhancing e-hailing service availability and affordability for all students at USM's main campus.

University students frequently encounter commuting challenges, such as extended bus wait times and limited transportation options. A 2017 *The Straits Times* article underscores these challenges and the potential of e-hailing services to alleviate them. However, university students' travel behaviour patterns when using e-hailing services should be examined to elucidate their role as an

alternative commuting means. This investigation can offer valuable insights into enhancing students' travel experiences and addressing transportation challenges. Concerns regarding price surges and driver shortages during peak hours in e-hailing services, as highlighted in a 2022 *Bernama* article, have contributed to user dissatisfaction. Against the backdrop of USM's main campus, assessing students' satisfaction levels with e-hailing services is crucial to address these concerns and improve service quality. Insights gleaned from the assessment can guide policymakers and service providers in making informed decisions and service enhancements aligned with the preferences of USM students. This research aims to provide invaluable insights that can drive policy adjustments and service delivery enhancements, thereby fostering a satisfactory and efficient e-hailing service experience for USM students.

LITERATURE REVIEW

The literature on e-hailing encompasses various definitions, ranging from the simple act of booking a car and driver through a smartphone to broader concepts involving the use of mobile apps for any transportation booking. Reflecting the dynamic nature of ride-hailing services, the global market was valued at USD 28.34 billion in 2021, with a projected compound annual growth rate of 15.7% from 2022 to 2030 (Grand et al., 2023). This valuation underscores its expanding role across different contexts.

This study emphasises key principles of e-hailing services, including safety, pricing, convenience, availability and user experience. Safety measures, competitive pricing, seamless user experience, service availability and efficient issue resolution are pivotal for e-hailing service providers to enhance their offerings and meet user expectations. The Statista Research Department (2019) revealed that e-hailing services in Malaysia are predominantly favoured by individuals aged 25–34, constituting 35.4% of users. This demographic includes university students and young professionals who strongly prefer e-hailing platforms as their primary transportation mode. Conversely, the survey findings suggest lower adoption rates among individuals aged 55–64. A possible reason is their limited familiarity with smartphone apps and concerns regarding technological complexity among older demographics.

E-hailing services have revolutionised transportation, providing convenient and accessible options through smartphone apps that considerably enhance mobility, particularly in developing countries, where they surpass traditional taxis in efficiency and user-friendliness. As a complement to traditional public transit, e-hailing services are especially effective as feeder options in low-demand suburban areas, according to regional departments of transportation (Hayakawa & Chikaraishi, 2023). The integration of e-hailing services with public transit systems, which offer direct routes to common public destinations, aims to reduce reliance on private vehicles (Acierto et al., 2023).

Improving transport infrastructure and enforcing vehicle emission standards can enhance fuel efficiency, substantially cutting carbon dioxide emissions.

E-hailing apps address challenges during peak hours and adverse weather conditions by ensuring quick and responsive transportation bookings, reducing travel stress and time spent in queues and crowded public transportation. Moreover, by allowing individuals to join as drivers, e-hailing platforms create income opportunities and economic empowerment, contributing to the gig economy and fostering grassroots economic development (Pasquali et al., 2022). The rise of e-hailing services not only transforms travel but also positively affects societal mobility and economic empowerment.

E-hailing services face many challenges and regulatory obstacles, notably in their competition with traditional taxi services. Traditional taxi drivers often perceive e-hailing as a threat to their livelihoods, resulting in protests and concerns regarding unfair competition, regulatory frameworks and market share loss. Regulatory adjustments and clear guidelines are imperative to foster fair competition and address the apprehensions of e-hailing services and traditional taxis. Customer satisfaction is another pivotal concern for e-hailing services. These companies prioritise enhancing customer experience by implementing features and strategies aimed at improving service quality and reliability (Sabar et al., 2023). By cultivating trust and fostering customer loyalty, e-hailing platforms can ensure repeat business, which is crucial for their sustained success. The theory of planned behaviour by Ajzen (1991) offers a conceptual framework for comprehending the factors influencing behavioural intentions and subsequent actions within the context of e-hailing services (Arumugam et al., 2020). Figure 1 illustrates the conceptual framework utilised in this study, wherein travel behaviour and attitudes towards e-hailing serve as independent variables that potentially influence the level of satisfaction with travel experiences. By integrating these variables, the conceptual framework endeavours to scrutinise how patterns of travel behaviour and attitudes towards e-hailing affect the satisfaction levels of university students with these services.

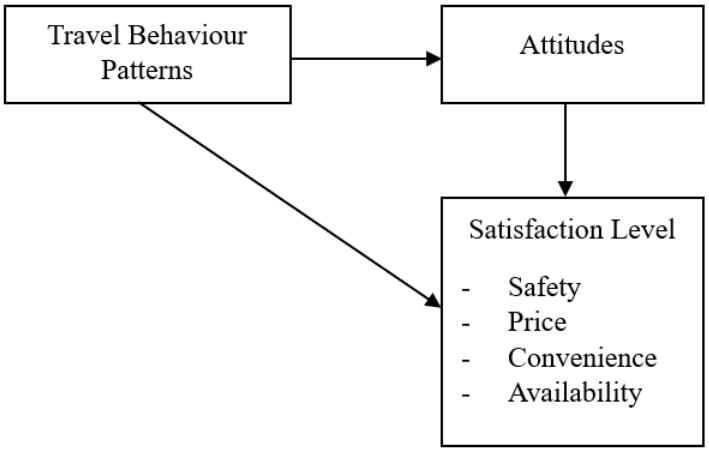

Figure 1: Conceptual Framework of the Study
Source: Authors

RESEARCH METHODOLOGY

The research adopted a quantitative approach. The primary research site was the main campus of USM in Penang, Malaysia. USM stands out as a prestigious institution renowned for its exceptional academic programmes and diverse student body. As such, it is an optimal setting for investigating university students' commuting habits and e-hailing service utilisation. Students enrolled at USM, who were the primary respondents. The objectives of the survey are to gather the perspectives of USM students, assess their travel behaviour patterns, gauge their satisfaction levels with e-hailing services and solicit their opinions regarding the utilisation of these services as an alternative mode of transportation. The survey instrument was a questionnaire featuring multiple-choice questions. The questionnaire was divided into four distinct sections, as outlined in Table 1.

Table 1: Development of Questionnaires

Question	Description	Sources
Section I	Demographic information of the respondents	Chung and Al-Khaled (2020)
Section II	Attitude towards e-hailing services as mode of transportation	Ubaidillah et al. (2019) Salim et al. (2021)
Section III	Travel preferences of the participants	Jaiz and Marzuki (2020)
Section IV	Level of satisfaction and potential strategies for enhancing e-hailing services	Adam et al. (2020)

Source: Various Researchers

The data collection approach primarily relied on surveys. The collected data underwent statistical analysis to extract meaningful insights. The study population encompassed all students enrolled at the main campus of USM in Penang, Malaysia. These students were from diverse faculties, courses and academic levels, spanning undergraduate, graduate and postgraduate programmes. According to the Academic Management Division Registry, the total student enrolment at USM in 2021 was 33,787. The questionnaire was distributed to all enrolled students at USM across various academic disciplines.
The sample population was meticulously chosen based on diverse criteria to guarantee a comprehensive and representative selection of respondents. Demographic factors such as gender, year of study and academic level were considered in selecting the respondents. This approach was used to mirror the broader student population and generate findings with wider applicability. The sample size of 380 respondents was determined using the Krejcie and Morgan formula, which ensures a 95% confidence level in the obtained results. Consequently, 760 online questionnaires were disseminated, doubling the initial sample size. A total of 394 responses were received, resulting in a response rate of 52%.

ANALYSIS AND DISCUSSION

Respondents' Profile

The analysis of demographic data for USM's main campus in Penang revealed several noteworthy findings. Table 2 shows that among the respondents, 59% (233) were female, indicating a predominant representation of younger female students. The age group of 19–22 accounted for 58% (229) of the total population, implying a substantial presence of younger students. Malaysian students constituted the majority, accounting for 86% (340) of the respondents, whereas international students represented only 14% (54). Undergraduate students comprised 75% (295) of the sample, with 40% (156) of the respondents enrolled in pure science programmes. Regarding transportation preferences on campus, walking was the preferred mode of transportation, chosen by 37% (146) of students, whereas e-hailing services were the least favoured, chosen by only at 7% (26). However, outside campus, e-hailing services were the most preferred mode, selected by 50% (198) of respondents, underscoring their popularity.

Table 2: Descriptive Analysis of Demographic Characteristics

Variable	Frequency (N = 394)	Percentage (%)	Variable	Frequency (N = 394)	Percentage (%)
Gender			**Nationality**		
Male	161	41	Malaysian	340	86
Female	233	59	International	54	14
Age			**Level of Education**		
19–22	229	58	Undergraduate student	295	75
23 and above	165	42	Postgraduate student	99	25
Year of Study			**Field of Study**		
Year 1	67	23	Pure Sciences	156	40
Year 2	83	28	Applied Sciences	92	23
Year 3	71	24	Pure Arts	92	23
Year 4	74	25	Applied Arts	54	14
Main Mode of Transportation Used in Campus			**Main Mode of Transportation Used Outside Campus**		
Beam Scooter	73	19	Beam Scooter	-	-
Biking	39	10	Biking	16	4
Own Vehicle (Car and Motorcycle)	34	8	Own Vehicle (Car and Motorcycle)	44	11
E-Hailing	26	7	E-Hailing	198	50
Public Transportation (USM Bus)	76	19	Public Transportation (USM Bus)	90	23
Walking	146	37	Walking	46	12
Race					
Malay	209	53			
Chinese	68	17			
Indian	36	9			
Others Bumiputera	27	7			
Others	54	14			

Source: Authors

The analysis of travel behaviour patterns among USM students yielded the following insights. As shown in Table 3, a majority of respondents (51%) reported using e-hailing services occasionally (two to three times per month), with 28% using them rarely (one to two times per month) and 21% using them frequently (five or more times per month). Shopping was the most common trip purpose for using e-hailing services (27%), followed by visiting friends/family

(21%) and school/university (19%). Over half of the respondents (56%) travelled distances greater than 5 km, with the majority (61%) reporting travel durations of less than 30 minutes. Additionally, a large percentage (66%) of respondents had a monthly expenditure of more than RM50 on e-hailing services.

Table 3: Descriptive Analysis of Travel Behaviour Patterns

Variable	Frequency (N = 394)	Percentage (%)	Variable	Frequency (N = 394)	Percentage (%)
Frequency of E-Hailing Service Usage			**Trip Purpose**		
Frequently (five or more times monthly)	81	21	Academic	74	19
Occasionally (three to four times per month)	202	51	Work	49	12
Rarely (one to two times per month)	111	28	Shopping	106	27
Travel Distance			Leisure/Recreation	59	15
Less than 5 km	173	44	Visiting Friends/Family	81	21
More than 5 km	221	56	Religious Services	25	6
Travel Duration			**Monthly Expenditure on E-hailing**		
Less than 30 minutes	241	61	Less than RM50	135	34
More than 30 minutes	153	39	More than RM50	259	66

Source: Authors

Relationship Between Variables

Table 4 presents the results of the internal consistency analysis for each dimension. The overall findings demonstrated that the reliability test, using Cronbach's alpha, yielded values exceeding 0.70, which is considered acceptable in accordance with the criterion outlined by Taber (2018).

Table 4: Reliability Test Results (N = 394)

Variable	Cronbach's Alpha	Number of Items
Travel Behaviour Patterns	0.862	3
Attitudes Towards E-Hailing Services	0.946	4
Levels of Satisfaction on E-Hailing Services	0.967	12

Source: Authors

A Pearson correlation analysis was conducted on six variables, as illustrated in Figure 4. The purpose is to investigate the relationship between travel behaviour patterns; attitudes towards e-hailing and satisfaction levels regarding safety, price, convenience and availability. Table 5 reveals significant correlations among the study variables.

Specifically, the analysis revealed a moderate positive correlation between attitudes and safety ($r = 0.393$, $p < .01$), attitudes and price ($r = 0.418$, $p < .01$), attitudes and convenience ($r = 0.412$, $p < .01$) and attitudes and availability ($r = 0.414$, $p < .01$). These findings suggest that positive attitudes are associated with perceptions of enhanced safety, favourable pricing, increased convenience and greater availability of e-hailing services.

The observed correlations underscore the importance of maintaining high service standards and continually improving the user experience to cultivate positive attitudes and elevate satisfaction levels. Moreover, the identified relationships suggest the presence of a reinforcing loop, wherein positive attitudes enhance the likelihood of positive experiences, thereby further reinforcing positive attitudes. Such insights are instrumental in guiding strategies aimed at optimising service delivery and enhancing customer satisfaction within the e-hailing industry.

Table 5: Results of Pearson Correlation Test

	Travel behaviour pattern	Attitude	Safety	Price	Convenience	Availability
Travel behaviour pattern	1					
Attitude	.041	1				
Safety	.058	.393**	1			
Price	−.015	.418**	.768**	1		
Convenience	.057	.412**	.859**	.779**	1	
Availability	.026	.414**	.753**	.824**	.855**	1

*** Indicates a strong correlation (r > 0.4) and statistical significance (p < .01)* *Source: Authors*

However, some correlations are weak or non-significant, including the correlation between travel behaviour pattern and attitude ($r = 0.041$, $p > .05$), safety ($r = 0.058$, $p > .05$), price ($r = −0.015$, $p > .05$), convenience ($r = 0.057$, $p > .05$) and availability ($r = 0.026$, $p > .05$). These results indicate a lack of meaningful linear relationship between these pairs of variables. The weak or non-significant correlations between travel behaviour, attitudes towards e-hailing and satisfaction levels can be attributed to the multifaceted nature of travel choices and diverse array of factors influencing them. It underscores the complexity

inherent in understanding and influencing consumer behaviour within the context of e-hailing services.

These findings highlight the necessity of addressing a broader spectrum of factors to effectively influence travel behaviour. Strategies aimed at enhancing the reliability and accessibility of e-hailing services, integrating them seamlessly with public transportation systems and addressing specific local issues can strengthen these relationships over time. By recognising and addressing the intricate interplay of various factors influencing travel behaviour, policymakers and industry stakeholders can develop nuanced and effective interventions to promote the adoption and usage of e-hailing services. Ultimately, these interventions can contribute to the advancement of sustainable and efficient transportation systems.

A multiple regression analysis was conducted to predict satisfaction from travel behaviour patterns and attitudes. These variables statistically significantly predicted satisfaction, $F\ (2, 391) = 47.903$, $p < .0005$, $R^2 = .197$. Travel behaviour patterns and attitudes contributed significantly to the prediction, with p-values < .05. These results suggest that travel behaviour patterns and attitudes collectively explain approximately 19.7% of the variance in satisfaction.

The regression equation derived was Satisfaction = 2.043 + (0.011 × Travel Behaviour Pattern) + (0.504 × Attitudes). This equation suggests that the independent variables included in the model account for a modest portion of the variability in the dependent variable. It also indicates that other unexplored factors may play significant roles in determining satisfaction levels.

The coefficient for Predictor 1, travel behaviour pattern ($\beta = 0.011$, $p > .05$), suggests a very small positive relationship with the dependent variable. However, since the p-value is greater than .05, this relationship is not statistically significant. In contrast, Predictor 2, attitudes ($\beta = 0.504$, $p < .01$), indicates a moderate positive relationship with the dependent variable. The low p-value (<.01) suggests that this relationship is statistically significant.

Therefore, the regression analysis results confirm significant relationships between attitudes and satisfaction levels. This finding underscores the importance of prioritising user perceptions and experiences. By focusing on improving service quality, building trust, enhancing technological features and promoting positive attitudes through effective communication strategies, e-hailing companies can achieve high user satisfaction and great overall success.

CONCLUSION

The study's findings regarding the positive correlation between attitudes towards e-hailing and overall satisfaction levels align with the results of recent research. For example, Rayle et al. (2016) highlighted the significant influence of perceived convenience and availability on user satisfaction with e-hailing services. Similarly, Wang (2019) emphasised the critical roles of safety and price

in shaping user satisfaction, with positive perceptions of these aspects correlating with high overall satisfaction.

The insights gleaned from this study underscore the importance for e-hailing companies to continually innovate and enhance their service offerings. Leveraging technology to improve convenience and availability, whilst maintaining a strong focus on user safety and affordability, can better address user needs and expectations. These findings hold practical implications for transport planners, e-hailing companies and campus planning initiatives, particularly in advancing sustainable transportation initiatives. Drawing on quantitative data analysis and literature review, the study offers insights into how e-hailing services can contribute to sustainable urban mobility and resilience.
Collaborative efforts among stakeholders, including policymakers, e-hailing companies and campus planners, are crucial. Together, they can devise policies, infrastructure improvements and awareness campaigns to promote e-hailing as a sustainable and practical transportation option. These efforts can influence public attitudes towards car ownership and foster sustainable travel behaviours.

However, this study has limitations, particularly its reliance on quantitative methods. Future research endeavours can benefit from integrating qualitative approaches to gain a more comprehensive understanding of user perceptions and experiences with e-hailing services. Future studies should also explore the long-term effects of e-hailing services on user satisfaction, urban traffic dynamics and environmental sustainability across diverse demographics and geographic regions. Additionally, investigating the effects of various policy interventions and incentives on user satisfaction and the promotion of e-hailing as a sustainable transport option will be valuable.

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