JOURNAL OF DIGITAL SYSTEM DEVELOPMENT

https://e-journal.uum.edu.my/index.php/jdsd

How to cite this article:
Mahat, S. A. & Nadzir, M. M. (2025). Assessing User Satisfaction of the Smart Parking Payment System in Selangor. *Journal of Digital System Development, 3* (1), 13-28. https://doi.org/10.32890/jdsd2025.3.1.2

ASSESSING USER SATISFACTION OF THE SMART PARKING PAYMENT SYSTEM IN SELANGOR

[1]Siti Aslinda Mahat & [2]Maslinda Mohd Nadzir
[1, 2] School of Computing, Universiti Utara Malaysia, Malaysia
[1]Akardya Technology, Malaysia

[1]Corresponding author: akardya.tech@gmail.com

Received: 9/1/2025 Revised: 19/3/2025 Accepted: 6/4/2025 Published: 28/4/2025

ABSTRACT

The Smart Selangor Parking (SSP) app aims to enhance digital adoption in Selangor's journey toward becoming a livable smart state. However, user satisfaction with the app remains unclear, raising concerns about its effectiveness in fostering economically productive and environmentally conscious communities. The research question is: What factors significantly influence user satisfaction with the SSP application? Thus, the objectives are to identify the factors influencing user satisfaction with SSP and determine which factors have the most significant impact. This analysis aims to provide insights into areas that require improvement to enhance the app's effectiveness and adoption. This study follows a quantitative design to assess user satisfaction with the SSP app. It includes three phases: definition, exploratory, and confirmation. In the definition phase, the research problem and objectives are set. The exploratory phase involves collecting data and refining the research questions. The confirmation phase rigorously tests hypotheses using statistical techniques. Validation activities ensure the reliability and validity of the findings, such as ensuring accurate measurements and testing the consistency of data collection methods. The findings revealed that user satisfaction with the Smart Selangor Parking app is most influenced by learnability, which ensures ease of use and minimises distractions. Helpfulness also plays a significant role, as providing relevant information enhances user satisfaction. Emotional attachment, controllability, and efficiency were also factors, though efficiency had the least impact. Overall, this study emphasises the importance of usability, clear information, and user-centred design in enhancing satisfaction. This study contributes to understanding factors influencing user satisfaction with mobile parking payment applications in Malaysia, offering valuable insights for developers and policymakers. It highlights the importance of usability, user perceptions, and barriers to adoption, guiding future research and enhancing the effectiveness of mobile payment systems for parking.

Keywords: Mobile Payment, Smart Selangor Parking, User Satisfaction

INTRODUCTION

Smartphone ownership has become indispensable worldwide, with significant growth in the number of users. In Malaysia, 78% of the population owned smartphones in 2018, which is expected to rise to over 89% by 2023, surpassing the Asia-Pacific region's 76% adoption rate in 2022 (Smartphones in Malaysia, MyGov, 2024). However, many users underutilise smartphones, often sticking to familiar apps despite their broader potential. One practical smartphone application is mobile payments for parking, which involves using smartphones to pay for parking spots via QR codes, NFC, or specific apps. Selangor, aiming to become ASEAN's premier smart state by 2025, launched the Smart Selangor initiative in 2016, emphasising digital governance, economy, community, and infrastructure. As part of the Smart Community pillar, hybrid payment systems were introduced, including the Smart Selangor Parking (SSP) app launched in 2018 to streamline parking payments (Cashless Parking Catches on – Smart Selangor, Smart Selangor, 2022).

The SSP app facilitates online payments for parking and summonses, encourages digital transactions, enhances the user experience, improves enforcement efficiency, and reduces administrative burdens. It also benefits drivers by offering convenience, security, and sustainability. For instance, users can pay for and extend parking remotely, avoid fines, and receive digital receipts, reducing waste and carbon footprint. By June 2023, the app had surpassed 2 million downloads in Selangor, which has a population of 5.8 million (Abd Wahab, 2023). Parking challenges in Malaysia include malfunctioning meters, limited coupon agents, and adverse weather. The SSP app addresses these issues by providing a hassle-free, eco-friendly digital alternative. Research reveals various factors influencing customers' willingness to adopt mobile payment systems. For instance, Adi Soemarmo Airport in Indonesia operates a dual-mode payment system (combining cash and cashless options). However, users still face challenges such as insufficient cash and large denominations (Dwiyana & Muqorobin, 2021). Parking applications like Selangor's SSP aim to address these issues by streamlining parking payments, saving time, and reducing congestion.

Parking apps offer several advantages. Enforcers can verify payments efficiently, and the apps provide online data for better urban planning and parking management. However, despite the SSP app's 2 million downloads, many users still prefer traditional payment methods or neglect paying parking fees altogether, leading to summonses. To address this, the Shah Alam City Council, among others, launched campaigns offering reduced fines, such as a 70% discount on selected compounds, to encourage compliance. SSP app utilisation challenges include internet connectivity issues, smartphone accessibility, app reliability, and user compliance. Furthermore, user dissatisfaction is evident, with the app receiving a rating of 3.3 stars on Google Play and only 1 star on the Apple App Store, highlighting issues such as instability, poor functionality, and a lack of user-friendliness (Google Play, n.d.; App Store, Smart Selangor, 2018). Litman (2023) also noted broader parking issues, including inadequate user information and poor management, exacerbating user dissatisfaction. Kawamoto et al. (2023) emphasise that analysing key elements of mobile payment services is crucial to improving user acceptance and maintaining a competitive edge. Continuous innovation is necessary for businesses to enhance user satisfaction and overcome the dominance of traditional payment methods. The research aims to assess user satisfaction with the SSP app in Selangor, aligning with the state's goal of becoming a liveable smart state by fostering digital adoption.

LITERATURE REVIEW

User satisfaction refers to the degree to which a product or service meets or exceeds user expectations, contributing to their well-being and comfort (Hemmati, 2024). Key determinants include usability, functionality, support, and user acceptance, which are crucial for evaluating products like parking applications. Usability involves intuitive interfaces and workflows, while functionality pertains to the reliability and effectiveness of features. Customer support responsiveness also significantly influences user experience. Additionally, user satisfaction incorporates emotional and cognitive aspects, such as product efficiency, and assesses platforms based on speed, stability, and responsiveness (Trymata & Trymata, 2024; Koch & Koch, 2024).

Businesses can measure user satisfaction using surveys, reviews, Net Promoter Scores (NPS), and Customer Effort Scores (CES), which gauge how easily users interact with the product. High satisfaction levels foster loyalty, retention, and advocacy, ensuring business growth and success (Trymata & Trymata, 2024). Previous research has explored various methods for assessing user satisfaction, focusing on factors such as ease of use, trust, and confirmation of expectations. Table 1 summarises key studies highlighting different approaches to measuring and analysing user satisfaction.

Table 1

Summary of Previous Research Studies

Researchers and Research Title	Objective	Result	Limitation
Dwiyana and Muqorobin (2021)	To provide the best solution for airport parking payment systems.	AINO is an essential part of the Solo Airport parking payment system. Many survey participants reported that they had completed transactions and that everything worked practically and efficiently using this system.	This study does not consider other factors that may affect the effectiveness of cashless payment systems, such as consumer awareness of the technology.
Negmu (2021)	To investigate the impact of mobile app quality on user satisfaction in the Ethiopian e-hailing taxi service industry.	Creating a clear link between the two advances knowledge of the relationship between user satisfaction and mobile app quality. The results support the theory that, over time, the application quality dimension may surpass client expectations, leading to increased service usage frequency.	The research relied on self-reported data, which may introduce biases or inaccuracies in customer responses.
Fatima et al. (2021)	To empirically evaluate the proposed	The adoption of mobile payments is strongly	The research relied on cross-sectional data,

	modification of UTAUT2 by adding perceived value as an influencing construct.	correlated with perceived value.	capturing users' perceptions at one point, which may not reflect changes in attitudes or behaviour over time.
Abdellah and Fernandez (2021)	To examine the extent to which Generation Y in Johor can accept electronic wallets. The study's research factors were used in the TAM model.	The study indicates that Gen-Y users utilise electronic wallet services to facilitate more straightforward purchases, and most users believe these apps are reliable. Every variable significantly influences the behavioural intentions of Johorean consumers regarding electronic wallets.	The study only considered Millennials (Generation Y), excluding older and younger generations, who may have different attitudes toward e-wallet usage.
Shin and Lee (2021)	To determine the elements influencing consumers' acceptance of NFC mobile wallets in the U.S. and Korean markets. The model adds new constructs for credibility and service intelligence to the UTAUT2 model.	The study findings demonstrate a strong positive correlation between users' behavioural intention to use NFC mobile wallets and their expectations regarding habit, performance, credibility, and service intelligence.	The research relied on self-reported data, which could introduce bias in user perceptions.

These studies emphasise the importance of usability, perceived value, and technological innovation in influencing user satisfaction and acceptance of parking and e-wallet applications.

Theories of Customer Satisfaction

Theories of customer satisfaction explain how and why customers form judgments about their experiences. Prominent frameworks include the Expectancy-Disconfirmation Paradigm (EDP), which evaluates satisfaction based on the gap between expectations and performance; the Value-Percept Theory, which focuses on the perceived value of the product or service; and Equity Theory, which considers the fairness of exchanges between users and providers (Yüksel & Yüksel, 2008).

The Expectancy-Confirmation Theory (ECT) helps explain user satisfaction with technology and services, such as the Smart Selangor Parking (SSP) app. The theory involves several steps:

- Expectations – Users expect the app to be efficient, easy to use, and helpful.
- Perceived Performance – After using the app, users assess its performance.
- Comparison – Users compare their expectations with their experience. If the app meets or exceeds expectations, confirmation occurs. If it falls short, disconfirmation happens.
- Satisfaction – Positive confirmation increases satisfaction, while negative disconfirmation lowers it.
- Continuance Intention – Satisfied users are more likely to continue using the app and recommend it to others.

Recent studies highlight the importance of trust in ECT. AlSokkar et al. (2024) proposed a trust-based model demonstrating how expectations influence user satisfaction and repurchase intent. Additionally, a review from Newcastle University (n.d) explains how ECT evolved from consumer research, emphasising how expectations before purchase influence satisfaction afterwards. These findings suggest that trust is crucial to user satisfaction with digital services, including parking applications like SSP.

The Value-Percept Theory posits that user satisfaction stems from the perceived value of a product or service relative to the user's expectations. Satisfaction is determined by the disparity between the user's value and the perceived performance. Smaller gaps lead to higher satisfaction, while more significant gaps cause dissatisfaction. Research by Zhao et al. (2023) highlights how "context value," such as functional and monetary convenience, positively influences overall satisfaction. Similarly, Miller (2023) underscores how the Value-Percept Theory recognises both external (e.g., affordability) and intrinsic (e.g., usability) factors affecting satisfaction. These principles suggest that the SSP app can enhance satisfaction by delivering functional efficiency and an enjoyable user experience. While ECT focuses on expectation alignment, Value-Percept Theory emphasises how users judge satisfaction based on the perceived worth of a product relative to their needs.

Theories of Service Quality and Customer Satisfaction

Smartphone app usability is integral to an app's success and is characterised by several components: learnability, which ensures tasks are easily performed on the first attempt; efficiency, measuring the time or steps required to complete tasks; memorability, which allows users to return without relearning features; error recovery, ensuring users can recover smoothly from issues; and satisfaction, capturing overall user experience through surveys and feedback. Practical considerations include technical criteria, such as battery life, environmental factors and social elements like privacy and personalisation.

Customer satisfaction is often evaluated through perceived quality, value, user experience, and customer service. Perceived quality, encompassing performance, design, and durability, directly correlates with satisfaction, as Hoque's (2019) findings demonstrate. Perceived value, measuring worth relative to cost, significantly influences satisfaction, according to Smith (2020). While important, customer expectations may not consistently correlate with satisfaction, as Hoque (2019) noted, suggesting that other factors may have a more significant impact. User experience, which involves ease of use and interface design, is a key predictor of satisfaction, as highlighted by Yazdanparast and Tran (2015). Quality customer service further enhances satisfaction and loyalty, reinforcing its importance in the user's experience.

Theoretical Review of User Satisfaction

This study explores user satisfaction with mobile applications, emphasising customer acceptance and building upon various empirical models that predict user attitudes and intentions. Insights from prior research have revealed diverse influences on satisfaction, ranging from usability and convenience to food quality and pricing. For example, Kedah et al. (2015) focused on loyalty within online booking services, while Ling et al. (2021) highlighted payment security and usability in mobile food delivery apps. Prasetyo et al. (2021) found that usability did not significantly impact user intention during the COVID-19 pandemic, as it was influenced by prior experience. Negmu (2021) demonstrated the effectiveness of the SUMI model in measuring satisfaction with ride service apps.

The SUMI model evaluates satisfaction across five dimensions: efficiency, addressing speed and task completion; affect, capturing emotional responses such as enjoyment or frustration; helpfulness, assessing the quality of help features; control, reflecting perceived user autonomy; and learnability, focusing on ease of proficiency development.

This study applies the SUMI model to evaluate the usability of the SSP app. Users complete SUMI questionnaires after using the app, with the data analysed and benchmarked to identify strengths and areas for improvement. This structured approach ensures usability enhancements align with user expectations and fosters adoption.

Related Factors

This study adopts a theoretical conceptual framework based on the work of Furlong et al. (2013), which identifies five key factors influencing user satisfaction: efficiency, Affection, controllability, learnability, and helpfulness. These factors serve as the foundation for hypothesis development and guide the evaluation of user experiences with the Smart Selangor Parking (SSP) application.

1. Efficiency refers to how quickly and effortlessly users can achieve their goals within the application. A system that minimises the time and steps required enhances user satisfaction, leading to the first hypothesis:
2. Affection considers users' emotional response when interacting with the application. A positive and enjoyable user experience enhances overall satisfaction, forming the basis for the second hypothesis:
3. Controllability relates to the user's ability to manage and navigate the application effectively. Features such as customisable settings and intuitive interfaces contribute to a sense of autonomy, resulting in the third hypothesis:
4. Learnability measures how easily users can understand and adapt to the application's interface and functionality. A well-designed system reduces the learning curve, supporting the fourth hypothesis:
5. Helpfulness assesses the availability of support resources such as user guides, technical assistance, and troubleshooting features. Practical assistance reduces user frustration and improves satisfaction, forming the final hypothesis.

Related Hypotheses

The hypotheses for this study are:

H1 Efficiency has a significant influence on user satisfaction with the SSP application.

H2 Affection has a significant influence on user satisfaction with the SSP application.

H3 Controllability has a significant influence on user satisfaction with the SSP application.

H4 Learnability has a significant influence on user satisfaction with the SSP application.

H5 Helpfulness has a significant influence on user satisfaction with the SSP application.

RESEARCH METHODOLOGY

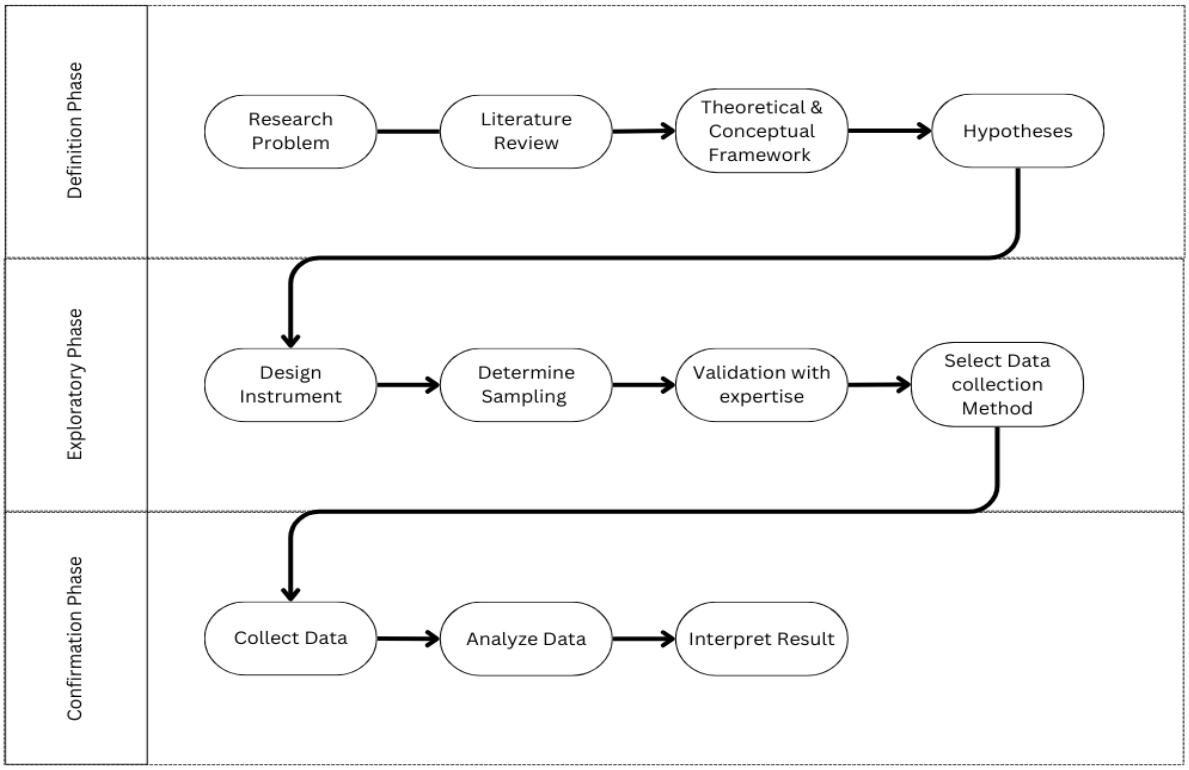
The research design for this study adopts a quantitative approach to assess user satisfaction with the Smart Selangor Parking (SSP) app. This study follows three key phases:

- Definition Phase – Establishing research objectives and key variables.
- Exploratory Phase – Collecting and analysing initial data to identify trends.
- Confirmation Phase – Validating findings through statistical analysis.

Figure 1 illustrates the overall research design, outlining each phase and its role in guiding this study.

Figure 1

Research Design



During the definition phase, the research problem, objectives, and questions are established, followed by a review of existing literature to identify knowledge gaps. The exploratory phase involves collecting preliminary data through qualitative and quantitative surveys and interviews. This phase helps refine the research questions and hypotheses, with key validation activities focused on ensuring the reliability and credibility of the findings, such as construct validity, content validity, and reliability tests. The final confirmation phase tests the hypotheses, utilising statistical techniques such as Confirmatory Factor Analysis (CFA) and reliability measures like Cronbach's Alpha.

The research instruments for this study consist of a translated questionnaire tailored to the context of the SSP app. The questionnaire includes two sections: demographic profiles and specific items related to this study's constructs. These constructs are based on models of user satisfaction, and the items were adapted from previous research on technology acceptance and customer satisfaction. The Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree), was used to facilitate data collection and analysis.

To ensure the validity and reliability of the instrument, expert feedback was sought from two specialists in entrepreneurship and research methods. This resulted in significant improvements to the questionnaire, including adjustments to grammar, question order, and layout. The feedback refined the questions, making them more suitable for this study's target population. After revising the instrument, a pilot test was conducted with 35 respondents to assess the questionnaire's effectiveness. The results showed no significant issues in understanding the survey, and reliability was assessed using Cronbach's alpha, with most constructs achieving values between 0.72 and 0.98, indicating good reliability.

The population targeted for this study consists of parking spot users aged 18 and above in Selangor, Malaysia. A sample size was calculated using Chua's (2011) guidelines, and a simple random sampling technique was employed. The data were collected through online surveys distributed via email and social media platforms, including Telegram, WhatsApp, Facebook, LinkedIn, and Instagram. The survey remained accessible for one month to ensure adequate participation.

Data was analysed using the Statistical Package for the Social Sciences (SPSS). Descriptive analysis summarised the sample's demographic characteristics, while Pearson's correlation analysis examined the relationships between variables. Additionally, linear regression analysis was used to predict the value of the dependent variable based on related independent variables. This combination of descriptive and inferential statistical methods allowed this study to draw meaningful conclusions regarding user satisfaction with the SSP app and its influencing factors.

RESEARCH FINDINGS

The online survey from February 16, 2023, to June 15, 2023, was distributed amongst personal and program-based contact databases, entrepreneurial portals, and social media groups with 384 usable responses.

Key Demographic Insights

Analysis revealed that most respondents fell within the 30–49 age range, comprising 38 per cent aged 30–39 and 37 per cent aged 40–49. This age group demonstrated active engagement with digital tools, reflecting their readiness to adopt new technologies such as e-wallet applications. In comparison, younger users aged 20–29 formed only 7 per cent, while senior age groups (50 years and above) represented a smaller share. Previous studies, such as those by Farag et al. (2007) and Burns et al. (2013), support this observation, highlighting middle-aged consumers' digital adaptability and openness. The gender distribution revealed a significant skew, with 71% female respondents compared to 29% male respondents. Women preferred using the SSP app for parking payments, emphasising convenience and ease of use, particularly when attending meetings or operating from indoor spaces. Male respondents, on the other hand, tended to use the app less frequently, often relying on it during family outings or when carrying equipment. Table 2 presents a detailed demographic breakdown, offering insights into the user base and parking behaviours.

Table 2

Demographic Analysis

Description		Frequency	Percentage
Age	Below 19 years	3	0.8%
	20-29 years	27	7.0%
	30-39 years	145	37.8%
	40-49 years	143	37.2%
	50-59 years	48	12.5%
	Above 60 years	18	4.7%
Gender	Male	112	29.2%
	Female	272	70.8%
Employment status	Employed	113	29.2%
	Self-Employed	221	57.6%
	Unemployed	50	13.0%

Usage and Frequency of the SSP App

Most respondents (95.1 per cent) had used the SSP app, aligning with this study's focus on user satisfaction among active users. Usage frequency showed varied patterns, with 45 per cent using the app as needed and 25 per cent using it monthly. Daily and weekly usage rates were lower, at 13% and 12%, respectively, reflecting the context-specific nature of its application. Table 3 provides a detailed breakdown of these usage patterns and frequency trends.

Table 3

Usage and Frequency of the SSP App

Description		Frequency	Percentage
How frequently do you use Smart Selangor Parking	At least once a day	49	12.8%
	At least once a week	48	12.5%
	At least once a month	95	24.7%
	If needed	173	45.1%
	Not Applicable	19	4.9%
For how long have you been using Smart Selangor Parking?	Less than 1 year	16	4.2%
	1-2 years	147	38.3%
	2-3 years	109	28.4%
	More than 3 years	93	24.2%
	Not Applicable	19	4.9%

Factors Influencing User Satisfaction

Respondents found the application efficient, particularly in providing real-time information. However, initial use posed challenges due to multiple steps and occasional errors, reflecting a need for streamlined processes. Affection-related aspects were rated positively, with users appreciating the logical menu layout, appealing icon design, and overall comfort during use, emphasising the importance of aesthetics in user engagement.

Controllability was deemed satisfactory, as users felt tasks were performed quickly and were under their control. However, unexpected app stoppages raised concerns about reliability, suggesting potential issues with the app, device compatibility, or internet connectivity.

Learnability scored highly, with respondents agreeing that the application was easy to learn and provided clear information. Features such as local language support and enhanced accessibility, enable users to familiarise themselves with the app.

Helpfulness showed mixed results. While most users managed parking payments independently, occasional insufficient on-screen information limited satisfaction. This indicates room for improvement in delivering comprehensive details during use.

Overall, user satisfaction was exceptionally high, with respondents valuing the app's ability to simplify daily tasks, reduce mental effort, and offer an enhanced user experience. Many expressed strong intent to continue using the SSP app over other alternatives. Despite its success, incremental updates and optimisations could further enhance functionality and user trust.

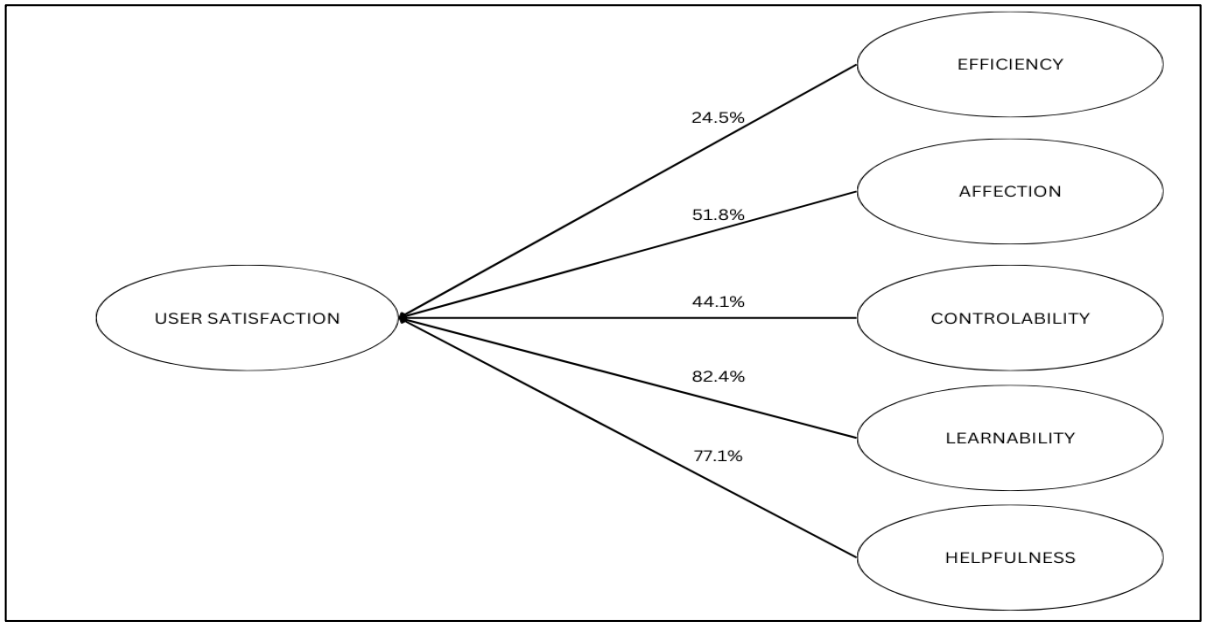
Pearson Correlation and Hypothesis Testing

The Pearson correlation analysis revealed a significant relationship between various factors and user satisfaction with the Smart Selangor Parking (SSP) application. The correlation was measured across five independent variables: Efficiency, Affection, Controllability, Learnability, and Helpfulness, all showing varying degrees of correlation with user satisfaction. Learnability demonstrated the strongest positive correlation (r=0.824), followed by helpfulness (r=0.771), Affection (r=0.518), controllability (r=0.441), and efficiency (r=0.245). The strength of these correlations underscores the significant contribution of these factors to user satisfaction with the app.

As shown in Figure 2, the highest contributing factor to user satisfaction is learnability (82.4%), followed by helpfulness (77.1%), Affection (51.8%), controllability (44.1%), and efficiency (24.5%).

Figure 2

The relationship of factors to user satisfaction using SSP



Learnability emerged as the most significant factor in achieving high user satisfaction, with 82.4% of users reporting that they could easily understand and navigate the app's features quickly. This suggests that the app's intuitive design and clear information presentation are critical in enhancing the user experience. Helpfulness was also a substantial contributing factor (77.1%), with users indicating that the app effectively resolves parking payment issues, although some information gaps were noted.

Affection, with a correlation of 51.8%, also had a positive impact, highlighting the importance of user-friendly aesthetics, such as an organised menu and an eye-catching icon. Controllability (44.1%) and efficiency (24.5%) showed weaker correlations, with efficiency being the lowest priority for user satisfaction, although it is still essential for providing accurate, real-time information. However, some users reported initial confusion when using the app due to multiple steps and occasional mistakes.

In conclusion, while Learnability and Helpfulness are the most impactful factors contributing to user satisfaction, Efficiency and Controllability, though important, require improvement to enhance the overall user experience with the SSP app.

Table 4 provides a detailed statistical summary of these correlations, offering insights into the key drivers of user satisfaction with the SSP app.

Table 4

Pearson Correlation Analysis

		E	**A**	**C**	**L**	**H**	**The U.S.**
E	Pearson Correlation	1	.391**	.426**	.125*	.431**	.245**
	Sig. (2-tailed)		.000	.000	.017	.000	.000
	N	365	365	365	365	365	365
A	Pearson Correlation	.391**	1	.883**	.501**	.269**	.518**
	Sig. (2-tailed)	.000		.000	.000	.000	.000
	N	365	365	365	365	365	365
C	Pearson Correlation	.426**	.883**	1	.250**	.290**	.441**
	Sig. (2-tailed)	.000	.000		.000	.000	.000
	N	365	365	365	365	365	365
L	Pearson Correlation	.125*	.501**	.250**	1	.673**	.824**
	Sig. (2-tailed)	.017	.000	.000		.000	.000
	N	365	365	365	365	365	365
H	Pearson Correlation	.431**	.269**	.290**	.673**	1	.771**
	Sig. (2-tailed)	.000	.000	.000	.000		.000
	N	365	365	365	365	365	365
US	Pearson Correlation	.245**	.518**	.441**	.824**	.771**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	
	N	365	365	365	365	365	365

***. Correlation is significant at the 0.01 level (2-tailed).*
**. Correlation is significant at the 0.05 level (2-tailed).*

Hypothesis Test Result

The investigation into the Smart Selangor Parking (SSP) app reveals that efficiency, Affection, controllability, learnability, and helpfulness significantly impact user satisfaction. Linear regression analysis reveals a statistically significant relationship between these independent variables and user satisfaction, with all predictor coefficients significant.

Learnability is the most influential factor, accounting for a substantial portion of user satisfaction. Users find the app intuitive and easy to learn, greatly enhancing their overall experience. Helpfulness also plays a critical role, reflecting the app's ability to simplify parking tasks without external assistance.

Affection, controllability, and efficiency have moderate to lower impacts but remain significant. Affection highlights the importance of logical organisation and appealing design, while controllability emphasises the app's reliability and user control during operation. Though the least influential, efficiency still contributes by providing accurate real-time information, albeit with challenges during initial use.

The hypothesis testing result presented in Table 5 confirms that all five factors significantly impact user satisfaction, validating their inclusion in the regression model. The findings underscore the need for continuous improvement, particularly in efficiency, to further enhance user satisfaction.

Table 5

Hypothesis Test Result

	Alternate Hypothesis	Result
H1	Efficiency has a significant influence on user satisfaction with Smart Selangor Parking.	Significant
H2	Affection has a significant impact on user satisfaction with Smart Selangor Parking.	Significant
H3	Controllability has a significant influence on user satisfaction with Smart Selangor Parking.	Significant
H4	Learnability has a significant impact on user satisfaction with Smart Selangor Parking.	Significant
H5	Helpfulness has a significant impact on user satisfaction with Smart Selangor Parking.	Significant

CONCLUSION

This study on user satisfaction with the Smart Selangor Parking (SSP) app highlights several key findings. This study identifies user satisfaction factors, including learnability, helpfulness, Affection, controllability, and efficiency. Learnability emerged as the most significant factor, contributing to 82.4% of user satisfaction, followed by helpfulness (77.1%), Affection (51.8%), controllability (44.1%), and efficiency (24.5%). These findings were derived using linear regression and descriptive analysis, which analysed the relationships between these factors and user satisfaction.

This study also explored how these factors influence the app's usage. Learnability, which relates to how easily users can understand and navigate the app, was found to have the most substantial impact on satisfaction. Helpfulness and Affection followed closely, reflecting the app's ability to assist users and its user-friendly design. Controllability and efficiency had a more moderate effect, with efficiency being the least influential but still significant. This study shows that the SSP app enhances productivity through its convenient parking payment method across Selangor's 12 local authorities. The functions are seen as faster and more convenient than traditional methods, aligning with previous models of user satisfaction, which emphasise ease of use, perceived enjoyment, and informativeness.

Further studies could expand the theoretical framework by adding other variables such as perceived ease of use, enjoyment, risk, and environmental awareness. Additionally, understanding the reasons behind non-adoption is vital, and qualitative methods like interviews and focus groups could help uncover more profound insights. Finally, expanding the sample size and incorporating diverse geographical areas would improve this study's statistics.

ACKNOWLEDGMENT

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

REFERENCES

Abd Wahab, D. (2023, June 8). *Smart Parking app records 2.6 million users, reducing paper use — Exco*. Selangor Journal. https://selangorjournal.my/2023/06/smart-parking-app-records-2-6-mln-users-reduce-use-of-paper-exco/

Abdellah, R. H. B., and Fernandez, D. (2021). Faktor yang mendorong generasi Y dalam penggunaan dompet elektronik. *Research in Management of Technology and Business, 2*(1), 47–59.

About us – Smart Selangor. (n.d.). https://www.smartselangor.com.my/about-us/

Academy, E., and Academy, E. (2024, February 28). *Why is a pilot study important in research?* Enago Academy. https://www.enago.com/academy/pilot-study-defines-a-good-research-design/#:~:text=Importance%20of%20Pilot%20Study%20in,may%20negatively%20affect%20your%20project.

Ahmed, H. M., Alkhateeb, N. E., Shabila, N. P., & Ahmad, A. A. (2024). Research practice, satisfaction, motivation, and challenges among university academics in Kurdistan Region of Iraq. *PLoS ONE, 19*(4), e0302540. https://doi.org/10.1371/journal.pone.0302540

Alalwan, A. A., Dwivedi, Y. K., & Rana, N. P. (2017). Factors influencing adoption of mobile banking by Jordanian bank customers: Extending UTAUT2 with trust. *International Journal of Information Management, 37*(3), 99–110. https://doi.org/10.1016/j.ijinfomgt.2017.01.002

AlSokkar, A. a. M., Law, E. L., AlMajali, D. A., Al-Gasawneh, J. A., and Alshinwan, M. (2024). An Indexed Approach for Expectation-Confirmation Theory: A Trust-based Model. *Electronic Markets, 34*(1). https://doi.org/10.1007/s12525-024-00694-3

App Store. (2018, April 23). *Smart Selangor Parking.* https://apps.apple.com/us/app/smart-selangor-parking/id1369995577

Badshah, S., Khan, A. A., Hussain, S., & Khan, B. (2020). What users think about the usability of smartphone applications: a diversity-based empirical investigation. *Multimedia Tools and Applications, 80*(6), 9177–9207. https://doi.org/10.1007/s11042-020-10099-x

Bank Negara Malaysia. (n.d.). Payment Systems in Malaysia. https://www.bnm.gov.my. https://www.bnm.gov.my/types-of-payment-systems#:~:text=E-money%20is%20a%20payment,goods%20and%20services%20from%20merchants.

Boxall, P. (2013). *Twenty-First-Century fiction*. https://doi.org/10.1017/cbo9780511902727

Burns, A., Veeck, A., & Bush, R. (2013). *Marketing research (7th ed.)*. Pearson.

Cabrera-Nguyen, P. (2010). Author Guidelines for reporting scale development and validation results in the Journal of the Society for Social Work and Research. *Journal of the Society for Social Work and Research, 1*(2), 99–103. https://doi.org/10.5243/jsswr.2010.8

Cashless parking Catches on – Smart Selangor. (2022, February 28). https://www.smartselangor.com.my/2022/02/28/cashless-parking-atches-on/

Cavada, M., Hunt, D. V. L., and Rogers, C. D. F. (Eds.). (2014). Smart cities: contradicting definitions and unclear measures. *MDPI.* https://doi.org/10.3390/wsf-4-f004

Chua, Y. (2011). *Kaedah dan statistik penyelidikan: kaedah penyelidikan*. In McGraw-Hill Education eBooks. http://eprints.um.edu.my/10246/

Dwiyana, D., and Muqorobin, M. (2021). Analysis of Adi Soemarmo Solo Airport Parking Payment System. *International Journal of Computer and Information System (IJCIS),*

2(1), 1–3. https://doi.org/10.29040/ijcis.v2i1.21

eBusiness@Newcastle. (n.d.). Expectation Confirmation Theory - TheoryHub - Academic theories reviews for research and TandL. https://open.ncl.ac.uk/theories/14/expectation-confirmation-theory/

Farag, S., Schwanen, T., Dijst, M., & Faber, J. (2007). Shopping online and/or in-store? A structural equation model of the relationships between e-shopping and in-store shopping. *Transportation Research Part a Policy and Practice, 41*(2), 125–141. https://doi.org/10.1016/j.tra.2006.02.003

Fatima, T., Kashif, S., Kamran, M., & Awan, T. M. (2021). Examining Factors Influencing Adoption of M-Payment: Extending UTAUT2 with Perceived Value. Research Gate. https://www.researchgate.net/publication/352847396_Examining_Factors_Influencing_Adoption_of_M-Payment_Extending_UTAUT2_with_Perceived_Value

Furlong, M. J., You, S., Renshaw, T. L., Smith, D. C., and O'Malley, M. D. (2013). Preliminary development and validation of the Social and Emotional Health Survey for secondary school students. *Social Indicators Research, 117*(3), 1011–1032. https://doi.org/10.1007/s11205-013-0373-0

GceLab. (n.d.*). Smart Parking Solutions: Revolutionising urban mobility and convenience*. https://www.gcelab.com/blog/smart-parking-solutions-revolutionizing-urban-mobility-and-convenience

Guide On: Parking Services (2022nd ed., Vol. 2). (2022). Royal Malaysian Customs Department, Sales and Service Tax Division, Putrajaya. https://mysst.customs.gov.my/assets/document/Industry%20Guides/GI/Guide%20on%20Parking%20Services%2020220110.pdf

Gunnell, M. (2024, May). *Mobile Application.* https://www.techopedia.com/definition/2953/mobile-application-mobile-app

Gupta, R., Kapoor, C., & Yadav, J. (2020). Acceptance towards digital payments and improvements in the cashless payment ecosystem. *2020 International Conference for Emerging Technology (INCET).* https://doi.org/10.1109/incet49848.2020.9154024

Hemmati, R. (2024). District energy systems. In Elsevier eBooks (pp. 201–259). https://doi.org/10.1016/b978-0-443-23728-7.00009-6

Hinkin, T. R. (1998). A brief tutorial on the development of measures for use in survey questionnaires. *Organisational Research Methods, 1*(1), 104–121. https://doi.org/10.1177/109442819800100106

Hollands, R. (2008). Will the real smart city please stand up? City: Analysis of Urban Trends. Research Gate. https://doi.org/10.1080/13604810802479126

Hoque, S. (2019). *An empirical study on customer satisfaction: Mobile phone users in an emerging market*. www.academia.edu. https://www.academia.edu/96480822/An_empirical_study_on_customer_satisfaction_Mobile_phone_users_in_an_emerging_market

Husain, A., Varshney, T., Bhatnagar, S., and Satsangi, A. K. (2019). E-Satisfaction towards cashless Transactions: Re-Tests model for e-Tourism. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3376618

Kagan, J. (2024, July 1). What is a digital wallet? Investopedia. https://www.investopedia.com/terms/d/digital-wallet.asp

Kedah, Z., Ismail, Y., Haque, A. K. M. A., & Ahmed, S. (2015). Key success factors of Online food ordering Services: *An Empirical study*. *Malaysian Management Review, 50*(2). http://ur.aeu.edu.my/529/1/Key%20Success%20Factors%20of%20Online%20Food%20Ordering%20Services-2-19.pdf

Kim, S. C., Yoon, D., & Han, E. K. (2014). Antecedents of mobile app usage among smartphone users. *Journal of Marketing Communications, 22*(6), 653–670. https://doi.org/10.1080/13527266.2014.951065

Koch, R., and Koch, R. (2024, August 15). *Reason: User satisfaction: Key strategies for improving customer experience*. https://www.resonio.com/blog/user-satisfaction/

Koestler Parapsychology Unit Study Registry. (2018, January 27*). Exploratory and Confirmatory Analyses.*https://www.koestler-parapsychology.psy.ed.ac.uk/Documents/explore_confirm.pdf

Ling, G. M., Tiep, H. S., and Er, N. Z. (2021). Customer Satisfaction Towards Mobile Food Delivery Apps during COVID-19 Pandemic. *GATR Journal of Management and Marketing Review*, *6*(3), 191–201. https://doi.org/10.35609/jmmr.2021.6.3(5

Litman, T. (2023). *Parking management : strategies, evaluation and planning*. Victoria Transport Policy Institute. https://www.vtpi.org/park_man.pdf

Locke, E. A. (1976). The nature and causes of job satisfaction. Research Gate, 1297–1349. https://ci.nii.ac.jp/naid/10016045566

Miller, K. (2023, August 10). *Understand Employee Satisfaction with Value-Percept Theory. Crowjack*. https://crowjack.com/blog/strategy/motivational-theories/value-percept-theory

MyGov is the official portal of the government of Malaysia. (n.d.). https://www.malaysia.gov.my/portal/content/30629

Negmu, H. (2021). *The Effect Of Perceived Quality Of Mobile Applications On Customer Satisfaction In The Case Of Ride Service Providers In Addis Ababa*. http://repository.smuc.edu.et/handle/123456789/6157

O'Malley, G., Dowdall, G., Burls, A., Perry, I. J., & Curran, N. (2014). Exploring the usability of a mobile app for adolescent obesity management. *JMIR Mhealth and Uhealth*, *2*(2), e29. https://doi.org/10.2196/mhealth.3262

Peterson, T., and Wezel, R. V. (2016). *The evolution of digital and mobile wallets*. https://www.paymentscardsandmobile.com/wp-content/uploads/2016/10/The-Evolution-of-Digital-and-Mobile-Wallets.pdf

Prasetyo, Y. T., Tanto, H., Mariyanto, M., Hanjaya, C., Young, M. N., Persada, S. F., Miraja, B. A., and Redi, A. a. N. P. (2021). Factors Affecting Customer Satisfaction and Loyalty in Online Food Delivery Service during the COVID-19 Pandemic: Its Relation with Open Innovation. *Journal of Open Innovation Technology Market and Complexity*, *7*(1), 76. https://doi.org/10.3390/joitmc7010076

Rahim, N. M., and Yunus, N. F. a. M. (2021). Consumer satisfaction towards e-Hailing food delivery services during the Movement Control Order period: A case study in Selangor. *Journal of Science and Mathematics Letters, 9*(Special), 1–9. https://doi.org/10.37134/jsml.vol9.sp.1.2021

Rogers, P. (2024). Best practices for your confirmatory factor analysis: A JASP and lavaan tutorial. *Behaviour Research Methods.* https://doi.org/10.3758/s13428-024-02375-7

Sekaran, U., and Bougie, J. (2009*). Research Methods for Business : A Skill-Building Approach*

(5th Edition). Research Gate. https://research.tilburguniversity.edu/en/publications/research-methods-for-business-a-skill-building-approach-5th-editi

Shin, S., & Lee, W. (2021). Factors affecting user acceptance for NFC mobile wallets in the U.S. and Korea. *Innovation and Management Review, 18*(4), 417–433. https://doi.org/10.1108/inmr-02-2020-0018

Smart Selangor Parking - Apl di Google Play. (n.d.). https://play.google.com/store/apps/details?id=my.com.lits.smartselangorparkingandhl=msandpli=1

Smith, T. A. (2020). The role of customer personality in satisfaction, attitude-to-brand and loyalty in mobile services. *Spanish Journal of Marketing - ESIC, 24*(2), 155–175. https://doi.org/10.1108/sjme-06-2019-0036

Tak, P., and Panwar, S. (2017). Using UTAUT 2 model to predict mobile app-based shopping: evidence from India. *Journal of Indian Business Research, 9*(3), 248–264. https://doi.org/10.1108/jibr-11-2016-0132

Topic: Smartphones in Malaysia. (2024, June 20). Statista. https://www.statista.com/topics/6615/smartphones-in-malaysia/#topicOverview

Trymata, and Trymata. (2024, August 29*). Trymata: What is User Satisfaction? Definition, Metrics and Best Practices - Trymata*. https://trymata.com/blog/what-is-user-satisfaction/

Unlocking Urban Mobility: Exploring the impact of smart parking solutions on city residents | Modii. (n.d.). https://www.modii.co/insights/unlocking-urban-mobility-exploring-the-impact-of-smart-parking-solutions-on-city-residents

Venkatesh, N., Thong, N., and Xu, N. (2012). Consumer Acceptance and use of Information technology: Extending the unified theory of acceptance and use of technology. *MIS Quarterly*, *36*(1), 157. https://doi.org/10.2307/41410412

Yazdanparast, A., and Tran, G. A. (2015). Mobile Phone Satisfaction: An examination of antecedents and consequences. In Developments in marketing science: *Proceedings of the Academy of Marketing Science* (pp. 89–90). https://doi.org/10.1007/978-3-319-11815-4_29

Yeap, A. (2019, November 29). *The mobile app offers an easier method to pay for parking in Taiping. The Star*. https://www.thestar.com.my/metro/community/2015/12/07/mobile-app-offers-easier-method-to-pay-for-parking-in-taiping/

Yüksel, A., and Yuksel, F. (2008). Customer satisfaction: Conceptual issues Consumer Satisfaction Theories: A Critical review. Researchgate. https://www.researchgate.net/publication/258180675_Customer_Satisfaction_Conceptual_Issues_Consumer_Satisfaction_Theories_A_Critical_Review

Zarmpou, T., Saprikis, V., Markos, A., & Vlachopoulou, M. (2012). Modelling users' acceptance of mobile services. *Electronic Commerce Research, 12*(2), 225–248. https://doi.org/10.1007/s10660-012-9092-x

Zhao, J., Wang, L., Wang, G., Chen, H., Wang, B., & Zhou, Y. (2023). Understanding continued usage behaviour and value perception in the sharing economy: the case of taxi calling mobile application. Research Square (Research Square). https://doi.org/10.21203/rs.3.rs-2850488/v1

Zikmund, W. G., and Babin, B. J. (2013). *Business Research Methods (9th ed.).* Southwestern.