



# Determinants of Riders' Intention to Use Mobile Parking Applications: Evidence from Kathmandu Valley

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## Abstract

Rapid urbanization and the increasing number of private vehicles have placed immense pressure on existing urban transport infrastructure, making efficient parking management a critical challenge for city authorities. Against a backdrop of acute urban parking scarcity and traffic congestion, this research aims to identify the key determinants of user acceptance of mobile parking application, the primary challenges hindering implementation, and viable managerial solutions to promote the successful deployment of smart parking technology. An explanatory research design was employed, grounded in an extended Technology Acceptance Model (TAM). Data were collected from 411 riders (drivers) across Kathmandu Valley using a structured questionnaire administered via digital and offline channels. The sample was selected using a non-probability convenience sampling technique. Both descriptive statistics and Structural Equation Modeling (SEM) with Partial Least Squares (PLS) were utilized to analyze the data. The results indicate that Perceived Usefulness, Parking App Attributes, Trust in the Parking App, and Social Influence have a significant positive impact on riders' intention to adopt mobile parking applications. Conversely, Perceived Ease of Use was found to have no significant direct effect on behavioral intention, although it positively influences Perceived Usefulness. The study also reveals a critical lack of awareness and trust among potential users, with only 24.09% aware of a previously launched application. Major implementation challenges identified include user distrust, inaccurate digital mapping data, and the absence of real-time tracking systems. Correspondingly, the most endorsed managerial solutions are robust promotional campaigns, precise location information for parking lots, and the integration of reliable online/offline payment systems. The study provides clear directives for application developers to prioritize data accuracy, real-time functionality, and security features. For policymakers and municipal authorities, it underscores the necessity of creating enabling regulations, ensuring data standardization, and acting as a trust anchor to facilitate successful public adoption.

## Introduction

Parking is increasingly recognized as a critical urban resource that plays a vital role in coordinating land use, transportation systems, and revenue generation



for metropolitan communities (Kirschner & Lanzendorf, 2020). Efficient parking management contributes to smoother traffic flow, reduced environmental pollution, and improved urban mobility. With the support of smart parking applications, drivers can significantly reduce the time spent searching for parking spaces, lower fuel consumption, minimize emissions, and alleviate traffic congestion. Furthermore, reduced on-street parking search time increases parking turnover, thereby enhancing municipal revenue generation. The installation of sensors in unauthorized or restricted parking zones, such as areas designated for electric vehicles or individuals with disabilities, also enables the detection of illegal parking and supports enforcement mechanisms (Lin et al., 2017).

Globally, rapid urbanization and economic growth have led to a substantial increase in vehicle ownership, intensifying the demand for limited parking spaces in major cities (Parmar et al., 2020). Insufficient parking infrastructure has resulted in traffic congestion, air pollution, and increased driver frustration. In densely populated urban areas, the scarcity of parking spaces has encouraged parking cruising, where drivers spend excessive time searching for available spots (Shoup, 2006). This issue is further aggravated by poor urban planning and limited land availability, which fail to accommodate the growing number of vehicles (Chen & Liu, 2006). The allocation and management of parking spaces have therefore become essential components of urban transportation planning. Facilities such as offices, commercial centers, and hotels often lack adequate parking capacity to meet demand, emphasizing the need for continuous advancements in parking management systems. The emergence of Internet of Things (IoT) technologies has revolutionized parking solutions by enabling real-time monitoring, reservation, and management of parking spaces through mobile applications (Kalašová et al., 2023). Over time, parking systems have evolved from manual processes to machine-assisted systems, leading to the development of various models, including on-street, off-street, valet, shared, and smart parking systems aimed at enhancing efficiency and user convenience (Lin et al., 2017).

In the context of Nepal, particularly the Kathmandu Valley, transportation challenges have intensified due to rapid urbanization and a sharp rise in vehicle ownership (Pahari et al., 2020). The growing mismatch between vehicle demand and available parking infrastructure has resulted in widespread parking-related issues, especially in central urban areas characterized by mixed residential, commercial, and pedestrian zones. Unorganized and haphazard parking not only disrupts daily mobility but also negatively affects urban aesthetics and residents' quality of life (Thanh & Friedrich, 2017). Parking management thus represents a significant challenge for tourists, residents, government officials, and urban administrators alike. Effective parking management offers multiple benefits, including reduced travel delays, improved traffic flow, and lower environmental pollution (Willson Richard, 2018). Studies suggest that individuals may lose up to ten hours annually searching for parking spaces, particularly during peak hours. Proper parking management can significantly reduce this inefficiency while contributing to environmental sustainability by minimizing idle driving and emissions (Aderamo & Salau, 2013). Addressing the imbalance between rising vehicle demand and limited parking availability is therefore essential for sustainable urban development in Kathmandu Valley (Bhagat, 2017;).

To address these challenges, Smart Parking Systems (SPS) have been introduced to optimize parking capacity and manage traffic flow during vehicle parking processes (Baranovski et al., 2020; Biyik et al., 2021). Mobile parking applications enable users to locate, reserve, and pay for parking spaces using GPS-based technologies, while also allowing parking owners to share available spaces and managers to allocate optimal parking spots efficiently (Yang et al., 2020; Kee &). These systems provide real-time information regarding parking availability, pricing, and location, enhancing user convenience and operational efficiency. Kathmandu Valley, being the most densely populated and rapidly urbanizing region in Nepal, has witnessed a continuous increase in registered vehicles, thereby intensifying parking demand. In response, the local government initiated a Smart Parking System in collaboration with a private firm, PARK KTM, in 2019. However, the initiative failed to achieve its intended objectives due to inadequate public awareness, insufficient research on user needs, and limited assessment of public acceptance of the application. Consequently, understanding public perception, intention to use mobile parking applications, and the factor's influencing adoption has become essential. This study, therefore, aims to examine users' perceptions and behavioural intentions toward mobile parking applications in Kathmandu Valley and to identify the key factors influencing their adoption and use.

## **Theoretical Framework and Hypothesis Formulation**

For this study, different theories have been reviewed such as Technology Acceptance Model (Yang et al., 2020), Theory of Planned Behavior (Yuen et al., 2021), Theory of Reasoned Action (TRA), Unified Theory of Acceptance and Use of Technology (Alghazi et al., 2021;), and Innovation Diffusion Theory (Al-Rahmi et al., 2019; Giovanis et al., 2012). The first theory TAM which is used in this study was developed by Davis (1989), the technological Acceptance Model to explain how people use technology. Perceived usefulness, and Perception of use are the two essential construct of TAM. TAM assumed that computer/technology utilization was determined by behavior intention to use a system, based on numerous ideas and models in the background.

The second theory reviewed in this study is Theory of Reasoned Action (TRA) describes how an innovation, such as new information technology like mobile communication is adopted. The concept of a "Subjective Norm" recognizes the power of different people in influencing conduct; explicitly, it owes others' opinion towards a certain behavior (Oni et al., 2017). The third theory used in this study is Theory of Planned Behavior (TPB) defines intention in terms of three beliefs structure: attitude and behavior control. Theory of Planned Behavior adds two more constructs to the model of "Attitude towards Behavior", influencing "behavioral intention" influencing "behavior". One is "Subjective Norms," defined as perceived social pressure to perform or not to perform the behavior. The other is "Perceived Behavioral Control" defined as perception of the ease or difficulty of performing the behavior of interest (Dilekler et al., 2021).

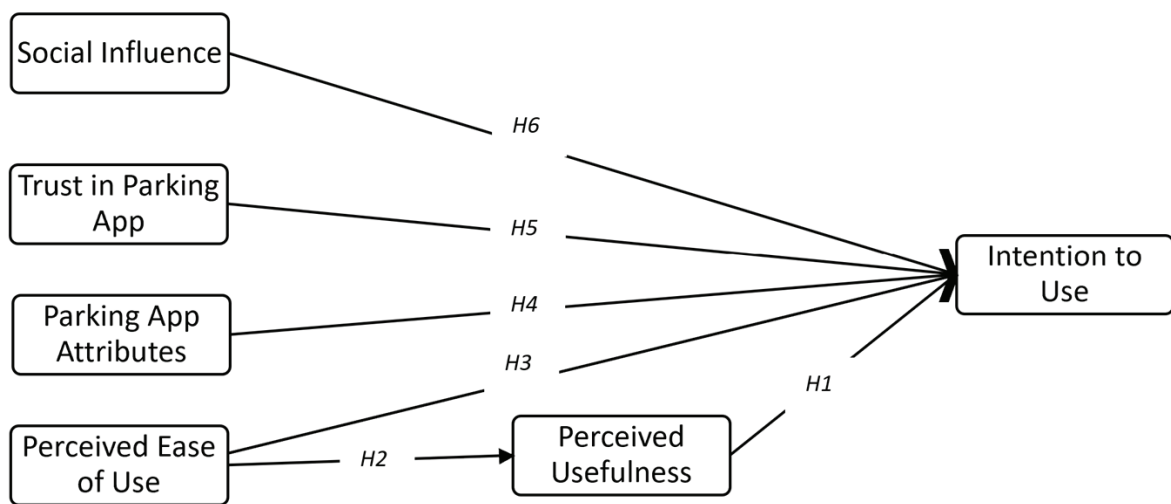
The fourth theory reviewed in this research is Innovation Diffusion Theory (IDT) is concerned with the dissemination of innovations and is made up of two interconnected processes: diffusion and adoption. Technology adoption speed, amount, and degree depend upon five characteristics of the innovation, namely: relative advantage, compatibility, complexity, divisibility or trialability, communicability or observability, and perceived enjoyability. Researchers have utilized the UTAUT model along with other constructs to understand online buying intentions. UTAUT was utilized to investigate critical characteristics that influence Jordanian customers' willingness to embrace and use mobile commerce. The Unified Theory of Acceptance and Use of Technology (UTAUT) was developed in 2003 by Venkatesh, Morris, Davis, and Davis. The fundamental elements of ICT acceptance, as determined by behavioral intention to use the technology and actual usage, are identified by the UTAUT model. Because of its benefits, the Unified Theory of Acceptance and Use of Technology (UTAUT) was adopted for this study (Oye et al., 2014).

From the theories, TAM has been used as it illustrates how a user learns to accept and utilize a technology (Davis et al., 1989) and better understand the information technology (IT) adoption and its usage (Chismar & Wiley-Patton, 2002), which is the best fit for this research. s. TAM indicates that the consumer behavioral intention is the determinant of actual behavior since people usually behave as what they intend to do within the available context and time (Davis et al., 1989; Cheema et al., 2013). TAM's purpose is to provide a generic explanation of the determinants of computer acceptance that is both minimalist and theoretically supported, and that can explain user behavior over a wide range of end-user computing technology and demographics. Using Technology Acceptance Model (TAM), this study aims to investigate the drivers' intention to accept and use the mobile parking application.

TAM assumes that the attitude of an individual towards a certain technology is mostly defined by the behavioral intention that can be predetermined by perceived usefulness and perceived ease of use, and the attitude of users to this technology. Over the last several years, TAM has been extended to the area of transportation and mobility-related technologies. As an example, Yang et al. (2020) tested the intention of the drivers to accept parking applications through a Structural Equation Modeling (SEM) design and validated the usefulness of TAM in describing the technology adoption of parking services. Equally, TAM has been expanded to explore user acceptance of autonomous vehicles, mobile navigation applications, and all forms of intelligent transportation systems. A number of studies have built on the original TAM by adding other constructs that have applicability to particular application situations. By way of illustration, a study on drivers' adoption of mobile navigation apps postulated a prolonged TAM by incorporating the variables like the sense of direction, affinity, and distraction perception by the drivers hence amplifying the predictive capacity of the model. Similarly, in their article, Impact

Investigation of Perceived Cost and Perceived Risk in Mobile Commerce: An Analytical Study of Pakistan, Rind et al. (2017) extrapolated TAM to investigate the influence of perceived risk and perceived cost on the use of mobile commerce.

Since mobile parking applications use information technology as a medium of delivering parking reservation, allocation, and management services, TAM will be deemed as a suitable theoretical framework to use in analyzing the intention of the riders to accept and use the applications. Based on the model that is suggested by Yang et al. (2020), the current research is based on the concept of an extended Technology Acceptance Model, where the authors add several context-specific variables, including Trust in Parking App, Parking App Attributes, and Social Influence, on top of the key TAM constructs. Structural Equation Modeling (SEM) was used to empirically test the proposed model. TAM is used as the baseline model with the other constructs being incorporated as independent variables to gain a better understanding of the factors affecting the adoption of mobile parking applications by the riders. The Intention to Use (IU) is the dependent variable of the research as shown in Figure 12. These independent variables are Perceived Usefulness (PU), Perceived Ease of Use (PE), Parking App Attributes (PA), Trust in Parking App (TP), and Social Influence (SI). Also, the concept of Perceived Usefulness (PU) is defined as an intermediate variable in the association between Perceived Ease of Use (PE) and Intention to Use (IU). The theoretical framework has been changed and adjusted to the needs of the current research and aims proposed by Yang et al. (2020).



**Figure 1: Conceptual Framework**  
Sources: Modified from Yang et al. (2020)

**Perceived Usefulness:**

The degree to which a person feels that employing a given system will improve his or her job performance is described as perceived usefulness (Davis, 1989). It is the key variables that have been shown in the literature to explain the desire to accept and use a range of IT/IS systems. External factors have an impact on how much users believe a system or piece of technology will improve their ability to accomplish their jobs. When users believe the system is simple to use, they will operate more efficiently and provide better job results ). Consequently, the following theory is advanced.

*Hypothesis 1 (H1): The perceived usefulness significantly affects the user's intention to use the mobile parking application.*

**Perceived Ease of Use:** Perceived ease of use (PE) influences perceived usefulness (PU) favorably. Users who are taught how to utilize a new information system can rapidly become familiar with how it works and see how it might be useful to them. People who locate the shared parking platform in the study's setting are more likely to

recognize how it may help them if it's simple to use. As a result, the following theories are advanced.

*Hypothesis 2 (H2): The perceived ease of use significantly affects perceived usefulness.*

*Hypothesis 3 (H3): The perceived ease of use significantly affects the user's intention to use the mobile parking application.*

**Parking App Attributes:**

Parking app provides the service that links the parking users with available parking spaces. Therefore, the information provided by the parking app becomes one of the decisive factors for drivers to accept this information and use this app to park. Several studies of travel information have confirmed that the reliability and timeliness of such information can influence travelers' acceptance of it (Yang et al., 2020). The following hypothesis is proposed for parking app attributes in this study.

*Hypothesis 4 (H4): Parking app attributes significantly affect the user's intention to use the mobile parking application.*

**Trust in Parking App:**

Trust in parking apps, that is, the degree to which the traffic information service provided by parking apps can be trusted by the users. Therefore, in SPS with uncertainty, it is important to analyze the credibility of the parking app and identify the risks it may bring, to effectively develop a credible parking app (Sharif et al., 2020). Users' trust in the parking app is reflected in their trust in the parking information provided by the App (Yang et al., 2020). Therefore, the following hypothesis is proposed.

*Hypothesis 5 (H5): Trust in parking app significantly affects the user's intention to use the mobile parking application.*

**Social Influence:**

Social Influence is defined as the extent to which individuals perceive the interests that are trusted by others who will influence him/her using a new system. The likelihood that someone will make the decision to adopt a behavior increases when their significant others support it ( ).

*Hypothesis 6 (H6): Social Influence significantly affects the user's intention to use the mobile parking application.*

**Intention to Use**

The decision of whether to use technology is made by the individual. Therefore, it is considered in this study that behavioral intention to use in connection to mobile parking applications has the potential to increase the public's parking efficiency.

**Table 1: Variables and Definitions**

Constructs	Indicators	Variables	Details
Perceived Ease of Use	PE1	Clear and Understandable	Interaction with mobile parking app would be clear and understandable
	PE2	Flexible	Mobile parking app interface will be flexible to interact with.
	PE3	Learning	Learning to use parking app would be easy for me.
	PE4	Easy to use	It is easy to use the mobile parking app to park my vehicle.
	PE5	Skills	It would be easy to develop the skills needed to use mobile application for parking.

Constructs	Indicators	Variables	Details
Perceived Usefulness	PU1	Improve	Parking app would improve travel convenience.
	PU2	Payment	Using mobile parking app would help to make payment more quickly.
	PU3	Save time	Using parking app would save time so that other activities can be done in the meantime.
	PU4	Beneficial	Parking app would be beneficial to improve the parking problem.
	PU5	Advantageous	The advantages of mobile parking app outweigh the disadvantages.
Trust in Parking App	TP1	Significant	Parking information by parking app is significant.
	TP2	Trust	Trust the parking app to park vehicles.
	TP3	Privacy	Privacy on mobile parking application will be protected.
	TP4	Secured	Transactions via mobile parking app would be secured.
	TP5	Confident	Feel confident with the security measurements offered by mobile parking app.
Parking App Attributes	PA1	Accurate	Parking app will provide accurate information of parking charges.
	PA2	Information	Parking app will provide accurate information of the number of vacant parking spaces.
	PA3	Quick and timely	The update speed of parking information by parking app will be quick and timely (real-time).
	PA4	Electronic payment	The app will provide an electronic payment function both online and offline.
	PA5	Reservation	The app will provide parking reservation function
Social Influence	SI1	Influence	People who influence behavior would think should use mobile app for parking when available.
	SI2	Important	People who are important would think that should use mobile parking app whenever available.
	SI3	Assist	People who are important could assist in the use of parking app, if available any.
	SI4	Opinion	People whose opinion appreciate prefer to use the parking app to park my vehicle.
	SI5	Influencer	Influencer would affect decision in using the services offered by the parking app.
Intention to use Parking App	IU1	Intend	Intend to use parking app in the future whenever available.
	IU2	Willing	Willing to use the parking app in daily life while parking my vehicles
	IU3	Plan	Plan to use the parking app in the future
	IU4	Recommend	Recommend others to use mobile parking app.
	IU5	Insist	Insist on using the parking app in a sustainable way in the future.

### **Research Methods**

This study employs an explanatory research design to investigate riders' intention towards using a mobile parking application in Kathmandu Valley (Kothari, 2004). In social science research, explanatory research is especially useful for testing theoretical claims and analyzing causal relationships between variables (Shrestha et al., 2021). Residents of the Kathmandu Valley, which includes the districts of Kathmandu, Lalitpur, and Bhaktapur, were included in the population of interest. The study area for this research is Kathmandu Valley in Nepal which consists of three districts: Kathmandu, Lalitpur and Bhaktapur which is located in Province 3 known as Bagmati Province

of Nepal (Adhikari et al., 2020). The geographic coordinates of Kathmandu valley are: latitudes 27°32'13" and 27°49'10" north and longitudes 85°11'31" and 85°31'38" east and is located at a mean elevation of about 1,300 meters (4,265) above sea level in the bowl-shaped and thus Kathmandu valley covers an area of 395 km (Mesta et al., 2022; Rajkarnikar, 2020).

Non-probability sampling, convenience sampling method has been selected for the analysis of the study (Devkota et al., 2020). A technique used to gather research data from a pool of respondents who are readily accessible is convenience sampling (Etikan, 2016; Lawaju et al., 2024). Convenience sampling is applied in the study to learn about riders' intentions to use a mobile parking application, if available in the future, data has been collected from those who own automobiles as well as from those who have a driving license but do not own a vehicle. It would be beneficial to get information from those who are experiencing parking problems to better understand the problems and their views on the parking application.

To calculate the sample size for this study, we used the following formula:  $n = z^2 pq / e^2$  (Mahato et al., 2023; Neilson, 2011). Here,  $n_0$  is the sample size for the study the standard tabulated value for 5% level of significance ( $z$ ) is 1.96,  $p$  is the prevalence of users' intention to use the mobile parking application is 50% and the allowable error to be tolerated ( $e$ ) is 6%. Therefore, the final sample size for this study was 403.

The primary research tool employed in the study was an interview with structure questionnaire (Devkota et al., 2020). To accomplish the numerous study objectives outlined above, primary sources of data collection were employed to link the main data with the questionnaire. Pilot testing including 15 responses to identify any kind of inaccuracy in the questionnaire was done for data collecting before it was moved to the Kobo tool for the actual data collection from the respondents. Both online and offline methods were used to gather data for the study. To conduct this study, both descriptive and inferential data analysis approaches were used. Each item of collected data was assessed to draw some conclusions and results. Microsoft Excel has been used for descriptive analysis, and Smart PLS 4.0 has been employed for inferential analysis.

## Results

### Socio- Demographic Characteristics

**Table 2:** *Socio Demographic Profile of Respondents*

Title	Category	Numbers	Percentage
Gender	Male	241	58.64
	Female	170	41.36
Age	18 – 25	105	25.55
	25 – 35	198	48.18
	35 – 45	65	15.82
	45 – 55	31	7.54
	55 and above	12	2.92
	Below 5 years	154	37.47
Driving Years	5 – 10 years	192	46.72
	10 – 15years	53	12.9
	15 – 20years	10	2.43
	20 years above	2	0.49
Location	Bhaktapur	32	7.79
	Lalitpur	99	24.09
	Kathmandu	279	67.88

Title	Category	Numbers	Percentage
Education Level	Illiterate	4	0.97
	Below SLC	27	6.57
	Intermediate	79	19.22
	Bachelors	195	47.45
	Master	93	22.63
	Master and above	13	3.16
Travel Purpose	Shopping	309	75.18
	Entertainment	302	73.48
	Working	296	72.02
	Others	7	1.7

Table 6 shows the socio- demographic characteristics, total of 411 respondents are surveyed to identify the rider’s intention to use the mobile parking application in the city. Altogether 241 male and 170 female out of total 411 respondents which consists of 58.64% male and 41.36% female respectively. In the study, majority of the respondent was male, which shows that there are majority of the male rider in the city. (Yuen et al., 2021), in their study also concluded that men are individual who are very curious about new things especially the things related to technology as majority of their respondents are male i.e., 50.7% than female 49.3%. The study shows that most of the respondents, that is 198 respondents out of 411 are in the age group of 25 – 35 which is 48.18%, followed by the age group 18 – 25 with 105 respondents which is 25.55%. Similarly, 15.82% respondents are between the age group of 35 – 45 years and 7.54% in the age group of 45 - 55 years. In this study, most of the respondents are in the age group 25 – 35years, and the least is of the age group 55 and above i.e., 12 respondents (2.92%). The result of the survey shows many respondents have the driving experience of 5 – 10 years i.e., 192 (46.72%), followed by 154 respondents (37.47%) who have below 5 years driving experience. Similarly, 12.9%, 2.43%, and 0.49% of respondents have driving experience of 10 – 15, 15 – 20 and 20 above driving experience in the city. (Yang et al., 2020) in their study shows that 66.7% respondents have the driving experience below 5years and 19% and 14.3% have the driving experience of 5 – 10 and above 10 years of driving experience. Out of 411 respondents, 195 respondents were bachelor’s degree holders by 47.45%, followed by master 22.63%. Similarly, the respondents who have completed their intermediate are 79 (19.22%), below average are 27 i.e., 6.57% and the respondents above master level are 13 i.e., 3.16% of the total respondents. Lastly, only 4 respondents are illiterate, which covers only 0.97% of respondents. Furthermore, many of the respondents were found to travel for multiple purposes whereas most of the respondents would travel for shopping, entertainment, and their workplace. In the study, almost all the respondents’ travel purpose is almost same i.e., shopping as the respondents travelling for shopping is 309 (75.18%), which is closely followed by respondents travelling for entertainment purposes too by 302 (73.48%). Similarly, in the study, 296 (72.02%) respondents also travel to workplace and 7 (1.7%) of the respondents travel for other different purposes such as college, personal house related works and so on.

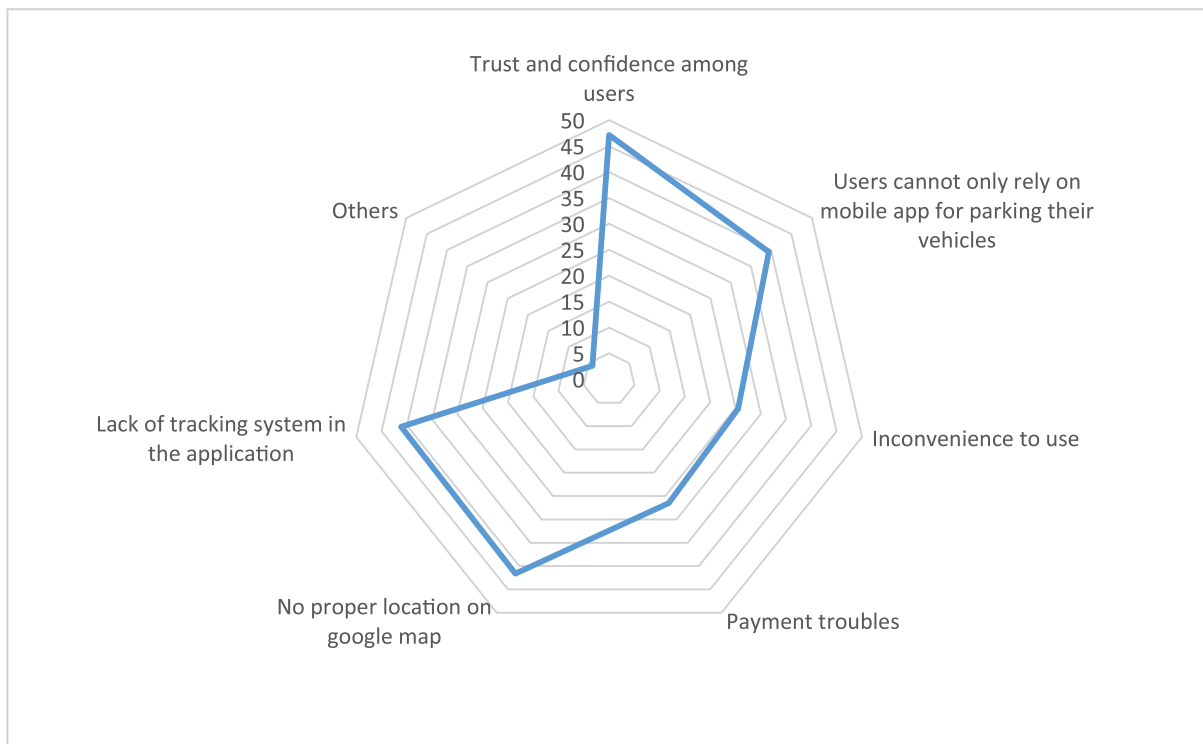
**Riders’ Awareness and Participation**

Only 22 (5.35%) of the 99 respondents said they used the previously launched parking application to park their vehicles often. Following 33 (8.03%) respondents who said they sometime used the parking app, and 7.3% of respondents who said they often used it. 8 respondents said they never use the parking application even though they are aware of the mobile parking application, whereas 6 respondents said they seldom use the parking application. This survey also showed that 312 respondents were unaware of any parking applications, and that the highest amount of time needed to find a parking spot and park their vehicles is between 11 and 15 minutes, according to 41 respondents. Similarly, 7.06% said they need no more than 6 to 10 minutes to park their automobiles, followed by 5.6% respondents who need no more than 5 minutes and 1.46% respondents who need no more than 16 to 20 minutes to find a spot in the city. Only 99 respondents, or 24.09% of those surveyed, are aware of the parking app that the city launched a year ago. Of those surveyed, 91 reported using the parking app, and 73 reported that

the app allowed users to reserve a parking space in advance. 99 people were surveyed, and 6.33 percent of them said there was no way to reserve a parking spot. Similarly, out of 73 respondents, 14.6% stated that the booking procedure was simple, while 3.16% claim that despite the availability of purchasing parking spaces in advance, doing so was not simple.

**Challenges to Implement the Mobile Parking Application and Managerial Solution**

This section discusses the constraints to mobile parking application adoption and usage in the Kathmandu Valley. The study revealed useful information about the issues and challenges in the implementation of the application to facilitate the service in the valley. In the study 54.01% of respondents believed that there exists a challenge to implement the mobile parking system (application) in the valley whereas the remaining 45.99% don't think there is any challenge to implement and use the parking application. Figure 14 below represents the challenges that the riders think is constraining to implement the parking application.



**Figure 2:** *Challenges to Implement the Mobile Parking Application*

In the study, 194 respondents (47.2%) out of 222 respondents expressed that Trust and Confidence among the users is the major challenge to adopt and use the parking application and which hinders the implementation of mobile parking system in the valley. Similarly, 41.61%, and 41.12% respondents believed that another major challenge is no proper location on google map, and lack of tracking system in the application respectively. Likewise, 39.42%, 26.52%, and 25.55% respondents believed that the other challenges to implement the system in the valley are users cannot only rely on mobile app for parking their vehicles, payment troubles, and inconvenience to use the application respectively. Remaining 4.14% mentioned the other challenge that is hindering the use of the application which are security and privacy, connectivity and network issues, parking facility provider's and limited number of parking locations of parking lots in the city, use of English language only in the system because of which the senior citizens may not be able to use the application, lack of awareness and promotion, and available on a specific platform (e.g. only iOS or only android). Similarly, the respondents were also asked the question about who is responsible for the challenges to implement the application in the valley. 44.28% (182) respondents answered that rider/drivers are the individual responsible for this challenge. Similarly, 36.01% believed that

government or local bodies are responsible for these challenges, followed by traffic police (26.28%), and company (26.03%). 1.47% respondents answered that parking facilitators or parking service provider/ owners are responsible for these challenges and 0.48% respondents answered that none were responsible for these challenges.

Respondents were asked if the challenges they mentioned are manageable or not, and how they can be managed. This also includes the authorities or individuals who are responsible for managing the challenges carrying out different strategies. 196 (88.29%) out of 222 respondents agreed that those challenges can be managed, and the mobile parking application can be implemented in the valley, and the remaining 11.71% responded that those challenges cannot be managed.

Out of 222 respondents, almost everyone agreed that the mentioned challenges can be managed through promotion/advertisement of the parking app (44.77%), proper information on location of parking lots (42.58%), online/offline payment system facility (42.09%), real time update on traffic conditions and number of vacant parking spaces in the parking lots (40.63%), security (40.39%). Most of the respondents responded that if all these measures could be effectively executed in the application, then the mobile parking application could be successfully implemented in the valley. All the respondents believed that these are the important measures/ strategies to implement the application. Similarly, many respondents, including 41.85% and 41.36%, think that the government, local authorities, and company oversee managing the solutions. According to 32.36% respondents, parking service providers must also manage the challenges of adopting and using mobile applications if they are made available later. Additionally, according to 32.12%, traffic police must manage obstacles and help with the adoption of parking-related mobile applications. Only 1.22% of respondents said that since riders are the ones who must use the software, they are also accountable for solving issues.

According to the respondents' responses, the respondents' expectations include real-time information on available parking spaces, traffic conditions, the ability to reserve available spaces for parking via a mobile app, information regarding the parking fees they must pay, access to parking lots at various locations throughout the valley, and both online and offline payment options. They also expect security.

### **Inferential Analysis**

**Internal Consistency Reliability:** Cronbach's Alpha and Composite reliability are used to evaluate internal consistency reliability. The data must satisfy the requirement of CA > 0.7 to be free from the internal consistency reliability issue. However, others categorized the Cronbach's alpha value into six groups: "Excellent" for values over 0.90, "Good" for values above 0.80, "Acceptable" for values above 0.70, "Questionable" for values above 0.60, "Poor" for values below 0.50, and "Unacceptable" for values beyond 0.50" (Jain & Angural, 2017; Kamalasanan et al., 2020). Additionally, composite reliability evaluations in the range of 0.60 to 0.70 are deemed "acceptable," while those in the 0.70 to 0.90 range are deemed "adequate to good" (Sarstedt et al., 2014; Tiwari et al., 2025). All the criteria of Cronbach's Alpha (CA) and Composite Reliability (CR) are satisfied. As a result, the model of this study has internal consistency reliability.

**Table 3:** *Internal Consistency Reliability*

<b>Constructs</b>	<b>Cronbach's alpha (CA)</b>	<b>Composite reliability</b>
PA	0.761	0.838
PE	0.574	0.774
PU	0.555	0.77
SI	0.582	0.782
TP	0.631	0.795
IU	0.695	0.809

**Convergent Validity:** For convergent validity, factor loading, and average variance extracted (AVE) are measured. According to Vinzi et al. (2010) Signs with factor loading values of less than 0.4 should be discarded and deleted. Factor loading values over 0.07 are preferable. However, indicators should only be dropped from

a construct if doing so raises the CA, CR, and AVE values above a particular threshold. However, AVE values higher than 0.50 (Lawaju et al., 2024) are frequently acceptable. Several indicators have loadings that are less than 0.70, and some constructs have AVE values that are less than 0.5. The items of the related construct with lower factor loading are eliminated because the AVE of the constructs perceived ease of use, perceived usefulness, trust in parking apps, social influence, and intention to use was less than 0.5, which is unacceptable. Items tp1 and tp3 from trust in the parking app, pe1, and pe2 from perceived ease of use, pu2, and pu5 from perceived usefulness, si4, and si5 from social influence, and iu1 from intention to use were left out to reach AVE of value 0.5 or above as they had the lowest loading.

**Table 4:** *Convergent Validity*

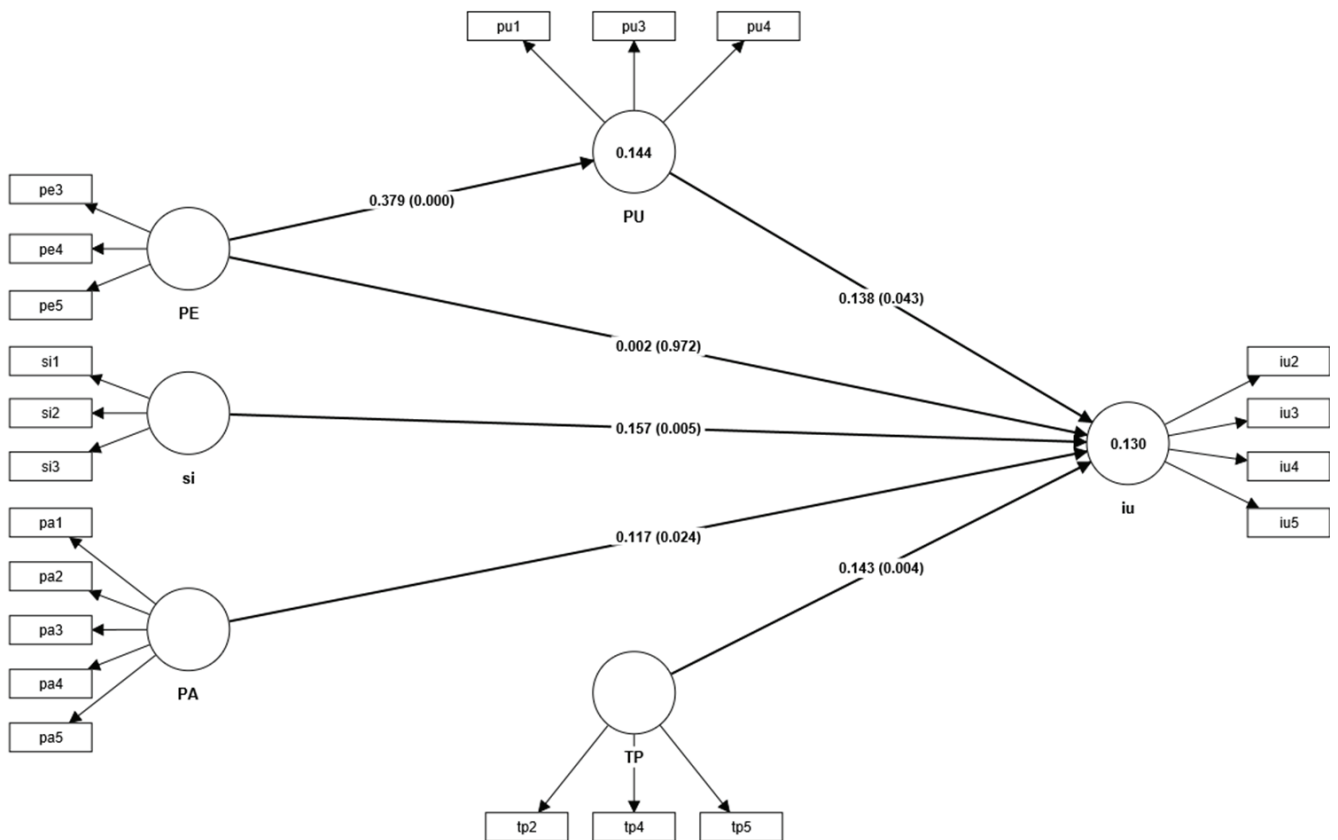
Constructs	Indicators	Outer Loading	AVE
Parking App Attributes	pa1	0.723	0.509
	pa2	0.641	
	pa3	0.741	
	pa4	0.705	
	pa5	0.75	
Perceived Ease of Use	pe3	0.772	0.538
	pe4	0.825	
	pe5	0.58	
Perceived Usefulness	pu1	0.689	0.528
	pu3	0.722	
Social Influence	pu4	0.766	0.545
	si1	0.673	
	si2	0.744	
Trust in Parking App	si3	0.793	0.567
	tp2	0.694	
	tp4	0.699	
	tp5	0.853	
Intention to Use	iu2	0.812	0.52
	iu3	0.641	
	iu4	0.814	
	iu5	0.589	

**Discriminant Validity:** Discriminant validity may be established statistically using techniques like factor analysis and correlation analysis. Factor analysis can help in identifying the several constructs that make up a test or scale, however correlation analysis can show that certain constructs are not strongly associated with one another (Comrey, 1988). A more cautious criterion is one with HTMT levels below 0.85 and specifically below 0.90 (Franke & Sarstedt, 2019). Similar to this, the Fornell and Larcker criterion is satisfied if any of the two constructs' AVEs is higher than the squared correlation between the two constructs (Hair et al., 2017). The square root of each AVE is proven to be larger than their subsequent inter-construct correlation in Table 5 of the Fornell-Larcker criteria, suggesting excellent discriminant validity (Fornell & Larcker, 1981;). Furthermore, the table 5 of HTMT represents that all the HTMT ratios are below the threshold value 0.90 (Henseler et al., 2015). Thus, all the criteria of discriminant validity met the threshold which shows that there is no issue of discriminant validity.

**Table 5:** Fornell - Larcker Criterion & HTMT Result

Fornell - Larcker Criterion							HTMT Result					
	IU	PA	PE	PU	SI	TP	IU	PA	PE	PU	SI	TP
IU	0.721						IU					
PA	0.185	0.713					PA	0.249				
PE	0.165	0.292	0.733				PE	0.265	0.426			
PU	0.26	0.373	0.375	0.726			PU	0.403	0.554	0.613		
SI	0.266	0.17	0.286	0.354	0.738		SI	0.404	0.269	0.498	0.608	
TP	0.208	-0.05	0.23	0.167	0.3	0.753	TP	0.302	0.144	0.388	0.243	0.506

**Structural Model:** A structural equation analysis was used to assess the study's hypotheses. SEM was assessed using the two-step procedure. The values of R-square, a statistical measure that assesses how much of the variance in the dependent variable can be explained by the independent variable, are discussed in path analysis. As a result, R-squared shows how well the data matches the regression model. R-square values of at least 0.10 were recommended in order to ensure acceptable model fit. R-square values are in the range of 13% and 20%. The mediating variable "Perceived Usefulness" has an R-square value of 0.144 as an effect. The endogenous variable "Intention to Use" has an R-square of 0.130. All the R-square values exceeded the advised level.



**Figure 3:** Path Analysis

The outcomes of a bootstrapping operation are displayed in Figure 15. Many subsamples are obtained from the original sample during the operations, and replacement is done to provide bootstrap standard errors, which provide an estimated p-value for the structural path's significance test. Each of the five latent variables has several observable variables. The influence of each observable variable or the impact of the hidden variable were assessed. Figure 15 demonstrates how the variables relate to one another. PU therefore accounts for 13.8% of Intention to Use. In the same way, SI explains 15.7% of intention to use, PE explains 37.9% of perceived usefulness and 0.2%

of intention to use, while PA and TP explain 11.7% and 14.3% of intention to use, respectively.

**Table 6:** Hypothesis Testing

	Beta	SD	T Values	P values	CI		Result
					LL	UL	
PU -> iu (H1)	0.138	0.068	2.024	0.043	0	0.266	Significant
PE -> PU (H2)	0.379	0.045	8.366	0	0.278	0.46	Significant
PE -> iu (H3)	0.002	0.061	0.035	0.972	-0.114	0.126	Insignificant
TP -> iu (H4)	0.143	0.05	2.886	0.004	0.041	0.232	Significant
PA -> iu (H5)	0.117	0.052	2.256	0.024	0.006	0.208	Significant
si -> iu (H6)	0.15	0.056	2.795	0.005	0.042	0.263	Significant

According to the data analysis, the empirical data support hypotheses H1 (PA -> IU), H2 (PE ->PU), H3 (PE -> IU), H4 (PU -> IU), H5 (TP ->IU), and H6 (SI -> IU). The findings demonstrate that hypotheses H1, H2, H4, H5, and H6 are significant since their respective p-values are less than 0.5, whereas H3 is rejected because its p-value is higher than 0.5, i.e., 0.987 (Kwak, 2023).

**Mediation Analysis**

The research examines the influence of the mediating factors on the dependent and independent variables. When doing a mediation study, the assumption has been formulated that an independent variable (X) will have an impact on a mediator (M), who will then have an impact on a dependent variable (Y). In mediation analysis, bootstrapping is done under which specific indirect effect is measured. Three variables perceived ease of use (X), perceived usefulness (M), and intention to use (Y) are analyzed in table 14. The fact that the P-value is higher than 0.05 indicates that PU does not function as a mediator between perceptions of ease of use and intention to use. This proves there was no indirect linkage.

**Table 7:** Mediation Analysis

	Original sample (O)	SD	T Value	P values	LL	UL
PE -> PU -> IU	0.052	0.027	1.905	0.057	-0.001	0.108

**Discussion**

This paper has explored the variables that contribute to the intention to use mobile parking applications among riders in Kathmandu Valley with the use of a broad Technology Acceptance Model (TAM) as its major theoretical framework. The results show a fine grain landscape of drivers and barriers of adoption within this particular urban setting. The analysis of structural model showed that Perceived Usefulness, Parking App Attributes, Trust in the Parking App, and Social Influence have significant and positive effects on the intention to use a mobile parking application, and this result supports hypothesis H1, H4, H5, and H6. The importance of Perceived Usefulness helps to emphasize the fact, that riders in Kathmandu Valley are inherently pragmatic; their adoption intention is the most powerful when they think that the application could be used in the context of the acute problem of parking scarcity to save some time, be less frustrating, and be more convenient in terms of traveling. This is in line with the fundamental assumption of TAM and it matters in a densely populated urban setting especially where the utility of a technological solution is of utmost importance. In addition, the research established that Perceived Usefulness (PU) is greatly influenced by Perceived Ease of Use (PE), which validated H2. This implies that the ease of use is not the driving factor of intention, but it is an essential antecedent that increases the perceived value and functioning of the application in the minds of users. The high effect of Parking App Attributes, in particular the quality of information about the parking space availability, position, and price, reveals the fact that technological adoption depends on the quality of the system. With a low perceived trust in the system previously,

technical reliability and feature-set of the application (e.g. real-time updates, reservation capability, integrated payment) are defining factors of the behavioral intention. Equally, the Trust in the Parking App came out as a very important factor. Considering the financial (payment security) and operational (reliability of information) risks, creating user confidence in the integrity of the application data, privacy and transactional security is a precondition that cannot be compromised to obtain adoption. The influential impact of Social Influence is a pointer that the adoption decision is not made in a vacuum. The attitudes and actions of friends, family, and peers become a highly effective heuristic and perceived uncertainty gets minimized and the legitimacy of using a new technology worked in the social environment of the valley is justified. This observation supports the role of social networks in diffusion of innovations particularly in collective societies. One of the most significant conclusions of the research is that Hypothesis H3 was rejected because it assumed that there was a direct correlation between Perceived Ease of Use and Intention to Use. This is unlike in some classical writings of TAM but in line with other researches where utility and need issues are more important than the issues of simplicity. The difficult parking ecosystem in Kathmandu, riders seem to be ready to use a fairly complex interface in case the application can provide high utility and sound solutions. Ease of Use, hence, works indirectly by increasing the Perceived Usefulness instead of being a direct motivator. The mediation analysis also helped to prove that indirect effect of PE on IU through PU is not significant, and thus the power of PU as a direct driver is independent in the model. These relationships are placed in the context of the descriptive findings. The insignificance (24.09) of the earlier introduced PARK KTM application and the identified set of obstacles, the main one being the lack of trust, inaccurate mapping information, and the lack of tracking system can be identified as the clear answer to the previous implementation failure. They directly correlate with the measures of Trust and App Attributes in the model that are significant. The anticipated expectations and proposed management recommendations by the respondents like strong promotion scheme, correct real time information, and adjustable payment system provides a viable roadmap to developing an application that specifically tackles the obstacles identified during the inferential analysis.

## **Conclusion**

This research aimed to examine the predictors of behavioral intention of riders to use mobile parking apps in Kathmandu Valley. The paper employed a longer version of the Technology Acceptance Model (TAM), and it was used to measure the responses of 411 riders to determine the most important factors that influence the issue and the contextual obstacles. The results clearly indicate that the Perceived Usefulness of the application, the quality and reliability of the Parking App Attributes, the level of Trust generated by the application, and the strength of Social Influence influence most of individuals to adopt a mobile parking application. All these elements lead to the development of a decision-making process of a rider in the context of extremely limited parking spaces and disillusionment with technologies previously. On the other hand, the direct impact of Perceived Ease of Use on intention was found non-significant which means that the users consider functional efficacy and reliability rather than simply being able to, when dealing with an urgent urban problem. The operating environment is also described clearly by the study. It is also characterized by a significant unfamiliarity and history of distrust due to the failure of the previous introduction of a parking app. Technological aversion is not the point of significant opposition to adoption but certain, solvable problems: lack of user confidence, improper use of spatial data (i.e., on Google Maps), and unavailability of real-time tracking systems. With this, the solutions their respondents offer are also accordingly focused: the targeted aggressive promotion and awareness campaigns, the availability of accurate and accessible information about the parking lot location and the introduction of dependable online/offline payment systems. To recap it all, the implementation of a mobile parking system in Kathmandu Valley is not just possible but conditional. It must have a well-planned application that is superior in providing actual utility and perfect information and a determined effort to create a systemic and user trust by open operations and sound social marketing. This study offers the empirical framework of the kind of activity, to fill the existing knowledge gap in the technological potential and user acceptance of the technology in the changing urban mobility in Nepal.

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