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Post-COVID-19 Behavioral Determinants of Unmanned Aircraft Adoption in Bangkok's Urban Mobility

Chartchai Charoensook[1,*], Thitinan Pholsook[2], Sajjakaj Jomnonkwao[2], Chamroeun Se[3] and Vatanavongs Ratanavaraha[2]

[1]*Program in Energy and Logistics Management Engineering, School of Mechanical Engineering, Institute of Engineering, Suranaree University of Technology, NakhonRatchasima 30000, Thailand*
[2]*School of Transportation Engineering, Institute of Engineering, Suranaree University of Technology, Nakhon Ratchasima 30000, Thailand*
[3]*Institute of Research and Development, Suranaree University of Technology, Nakhon Ratchasima 30000, Thailand*

([*]Corresponding author's e-mail: chartchai@catc.or.th)

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Abstract

In recent years, public transportation has evolved to offer faster and more efficient options. One emerging concept is using unmanned aircraft for vertical take-off and landing (VTOL-UAs) to enhance urban mobility. Although not yet implemented in Thailand or abroad, this study examines factors influencing the decision to use unmanned aircraft for public transportation in the Bangkok Metropolitan Region. Guided by the Unified Theory of Acceptance and Use of Technology (UTAUT), the researchers collected data from 1,200 participants through face-to-face questionnaires and analyzed the responses using Structural Equation Modeling (SEM). The results indicate a strong willingness among participants to use unmanned aircraft and share flights if such options become available. Gender differences significantly influenced decision-making, while age showed no overall impact, though respondents under 30 expressed the most positive attitudes. SEM analysis identified achievement, social influence, convenience, and performance as key factors, with weights of 0.325, 0.217, 0.193, and 0.143. These findings provide valuable insights for developing unmanned aircraft as a mass transit option, with implications for the public and private sectors. Educational institutions may also use these results to guide curriculum development in transportation and unmanned aircraft systems.

Keywords: Unmanned aircraft, Urban mobility, Behavioral determinants, Technology adoption, Post-COVID-19

Introduction

The Bangkok Metropolitan Region has long depended on road-based transportation which frequently struggles with congestion and limited accessibility especially in crowded neighborhoods. To address these challenges, Thailand's 20-year transportation development plan (2018-2037) promotes the expansion of multi-modal infrastructure to boost logistics and transit efficiency (Jutamart & Mana, 2023). A key goal of this initiative is to support sustainable public transport options that help ease traffic in urban areas (Rhindress, 2008). The outbreak of COVID-19 brought about an additional shift in commuting habits, with more people favoring personal vehicles and alternatives that support physical distancing and reduce exposure risks (Anwari et al., 2021; Bhaduri et al., 2020). As a result, there has been a noticeable increase in public demand for safe, efficient, and adaptable transportation to evolving health and lifestyle needs (Ahmed et al., 2021; Rajendran et al., 2021).

Urban Air Mobility (UAM) has recently gained international attention as a new approach to solving urban transportation problems. It refers to short-range, on-demand air transport using unmanned aircraft (UA), most commonly electric vertical take-off and landing (eVTOL) vehicles, to deliver fast and environmentally friendly urban mobility solutions (Cohen et al., 2021; Wickens et al., 2021). According to the International Civil Aviation Organization (ICAO, 2015a; ICAO, 2015b), these aircraft operate without a pilot onboard and are generally controlled remotely. UAM holds the potential to ease road congestion, lower greenhouse gas emissions, and offer faster transport access in cities (Loubser et al., 2021). Real-world demonstrations such as China's EHang project, which initiated autonomous passenger drone flights in 2019, demonstrate that this system is not merely theoretical but it already undergoing practical testing.

Still, the path toward mainstream adoption is far from straightforward. Several key concerns remain unresolved, including ensuring safety, bringing the technology to a mature stage, building a supportive regulatory framework, and gaining public acceptance (Chamata, 2017; Rajendran et al., 2021). In regions like the European Union and the United States, regulatory agencies like EASA (2020) and the FAA (2020) have introduced strict certification rules to address these concerns. Additionally, cities hoping to implement UAM must invest in real-time Unmanned Traffic Management (UTM) systems capable of preventing collisions and managing shared airspace (Butilă & Boboc, 2022). These challenges are even more complicated in Bangkok, where dense development and limited vertical airspace presents unique obstacles.

Although countries worldwide have made notable progress in research and deployment of UAM systems, Thailand is still in the early stages. Little research has examined examining the public's readiness to adopt UAM services, especially after of the pandemic, which has altered many people's travel preferences. This study addresses that gap by identifying the behavioral factors shaping how Bangkok residents perceive and intend to use unmanned aircraft for urban travel. It draws upon the Unified Theory of Acceptance and Use of Technology (UTAUT). This framework blends insights from the Theory of Planned Behavior (Ajzen, 1991) and the Technology Acceptance Model (Davis et al., 1989). This model includes four core dimensions performance expectancy, effort expectancy, social influence, and facilitating conditions that collectively explain technology adoption behaviors (Venkatesh et al., 2003).

To analyze these elements meaningfully, the study applies Structural Equation Modeling (SEM), a statistical method that allows researchers to explore how multiple variables are interconnected (Hair et al, 2010). SEM is well-suited for understanding complex decision-making processes and can account for measurement errors, making it particularly useful in this context (Pakpisutkul, 2022).

Unlike many earlier studies that relied primarily on online surveys (Ahmed et al., 2021; Rice et al., 2019; Winter et al., 2020), this research uses a face-to-face survey approach to collect first-hand, context-specific responses from Bangkok residents, enhancing the reliability and cultural depth of the data. The goal is to offer valuable insights to help government officials, private companies, and city planners design more effective UAM strategies that resonate with the public. Moreover, the researchers' findings may guide educational institutions in developing curricula that prepare future professionals to meet the regulatory and technical requirements of urban air mobility UAM systems.

Research methodology

Population and samples

The population for this research comprised Thai citizens residing in the Bangkok Metropolitan Region. The survey was conducted in June 2022, targeting approximately 10.86 million residents. The researchers used Yamane's formula and a proportionate stratified sampling technique to select 1,200 participants for the study. The researchers selected these individuals based on their potential decision-making behavior related to the use of fully autonomous unmanned aircraft for travel purposes.

Research instrument

The researchers collected data using a structured questionnaire designed to gather both personal and travel-related information. The personal data included gender, age, residence, family status, education level, occupation, income, and vehicle ownership. Travel-related decisions were measured using a 5-point Likert scale to assess participants' attitudes toward flying by unmanned aircraft.

The researchers employed the Unified Theory of Acceptance and Use of Technology (UTAUT) as the theoretical framework, which is widely used in service and technology adoption. Based on the UTAUT model and the research hypotheses, we can propose the following equation to represent the relationship between these factors and the decision to fly focused on four key factors:

$$\text{Decision to Fly} = \beta 1\ (PF) + \beta 2\ (AF) + \beta 3\ (SF) + \beta 4\ (CF) + \varepsilon$$

Where:

Decision to Fly: The dependent variable

Performance Factors (PF)

Achievement Factors (AF)

Social Factors (SF)

Convenience Factors (CF)

β1, β2, β3, β4: The regression coefficients representing the strength and direction of the relationships between the independent variables and the dependent variable.

ε: The error term

Based on this model, the following research hypotheses were formulated: (Figure 1)

1) H1: Performance Factors (PF) significantly affect the decision to fly.

2) H2: Achievement Factors (AF) significantly affect the decision to fly.

3) H3: Social Factors (SF) significantly affect the decision to fly.

4) H4: Convenience Factors (CF) significantly affect the decision to fly.

This equation suggests that the decision to fly is a function of the four independent variables. The coefficients (β1, β2, β3, β4) indicate the relative importance of each factor in influencing the decision. For example, if β1 is significantly positive, performance factors positively influence the decision to fly.

Data analysis

Data were analyzed using descriptive statistics and Structural Equation Modeling (SEM) to identify influential variables. The researchers used descriptive statistics were used to summarize the general attitudes and perceptions of the participants. SEM was applied to validate the relationships between the factors and the decision to fly.

The researchers conducted a Confirmatory Factor Analysis (CFA) was conducted to assess the measurement model's fit before performing Structural Equation Modeling (SEM). If the model met the criteria for fit, it was subjected to SEM analysis to verify the research hypotheses. The researchers calculated composite reliability and average variance extracted (AVE) using equations (1) and (2) respectively, The researchers evaluated the model's goodness of fit was evaluated using the following indices (Sarstedt et al., 2021):

$$CR = \frac{(\Sigma\lambda_i)^2}{(\Sigma\lambda_i)^2 + \Sigma\theta_i} \qquad (1)$$

$$AVE = \frac{\Sigma\lambda_i^2}{\Sigma\lambda_i^2 + \Sigma\theta_i} \qquad (2)$$

Where λ_i is the standardized factor loadings obtained by CFA

θ_i is the error variances terms of measurement models

The model's goodness of fit was evaluated using the following indices (Sarstedt et al., 2021):

- $\chi^2/df < 3$
- NFI (Normed Fit Index) > 0.900
- RFI (Relative Fit Index) > 0.900
- CFI (Comparative Fit Index) > 0.900
- CRMR (Standardized Root Mean Square Residual) < 0.080

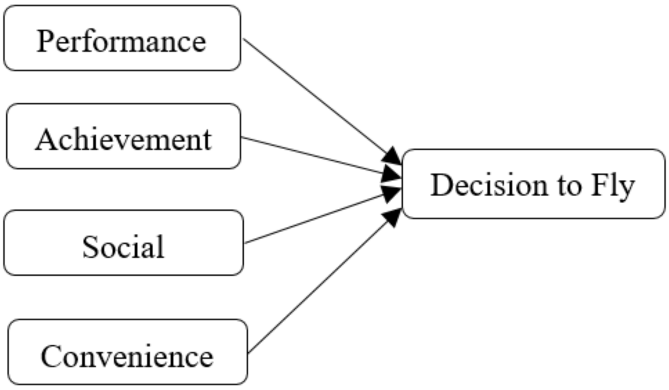

Figure 1 Proposed research model.

Research results

One thousand two hundred questionnaires were analyzed using descriptive statistics to evaluate data completeness and overall sample characteristics. The majority of respondents were women (587, 48.92%), aged 20-25 (519, 43.2%), with most residing in Bangkok (534, 44.5%). Most respondents were married (559, 46.6%) and held a bachelor's degree (685, 57.1%). Regarding employment, 36.5% (438 respondents) worked in the private sector, and 52.8% (634 respondents) owned motorcycles. A significant portion of the sample indicated a willingness to fly by unmanned aircraft if the service were available (557, 46.42%), and a majority were willing to sharing flights with others (705, 58.75%).

As shown in Table 1, gender influenced respondents' intentions to use the service, their purpose for using it, and their travel needs. However, there was no significant difference in willingness to pay across genders. Table 2 reveals that age, divided into four groups, did not influence opinions on service use intentions, purpose of use, travel needs, or willingness to pay.

Table 1 Gender comparison in decision-making behavior for flying by unmanned aircraft

Behavior	Gender (X, S.D) (N = 1,200)			z-Value	p-Value
	Male (465)	Female (587)	Unspecified(148)		
Intentions to use the service	2.24 (1.465)	2.54 (1.490)	2.03 (1.613)	5.467	0.004
Purpose of using the service	1.92 (0.825)	2.10 (0.799)	1.87 (0.782)	9.785	0.000
Travel needs	1.83 (0.883)	1.66 (0.901)	1.44 (1.067)	8.995	0.000
Pay for services	1.68 (1.329)	1.62 (1.278)	1.67 (1.350)	1.567	0.207

Remark: * p<.05

Table 2 Age group comparison in decision-making behavior for flying by unmanned aircraft

Behavior	Group Aged (X, S.D) (N = 1,200)				z-Value	p-Value
	Below 30 (599)	31-40 (326)	41-50 (117)	Over 50 (158)		
Intentions to use the service	2.26 (1.478)	2.23 (1.444)	2.20 (1.390)	2.25 (1.558)	0.479	0.851
Purpose of using the service	1.98 (0.811)	2.01 (0.823)	1.97 (0.810)	2.04 (0.811)	1.567	0.139
Travel needs	1.86 (0.880)	1.87 (0.879)	1.81 (0.923)	1.85 (0.912)	1.344	0.394
Pay for services	1.61 (1.834)	1.63 (1.279)	1.68 (1.301)	1.69(1.354)	1.545	0.694

Remark: * p<.05

The researchers further analyze behavioral attitudes (BA), by comparing responses across four variables: understanding of unmanned aircraft systems (BA1), confidence to fly (BA2), feeling toward flying (BA3), and acceptance of flying (BA4). Table 3 presents the average scores for these variables across gender and age groups. Table 4 highlights that respondents under 30 years old exhibited the highest overall attitudes (average score of 3.73), with the highest individual score for "feeling toward flying" (BA3) observed in respondents over 50 years old (3.86). In contrast, the 31-40 age group had the lowest overall attitudes (average score of 3.49), particularly in " understanding unmanned aircraft systems" (BA1).

Table 3 Mean and standard deviation of behavioral attitudes by gender

Behavioral Attitude	**Gender (X, S.D) (N = 1,200)**		
	Male (465)	**Female (587)**	**Unspecified (148)**
BA1	3.37 (1.702)	3.57 (1.613)	2.82 (2.230)
BA2	3.64 (0.825)	3.62 (0.752)	3.81 (1.108)
BA3	3.86 (0.705)	3.75 (0.731)	3.81 (0.979)
BA4	3.81 (0.853)	3.76 (0.795)	3.71 (0.993)
Total average	3.67 (1.021)	3.68 (0.973)	3.54 (1.328)

Table 4 Mean and standard deviation of behavioral attitudes by age group

Behavior	**Group Aged (X, S.D) (N = 1,200)**			
	Below 30 (599)	**31-40 (326)**	**41-50 (117)**	**Over 50 (158)**
Intentions to use the service	2.26 (1.478)	2.23(1.444)	2.20 (1.390)	2.25 (1.558)
Purpose of using the service	1.98 (0.811)	2.01 (0.823)	1.97 (0.810)	2.04 (0.811)
Travel needs	1.86 (0.880)	1.87 (0.879)	1.81 (0.923)	1.85 (0.912)
Pay for services	1.61 (1.834)	1.63 (1.279)	1.68 (1.301)	1.69(1.354)

Table 5 Measurement model evaluation using Confirmatory Factor Analysis (CFA)

Variable	**Loading**	**CR**	**AVE**
Performance (PF) (α= 0.900)	0.901	0.685	0.685
PF1 Knowledge in unmanned aircraft	0.619		
PF2 Aviation Safety Standards	0.912		
PF3 Law and regulation	0.949		
PF4 Emergency notice on board	0.834		
PF5 Reduce air emissions.	0.829		
Achieve (AF) (α= 0.937)	0.938	0.712	0.712
AF1 Reduce traffic congestion.	0.792		
AF2 Shorten travel time	0.801		
AF3 Accurately determine the travel time	0.916		
AF4 Travel in all weather conditions	0.867		
Social (SF) (α= 0.951)	0.952	0.765	0.766
SF1 Receive a press release from the media	0.827		
SF2 Family recommendation	0.81		
SF3 Friend recommendation	0.956		

Variable	Loading	CR	AVE
SF4 Use it on others.	0.908		
Convenience (CF) (α= 0.920)	0.925	0.76	0.76
CF1 Easy access to services	0.853		
CF2 Easy connection to other travel modes	0.945		
CF3 Online reservation system	0.766		
CF4 More service stations	0.906		
CF5 Privacy in travel	0.89		
Behavior Attitude (BA) (α= 0.901)	0.924	0.669	0.669
BA1 Understanding of unmanned aircraft system	0.784		
BA2 Travel confidence	0.886		
BA3 Travel feeling	0.946		
BA4 Travel acceptance	0.656		

To ensure the validity of the measurement model, a Confirmatory Factor Analysis (CFA) was conducted prior to the SEM analysis, as shown in Table 5 and Figure 2. The revised model met the following fit criteria: $\chi^2/df = 2.695$, NFI = 0.912, RFI = 0.910, CFI = 0.963, and SRMR = 0.074. Reliability was confirmed through Cronbach's Alpha (α) and Composite Reliability (CR), both exceeding the threshold of 0.7. They established convergent validity by ensuring that the Average Variance Extracted (AVE) for each construct was greater than 0.5 (Fornell & Larcker, 1981). The researchers ensured discriminant validity verifying that the square root of each construct's average variance extracted AVE exceeded its correlations with other constructs (Table 6).

Table 6 Comparison of correlation values with the square root of Average Variance Extracted (AVE)

Factor	Performance	Achieve	Social	Convenience	Behavior attitude
Performance	0.828				
Achieve	0.718	0.844			
Social	0.815	0.767	0.875		
Convenience	0.801	0.823	0.809	0.872	
Behavior attitude	0.550	0.629	0.620	0.789	0.818

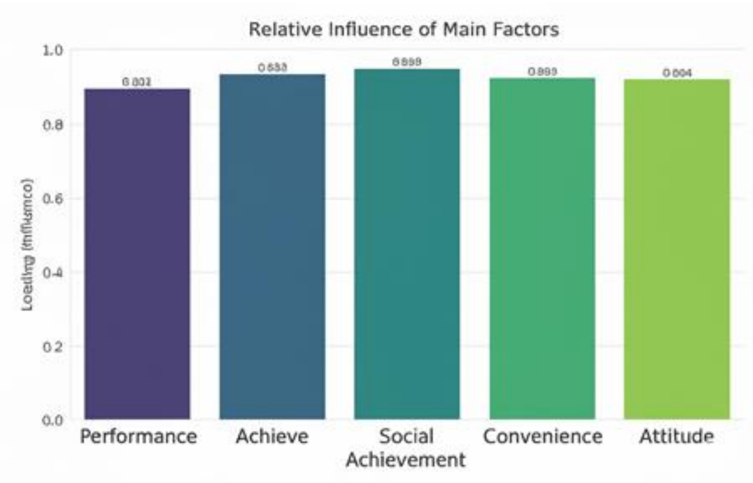

Figure 2 Relative influence of main factors

Table 7 Goodness-of-fit analysis of the model

Model	Chi-square	DF	Chi-square/DF	NFI	RFI	CFI	SRMR
Default Model	2660.297	987	2.304	0.923	0.924	0.975	0.072
Criteria			< 3	> 0.900	> 0.900	> 0.900	< 0.080

Table 8 Results of the Structural Equation Model (SEM) analysis

Hypothesis	Beta	Est.	S.E.	C.R.	p-Value	Result
1. BA < PF	0.143*	0.163	0.082	1.065	0.047	NR
2. BA < AF	0.325*	0.344	0.075	4.609	0.001	NR
3. BA < SF	0.217*	0.249	0.080	2.178	0.023	NR
4. BA < CF	0.193*	0.197	0.122	2.068	0.019	NR

Remark: NR: Not rejected

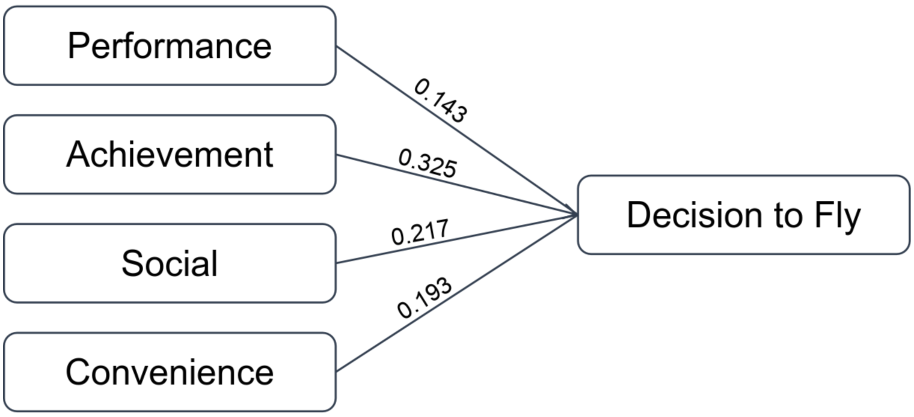

Figure 3 Relationship between latent variables and the decision to fly

The structural equation model (SEM) was revised and re-evaluated to ensure a strong fit, with final results meeting the following criteria: $\chi^2/df = 2.304$, NFI = 0.923, RFI = 0.924, CFI = 0.975, and SRMR = 0.072 (Table 7). The analysis confirmed that all factors were significant at the 95% confidence level (p-value < 0.05), supporting all four research hypotheses (H1, H2, H3, and H4). The factors influencing the decision to fly by unmanned aircraft, ranked in order of influence, are as follows: Achievement Factors (AF) with a weight of 0.325, Social Factors (SF) at 0.217, Convenience Factors (CF) at 0.193, and Performance Factors (PF) at 0.143 (Table 8 and Figure 3).

Discussion and conclusion

This study investigated the behavioral and decision-making factors influencing the adoption of unmanned aircraft for urban mobility in the Bangkok Metropolitan Region following the COVID-19 pandemic. One thousand two hundred respondents were randomly selected and analyzed using descriptive statistics and structural equation modeling (SEM) to assess the potential for future service provision.

Based on the descriptive statistical analysis, a most respondents expressed a willingness to use unmanned aircraft services and share flights if such services became available. This aligns with Thailand's strategic transportation plan, which emphasizes the promotion of multimodal transport to improve the nation's logistics and transportation infrastructure (Jutamart & Mana, 2023). When comparing travel decision behaviors across genders, significant differences were observed in service intentions, purpose of use, and travel needs, though there were no notable differences in willingness to pay. In contrast, the researchers found no significant differences across age groups regarding service intentions, purpose of travel, or willingness to pay. As Lidynia et al. (2017) and Chamata (2017) noted, testing unmanned aircraft services in large urban areas is essential for assessing their feasibility, safety, and ability to address social distancing and environmental and economic challenges in public transportation. Reducing reliance on private vehicles remains critical for alleviating traffic congestion, pollution, and greenhouse gas emissions (Loubser et al., 2021). Regarding gender differences in attitudes toward unmanned aircraft travel, women exhibited the highest overall positive attitudes, particularly about their emotional response to travel. Among age groups, respondents under 30 showed the most positive attitudes, while those over 50 demonstrated strong feelings toward flying. These findings are consistent with the Unified Theory of Acceptance and Use of Technology (UTAUT), which suggests that factors such as beliefs, expectations, social influences, and support systems influence technology adoption, with these relationships varying based on personal characteristics like age and gender (Venkatesh et al., 2003; Venkatesh et al., 2012).

To better align with the theoretical framework, the researchers refined structural equation model by removing non-significant variables, including timely arrival, noise reduction, and constant communication with ground staff. The model demonstrated acceptable confidence, reliability, and validity (Pakpisutkul, 2022). In this study, achievement emerged as the most influential factor in the decision to adopt unmanned aircraft (UA) for urban air mobility (UAM) in Bangkok, with a weight of 0.325 in the Structural Equation Model (SEM). This factor reflects people's expectations of the tangible benefits that UAM services can offer, such as accurate travel times, time savings, all-weather capability, and relief from traffic congestion. These practical advantages resonate strongly with urban commuters, particularly in Bangkok, where traffic congestion is persistent. While social influence, convenience, and performance also played roles in the decision-making process, their impact was less significant. However, these factors may become more important as people gain experience with UAM services over time, potentially influencing broader adoption as familiarity and trust in the technology grow.

First, in a highly congested urban area like Bangkok, where traffic delays are a major daily concern, the prospect of faster, more efficient travel is highly appealing. UAM offers the potential to bypass ground-level traffic, significantly reducing travel times for commuters. Respondents likely view UAM as a solution that can provide substantial time savings, making it a desirable option for individuals who prioritize efficiency in their travel decisions. Second, the ability to accurately predict travel times is another key advantage of UAM, especially compared to traditional road transport, where travel time can be highly variable due to traffic congestion. Respondents likely value this reliability, as it allows for better planning and reduces the uncertainty associated with everyday commutes. The expectation of consistent, reliable travel times enhances the appeal of unmanned aircraft services. Third, the expectation that unmanned aircraft can operate in various weather conditions, unlike some traditional transport modes, also contributes to its attractiveness. This feature would particularly resonate with commuters who face disruptions due to weather-related issues in ground transportation. Fourth, Bangkok is notorious for its heavy traffic, and any mode of transport that promises to alleviate congestion will likely gain strong public support. UAM offers a potential alternative to ground transportation, allowing travelers to avoid traffic jams and reduce commuting time. The significant influence of achievement reflects how respondents associate UAM with a solution to the city's long-standing traffic issues. Finally, the novelty of unmanned aircraft technology could contribute to its appeal. People may view it as a forward-thinking, innovative mode of transport that reflects technological progress and modernity. Researchers suggested that the prospect of being early adopters of cutting-edge technology may influence respondents' decisions, especially among those who value innovation and are attracted to new experiences. These expectations align with the broader goals of UAM technology and highlight the potential for this mode of transportation to meet the evolving needs of urban commuters.

In conclusion, this study highlights the factors that will likely influence the adoption of unmanned aircraft for urban air mobility in Bangkok. The findings provide valuable insights for policymakers and service providers aiming to develop efficient, sustainable, and user-accepted transportation options. Future research should further explore public acceptance and operational challenges as unmanned aircraft services move closer to implementation.

This study has several limitations. First, the sample was confined to the Bangkok Metropolitan Region's residents, which limits the findings' generalizability to other regions or countries with different traffic conditions and cultural contexts. The reliance on self-reported questionnaires may also introduce biases, such as social desirability or recall inaccuracies. Additionally, the researchers based the study on hypothetical scenarios, as unmanned aircraft services are not yet available in Bangkok. This limitation may lead to discrepancies between participants' stated intentions and their actual behavior once the services are launched.

In addition to methodological considerations, several practical challenges could slow down or complicate the rollout of UAM services in Bangkok. One of the biggest hurdles relates to regulation autonomous flights operating at low altitudes over densely populated urban areas. Updating these regulations to clarify airspace management, safety protocols, and liability issues is essential. Without these regulatory changes, policymakers and aviation authorities may find it difficult to ensure safe operations and gain public trust in this emerging mode of transportation (Goodchild & Toy, 2018; Zhang et al., 2020).

Infrastructure is another critical piece of the puzzle. It is not enough to have the aircraft themselves; successful implementation demands investment in specialized facilities such as vertiports for take-off and landing, reliable charging stations, and integrated air traffic control systems designed specifically for low-altitude urban flights. Without robust infrastructure, scaling UAM services to meet public demand will be a major challenge (Ford et al., 2019; Knell et al., 2021).

Public acceptance and safety concerns also remain significant barriers. Many people may hesitate to adopt this new technology due to fears about collision risks, technical malfunctions, or cybersecurity vulnerabilities especially pressing issues in a crowded and complex urban environment like Bangkok. To address these concerns, it is crucial to implement pilot programs that demonstrate the technology's safety and reliability, coupled with transparent communication strategies to build user confidence and trust over time (Hwang et al., 2021; Biehle et al., 2020).

Given that achievement emerged as the most influential factor in this study, its policy implications warrant closer attention. Respondents' expectations centered around tangible benefits such as time savings, reliable scheduling, and all-weather operability. These findings suggest that future UAM systems must deliver novelty and proven value. In this context, policymakers and developers should prioritize technologies that enhance perceived user benefits directly. For instance, deploying predictive flight-time algorithms, real-time adaptive routing to avoid weather disruptions, and automated booking platforms with guaranteed arrival windows can help reinforce public confidence in the reliability and efficiency of UAM.

Moreover, service providers could reinforce the perception of achievement by clearly communicating performance metrics to users. UAM operators might consider offering service-level guarantees or performance dashboards visible to users similar to how ride-sharing platforms display estimated arrival times and driver ratings. These strategies would contribute to shaping UAM as innovative but also dependable and time-efficient, resonating with commuter priorities in traffic-congested cities like Bangkok.

In the longer term, sustained investment in R&D to improve aircraft versatility and scheduling algorithms could further amplify these achievement-related benefits. Policymakers and stakeholders should design pilot programs to highlight these functional advantages, while public outreach initiatives can frame urban air mobility (UAM) as an intelligent, future-oriented solution to urban transportation challenges. By aligning technical performance with user expectations around achievement, stakeholders can pave the way for more enthusiastic and enduring adoption.

Future research could address these limitations by expanding the sample to include participants from various regions or conducting cross-country comparisons. Longitudinal studies that track how attitudes and behaviors evolve as UAM services become available more profound insights. Researchers or policymakers could implement behavioral experiments or pilot programs to examine real-world adoption patterns of urban air mobility systems. Moreover, future studies could explore new factors such as environmental concerns, privacy issues, and technological advancements to understand their impact on UAM adoption better.

Limitations and practical implications

This study focused on the Bangkok Metropolitan Region, examining behavioral intentions toward adopting Urban Air Mobility (UAM) services using a hypothetical scenario. Although the results provide valuable insights, the researchers acknowledge several limitations that should be taken into account. The geographic scope was limited to a single urban area, which may not fully represent opinions from other regions of Thailand.

Expanding the sample to more diverse locations would enhance the generalizability of the findings. Additionally, intentions expressed in hypothetical contexts might differ from actual behaviors when real-world factors such as risk, cost, and system reliability come into play. This discrepancy is a notable limitation of scenario-based research. Future studies should consider longitudinal designs to monitor changes in user acceptance over time or implement pilot programs to observe real usage behaviors, providing a more grounded understanding of UAM adoption.

Building on these findings, several practical recommendations can support the integration of unmanned aircraft (UA) into Bangkok's urban air mobility system. Developing a comprehensive regulatory framework is essential to ensure safe and efficient operation. This framework should address licensing, airspace management, safety protocols, and privacy issues. Simultaneously, public awareness and education initiatives are necessary to build trust and familiarity with UAM technology. Demonstration flights and information campaigns can reduce safety concerns, while educational institutions might incorporate UAM topics to foster long-term acceptance.

Government incentives such as discounted fares for initial users, tax breaks for companies investing in UAM infrastructure, and subsidies for eco-friendly technology development could be introduced to stimulate early adoption. Another key step is integrating UAM with existing multimodal transport networks by establishing stations near transit hubs like metro stations and airports, supported by digital platforms seamless travel connections. Emphasizing environmental sustainability, policies should encourage using electric or hybrid-electric aircraft to minimize emissions, supported by funding for research and development in green UAM technologies.

Infrastructure development is equally critical; investment is needed in take-off and landing sites, maintenance facilities, and charging stations for electric UAM vehicles, strategically located in high-demand urban areas to maximize user convenience. Finally, equity and access issues must be addressed to ensure UAM services benefit dense urban centers and underserved neighborhoods. This can be achieved through fare subsidies for low-income users and prioritizing routes that serve less accessible parts of the city.

By following these recommendations, policymakers can create an environment conducive to the effective implementation and broad acceptance of UAM in Bangkok. These efforts would improve urban mobility and enhance the sustainability and efficiency of the city's transportation infrastructure.

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