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Effects of trust and customer perceived value on the acceptance of urban air mobility as public transportation

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ABSTRACT

Urban air mobility (UAM) is expected to become an innovative mode of public transportation. Although multiple factors may facilitate the adoption of UAM, its implementation may be difficult owing to the lack of customer acceptance and usage intentions. This study proposes a research model to explore the effects of trust and customer perceived value on the acceptance of UAM as public transportation. In this study, empirical data from 573 respondents were collected via an online survey. Additionally, thirteen hypotheses on trust and customer-perceived value were presented, and a relationship model was conceptualized and analyzed using structural equation modeling based on the partial least squares method. The results indicated that all thirteen hypotheses proposed in this study were statistically supported and trust in technology and customer perceived value was found to positively influence the intention to use UAM as public transport. Notably, functional, emotional, and social values were found to considerably affect trust in technology and customer-perceived value; specifically, functional value had the greatest impact in this context. The results of this study validate the importance of trust and customer-perceived value, which should be prioritized in the adoption of UAM as a public transportation service.

1. Introduction

Urban air mobility (UAM) is a safe and efficient alternative mode of airborne transport using highly automated aircraft. Recently, UAM has received considerable attention from the transportation sector and academia. UAM is defined as "an air transportation system for passengers and cargo in and around urban environments" (European Union Aviation Safety Agency, 2021; Andritsos et al., 2022). In metropolitan areas, UAM can provide on-piloted, remotely piloted or operated, and automated on-demand transport services for passengers and freight (Lascara et al., 2018). Moreover, UAM facilitates short-range and point-to-point intra- and inter-urban transportation (Lim et al., 2022). Furthermore, UAM can be used for various operations, such as deliveries conducted by drones (Dayarian et al., 2020), postal services (Soffronoff et al., 2016), infrastructural inspections (Besada et al., 2018), traffic monitoring (Sutheerakul et al., 2017), and agriculture (Puri et al., 2017).

This revolutionary concept of UAM relies heavily on cutting-edge technologies that impart vertical takeoff and landing (VTOL) capabilities (Cohen et al., 2021; Andritsos et al., 2022), which mitigate resource wastage and allow UAM modes to operate in urban environments (Rice et al., 2022). Leveraging VTOL technologies can substantially reduce door-to-door travel times and address surface-congestion issues during inter- and intra-city commutes (Shaheen et al., 2018). VTOL aircraft, designed for agile vertical ascent and descent, are critical for seamlessly integrating air transportation within densely populated urban landscapes (Song & Yeo, 2021). The integration of UAM and public transport can provide passengers with cost-effective and comfortable transportation, as well as interconnected ground–air transport. UAM can serve as an on-demand service, offering a unique and time-saving experience for users willing to pay for speed and convenience (Wu & Zhang, 2021). Furthermore, UAM can rapidly deliver packages and transport people in urban areas via air metro and taxi for sightseeing activities (Rice et al., 2022).

Market-focused studies have revealed that the UAM market is expected to expand tremendously. Private UAM operations and

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commercial air mobility services are expected to commence between 2022 and 2025 and in 2025, respectively (Grandl et al., 2018). The value of the UAM passenger market related to intra- and intercity travel will be $32 billion in 2035, with 23,000 operating aircraft. The global value of this market is expected to be $74 billion. A UAM market study conducted by the National Aeronautics and Space Administration revealed that soon, air taxi and airport shuttle services in the U.S. could experience a daily demand of 82,000 passengers (Reiche et al., 2018). In the early stages of UAM deployment across 486 urban areas in the U.S., the combined demand for airport shuttles and air taxis is estimated at 55,000 daily trips and 82,000 daily passengers. This demand will result in an annual market value of $2.5 billion and may be fulfilled by approximately 4,000 four- to five-seat aircraft. In an unconstrained scenario, the potential demand could reach 11 million daily trips, with a resulting market valuation of $500 billion (Goyal et al., 2021). Customer's acceptance and their willingness to pay for a technology are essential to the success of innovative products (Schmidt et al., 2016). Such products generally gain consumers' acceptance when their benefits become evident (Raj et al., 2020). Improving customers' acceptance is, therefore, a prerequisite for the successful launch of UAM as the next-generation mode of transportation (Yedavalli & Mooberry, 2019).

However, several obstacles, such as regulations (Nehk et al., 2021); infrastructure (Takacs & Haidegger, 2022); weather (Reiche et al., 2021); cost (Ahmed et al., 2021); lack of societal acceptance (Cetin et al., 2022); and user concerns regarding safety, privacy, and environmental impacts (European Union Aviation Safety Agency, 2021), must be overcome before UAM is accepted as a mode of transportation. The global automotive consumer survey conducted by Deloitte revealed that consumers' concerns regarding the use of UAM are primarily safety-related; 48 % of the survey respondents were concerned regarding the safety of air taxis (Deloitte, 2020). In addition to the willingness to fly, safety concerns regarding varying weather conditions affect customers' intent to use UAM. Shaheen et al. (2018) explored the impact of weather conditions on the willingness of respondents to fly via UAM under adverse weather conditions. The results revealed that respondents displayed increased levels of fear and anxiety regarding UAM use under such conditions. Additionally, the respondents were concerned regarding snow, low visibility owing to fog, and turbulence.

Researchers have investigated the factors influencing consumers' acceptance of UAM. Kim et al. (2022) explored the influence of trust and service quality on user adoption of UAM. Trust in technology positively influenced the intention to use UAM. Service-quality factors related to transport substantiate the perceived usefulness (PU) and perceived ease of use (PEOU) of UAM. Rice et al. (2022) evaluated consumers' perceptions of the desired features and factors expected from air taxis. Passengers were primarily concerned with the security and safety of using UAM as a transportation service. Al Haddad et al. (2020) identified and quantified the factors affecting the adoption and utilization of UAM; safety, trust, affinity for automation, data concerns, social attitudes, and sociodemographics were identified as important factors. The following factors affecting UAM usage were identified: time savings, perceived automation costs, and service reliability. Winter et al. (2020) quantitatively assessed the factors that reliably predict consumers' willingness to fly via UAM. They reported that familiarity, value, enjoyment, wariness related to new technology, fear, and happiness were the major factors identified. Notably, the findings indicate six critical factors that affect consumers' choice to adopt this mode of transportation.

Trust in technology is the conviction that a technology can behave as expected in a specific situation with a potentially negative outcome (Mcknight et al., 2011). Kim et al. (2022) revealed that trust is a major factor influencing acceptance, which is an essential predictor of willingness to adopt technology and affects customers' acceptance of UAM. Customer perceived value could shape customers' perceptions of the service and positively affect their behavioral intentions (Putrianti & Semuel, 2018). Customers determine this perceived value by comparing the benefits or utilities obtained from a product or service (Zeithaml, 1988). Therefore, customer perceived value affects their future intention to use UAM for transportation.

This study investigated customers' perceptions of the utility of UAM as a form of public transport and the associated trust in technology. User acceptance models were investigated and expanded to explain the factors affecting the behavioral intention to use UAM for public transportation. A research model based on the technology acceptance model (TAM), with trust in technology and customer perceived value incorporated as factors, was developed. Finally, the model was validated using an online survey. The rest of this paper is organized as follows. Section 2 presents the research hypotheses based on a review of the literature investigating the factors influencing the acceptance of UAM. Section 3 describes the research methodology used in this study. Section 4 presents the results. Section 5 presents the discussion based on these results, and the final section presents the conclusions.

2. Literature review and research hypotheses

UAM technology is expected to improve overall transportation efficiency. However, limited research has been conducted on the factors influencing the intention to use UAM. Previous studies revealed that several factors affect the use and acceptance of UAM (Al Haddad et al., 2020; Kim et al., 2022). Based on the relevant literature, we integrated trust in technology and customer perceived value as constructs of the TAM. The effects of all the constructs on the behavioral intentions to use UAM were investigated.

2.1. Technology acceptance model

The TAM, introduced by Davis (1989) for investigating technology use in information systems, is used to explore the intention to use and accept novel technology systems. The model presents a framework for modeling user acceptance of the factors that influence technological decisions. In addition, the TAM is used in domains such as wearable devices (Chang et al., 2016a), mobile applications (Cho et al., 2020), e-commerce (Vărzaru et al., 2021), mobile wallets (To & Trinh, 2021), chatbots (de Andrés-Sánchez & Gené-Albesa, 2023), and autonomous vehicles (Yuen et al., 2021).

The TAM comprises two constructs: PU and PEOU, with PEOU reinforcing PU (Davis et al., 1989). Both these factors determine the behavioral intention influencing the adoption of specific services and systems. PU represents the extent to which users believe that adopting a certain technology will enhance their job performance, whereas PEOU denotes the degree of effort required to adopt this technology. The TAM can be used to determine the importance of service attributes that define major issues concerning the adoption of UAM (Al Haddad et al., 2020; Kim et al., 2022).

Intention to use represents "the extent to which an individual has consciously devised plans to either engage in or refrain from specific future behaviors" (Warshaw and Davis, 1985, p. 214). Consumers demonstrate increased intention to use when they positively evaluate offered products or services (Al-Qeisi et al., 2014). According to the TAM, behavioral intentions to use a certain technology are influenced by PEOU and PU. Therefore, we proposed the following hypotheses:

H1: Perceived usefulness positively influences the behavioral intention to use UAM as public transportation.

H2: Perceived ease of use positively influences the behavioral intention to use UAM as public transportation.

H3: Perceived ease of use positively influences on perceived usefulness.

2.2. Trust in technology

Trust is defined as an individual's willingness to depend on another party considering their characteristics (Rousseau et al., 1998). Notably, trust has an important influence on human-technology interactions.

Trust in technology is the conviction that a system provides rapid and adequate user support (Mayer et al., 1995). Various studies have provided insights into the influence of trust on technology acceptance and confirmed that trust is crucial for adopting new technologies (Ha et al., 2020; Kim et al., 2020). Lee and See (2004) explain the mechanism via which a representative attitude allows an individual to realize their goals in uncertain and vulnerable situations. Within the information systems domain, trust is defined in relation to people and not technology, thereby yielding adequate and responsive assistance to users (Mayer et al., 1995). Hoff and Bashir (2015) explained the effects of external variables such as system type and complexity on the trust in automation. Internal elements, such as self-confidence, subject-matter expertise, mood, and attentional capacity, can also affect trust.

Trust is positively correlated with reliance on automated driving systems and is a key factor affecting the adoption of autonomous vehicles (Zhang et al., 2021). Moreover, this metric is the strongest predictor of intention to use autonomous vehicles (Zhang et al., 2019). Similarly, trust is a key factor influencing the customer acceptance of UAM. Kim et al. (2022) identified trust in technology, transportation service quality, and the TAM as factors influencing the customer acceptance of UAM. The findings indicate that trust in UAM technology positively influences the intention to use UAM. Al Haddad et al. (2020) conducted a preference survey to assess the factors affecting UAM adoption and discovered that trust is a crucial factor in this context. Previous studies have consistently demonstrated a positive correlation between trust, the TAM, and the intention to use technology. Furthermore, research has underscored the critical role of trust in predicting the adoption of sustainable technologies. Both theoretical and empirical studies advocate for the continual integration of trust into the TAM constructs. Customers' trust in technology can significantly influence ease of use and streamline processes related to verifying, monitoring, and controlling service interactions (Dhagarra et al., 2020; Sarkar et al., 2020). Therefore, the following hypotheses were proposed:

H4: Trust in technology positively influences the behavioral intention to use UAM as public transportation.

H5: Trust in technology positively influences perceived ease of use.

2.3. *Customer perceived value*

The concept of value is fundamental for understanding consumer behavior. Customer perceived value is the perception of the received benefits compared with the disbursed costs related to service engagement (Zeithaml, 1988). Perceived value results from consumers' pre-purchase perceptions, evaluations during transactions, and post-purchase assessments (Asgarpour et al., 2014; Lindgreen et al., 2012; Ryu et al., 2012; Zeithaml, 1988; Zhu et al., 2017). Customer perceived value has attracted the attention of researchers in the transportation services field. Structural equations were modeled by Irtema et al. (2018) to determine the relationship between the behavioral intentions of public transport passengers and the perceived value of the service. The findings indicated that perceived value positively affects the behavioral intentions of public transport passengers in Kuala Lumpur. Hadiansah et al. (2018) reported that customer perceived value is positively correlated with the intention of purchasing intercity transportation services. Passengers who perceived the service value of air travel to be high demonstrated increased satisfaction, thereby revealing the positive effect of customer perceived value on customer satisfaction (Wehner et al., 2022). These studies indicate that customer perceived value is an important factor affecting the adoption of transport services such as UAM. Therefore, we proposed the following hypothesis:

H6: Customer perceived value positively influences behavioral intention to use UAM as public transportation.

H7: Customer perceived value positively influences perceived usefulness.

2.4. *Functional value*

Functional value, also known as perceived utility, is the PU owing to the functional capabilities, utilitarian performance, physical attributes, and perceived quality of an alternative, as well as the anticipated performances of goods and services (Sweeney & Soutar, 2001; Zhu et al., 2017). Functional value is a key factor that influences consumer choice and positively affects trust, as it is closely associated with the utilities perceived by consumers when making choices that yield practical and tangible results (Watanabe et al., 2020). Previous studies have indicated that functional value represents the potential benefits a product can provide to consumers. Hadiansah et al. (2018) reported that functional value, a factor related to customer perceived value, significantly influences purchase intention related to transportation services. Zhu et al. (2017) demonstrated that functional value directly affects the perceived value of ride-sharing applications. Individuals who strongly believe in the overall reliability and functionality of technology assume that this technology is dependable and offers essential assistance. In contrast, a trusting stance toward general technology is based on the extent to which users are confident that relying on technology yields positive outcomes (Mcknight et al., 2011). Based on the literature review, the influence of functional value on the acceptance of UAM as public transportation was hypothesized as follows:

H8: Functional value positively influences customer perceived value.

H9: Functional value positively influences trust in technology.

2.5. *Emotional value*

Emotional value is the utility derived from feelings or affective states generated by a product (Lee et al., 2011) and is essential for determining willingness to use the product. Consumer-perceived value is significantly influenced by emotional value, indicating that emotional value is essential for modifying behavior during purchase (Sweeney & Soutar, 2001). Winter et al. (2020) demonstrated that consumers who were happy with the concept of air taxis were willing to use these taxis, especially when they received new information. Emotional value is a strong predictor of behavior and a key factor related to the willingness to fly. Moreover, emotional value is similar to perceived playfulness and enjoyment. Lu and Wang (2020) explored travelers' behavioral intentions toward ride-hailing services. Emotional value is an important factor affecting perceived value and trust in services involving advanced technologies (Chang et al., 2016b). Empirical results revealed that perceived enjoyment significantly and positively affects emotional value. The influence of emotional value on trust indicates that the subjective aspects of pleasure and well-being are essential to consumers when using a product (Watanabe et al., 2020). Therefore, the following hypotheses were formulated:

*H*10: Emotional value positively influences customer perceived value.

*H*11: Emotional value positively influences trust in technology.

2.6. *Social value*

Social value refers to the prestige acquired via an alternative association with specific or important social groups (Sheth et al., 1991). Social image and value influence customer perceived value. Zhu et al. (2017) discovered that social value positively influences the perceived value of shared services, intrinsic emotional motivation, and external social factors. Kim et al. (2013) revealed that social motivation affects users' engagement in and the perceived value of mobile activities. Public transport is a reasonable reflection of a sharing economy (Stjernborg & Mattisson, 2016). In a sharing economy, consumer assessments of ride-social sharing's value are significantly high (Wang et al., 2019). Manca et al. (2019) investigated the effect of social influence on the adoption of a bike-sharing system and discovered that this factor is increasingly significant in terms of transport demand and travel behavior. Consumer perceptions of the social advantages of a shared economy are increasing in importance for determining whether ridesharing is accepted. However, this behavior has implications in terms of social value. Social value and trust in technology are highly correlated. As demonstrated by Liang et al. (2011) in a study on social commerce, social support influences trust in websites. Furthermore, the contemporary phenomenon of the sharing economy, characterized by widespread participation, is considerably affected by subjective norms and social influences. As Wang et al. (2020) discovered, this social trend reveals that individuals with a positive social-value orientation exhibit increased trust in digital platforms within the sharing economy, underscoring the nuanced connection between social values and trust in technology. Therefore, we developed the following hypotheses:

H12: Social value positively influences customer perceived value.

H13: Social value positively influences trust in technology.

2.7. Research model

The proposed model is based on the TAM, and trust in technology and customer perceived value are used as factors that affect the intention to use UAM as public transport. In addition, we investigated the effects of functional, emotional, and social values on trust in technology and customer perceived value. The research model featuring the 13 hypotheses is shown in Fig. 1.

3. Methods

In this study, we conducted an online survey to collect data. The questionnaire was based on the UAM research context. All the participants were instructed to answer the questionnaire using a 7-point Likert scale. The partial least squares (PLS) method implemented using SmartPLS 3.0 was used to determine the reliability, convergent validity, and discriminant validity of the model to test the aforementioned hypotheses. Additionally, path coefficient analysis of the structural model was conducted to test these hypotheses.

3.1. Variables and measurements

The literature review yielded 22 questionnaire items based on eight constructs. Multiple-item measurements were developed based on previous studies to improve content validity and were modified to reflect the UAM context. The English version of the questionnaire was translated into Korean. A 7-point Likert scale with “1 = strongly disagree” being the lowest and “7 = strongly agree” being the highest score was used in the evaluation. The highest scores were considered when recording data on each indicator variable related to the defined constructs. Table 1 lists the items used in the study.

3.2. Data collection and participants

The online survey comprised three major sections. The first section defined UAM and included images of the types of UAM systems provided by Joby Aviation, Hyundai Motors, and Lilium. The second section gathered information on transportation behavior, encompassing details such as driving information and public transportation time. Respondents were required to answer multiple-choice questions related to their transportation preferences and practices, as well as provide demographic information such as gender, age, and educational background. The third section comprised a Likert-based questionnaire in which respondents were questioned on their intentions to use UAM.

The data were collected in February 2023 by Embrain, a professional survey company located in South Korea. A total of 573 data samples were collected for the final analysis. The target population comprised adults (aged > 18 years) living in South Korea. Respondents were not filtered based on specific conditions because 1) the objective was to investigate general opinions regarding future transportation and 2) all adults can be potential users of UAM. According to the survey findings, 54.97 % and 45.03 % of the respondents were male and female, respectively, with a mean age of 29.08 (standard deviation = 5.82). Furthermore, 72.78 % of the respondents possessed driving licenses and 30.20 % owned cars. The average daily commuting time via public transport was calculated based on the values provided by the respondents, revealing that, they spend an average of 50 min per day commuting. Additionally, 10.82 % of the respondents were high-school graduates, 20.84 % were undergraduates, and 68.24 % were graduates. Table 2 highlights the essential demographic attributes of the respondents.

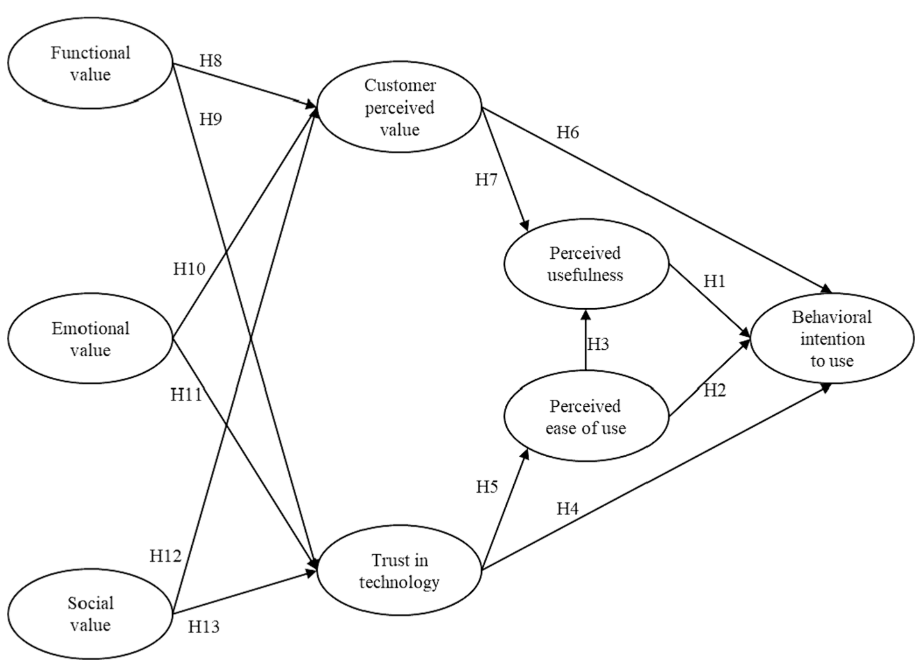

Fig. 1. Proposed research model.

Table 1
Construct and measurement items.

Construct		Item	References
Behavioral intention	BI1	I predict I will use UAM as public transport in the future.	(Kim et al., 2022; Venkatesh & Davis, 2000)
	BI2	I plan to use UAM as public transport in the future.	
	BI3	Assuming I have access to the UAM as public transport, I intend to use it.	
Perceived usefulness	PU1	Using UAM as public transport will improve my travel performance.	(Rahman et al., 2018)
	PU2	Using UAM as public transport will increase my safety.	
Perceived ease of use	PEOU1	I believe that UAM as a public transportation service will be easy to use.	(Davis, 1989; Davis et al., 1989)
	PEOU2	I believe that using UAM as a public transportation service will not require much effort.	
Trust in technology	TT1	I believe that the UAM system possesses integrity.	(Jian et al., 2000)
	TT2	I can trust the UAM system.	
	TT3	I believe that the UAM system is dependable.	
Customer-perceived value	CPV1	I believe that UAM as public transport offers valuable services.	(Chen, 2008; Irtema et al., 2018)
	CPV2	I believe that the service quality of UAM as public transport is reasonable.	
	CPV3	With respect to regular public transport, I believe that UAM as public transport offers reasonable quality.	
Functional value	FV1	I believe that UAM as public transport has an acceptable quality standard.	(Sweeney & Soutar, 2001)
	FV2	I believe that UAM as public transport provides consistent quality.	
	FV3	I believe that UAM as public transport will perform consistently.	
Emotional value	EV1	I will enjoy using UAM as public transport.	(Sweeney & Soutar, 2001)
	EV2	I believe that I will enjoy traveling when using UAM as public transport.	
	EV3	Using UAM as public transport will make me relaxed.	
Social value	SV1	Using UAM as a public transport system will be socially acceptable.	(Sweeney & Soutar, 2001)
	SV2	Using UAM as public transport will be good for society.	
	SV3	Using UAM as public transport will improve society.	

Table 2
Demographic statistics.

Demographic characteristics		Frequency	Percentage
Gender	Male	315	54.97
	Female	258	45.03
Education	High school graduates	62	10.82
	Undergraduate students	120	20.94
	Graduates	391	68.24
Driving license	Yes	417	72.77
	No	156	27.23
Car ownership	Yes	173	30.19
	No	400	69.81

3.3. Data analysis

PLS analysis was conducted using the SmartPLS software to investigate the corresponding hypotheses using the proposed model. PLS is a powerful tool that can separately assess measurement and structural models (Hair et al., 2014). PLS uses each path coefficient and explains the variance rather than the overall model fit (Chin et al., 2003). The measurement model was evaluated according to the following criteria established based on the reflective approach: 1) construct reliability and validity and 2) convergent and discriminant validity.

Construct reliability and validity were verified using Cronbach's alpha coefficient, composite reliability (CR), and the rho_A coefficient. Cronbach's alpha coefficient is a measure of reliability considering the correlations between indicator variables and should be greater than 0.7. CR considers different loads related to each latent variable, and the recommended CR values should exceed 0.7. Additionally, the rho_A coefficients should be greater than 0.7 to demonstrate the measurement reliability of the scales. Factor loadings must exceed 0.60 to confirm the validity of the constructs (Anderson & Gerbing, 1988).

The convergent validity of the measurement model was evaluated and confirmed using the average variance extracted (AVE) values, which were greater than 0.5. To ensure discriminant validity, the square root of AVE should be greater than the correlation between the latent variables (Hair et al., 2019).

After implementing the proposed model, bootstrapping was conducted to test the hypotheses and obtain t-values and path coefficients using 5,000 sub-samples. The significances of the path coefficients were analyzed using Student's *t*-test at the 5 % significance level.

4. Result

4.1. Descriptive statistics

Descriptive statistics were used to calculate the means and standard deviations of the data on the measurement items related to each construct. The results listed in Table 3 indicate that respondents exhibit positive behavioral intent (M = 5.34), PU (M = 5.52), and PEOU (M = 5.36) when considering the use of UAM as public transport. The respondents indicated positive customer perceived (M = 4.98), functional (M = 5.06), emotional (M = 5.28), and social (M = 5.21) values in relation to the use of UAM. However, their trust in technology was moderately high (M = 4.78), and customer perceived value (M = 4.98) influenced the intention to use UAM, indicating the significant importance customers place on the perceived value received from UAM, influencing their intention to use such transportation strategies.

4.2. Analysis of the measurement model

The data were analyzed based on construct reliability, validity, and convergent and discriminant validities. The results listed in Table 4 indicate that all eight constructs satisfy the required standard limits, and all item loadings were greater than 0.60. For all constructs, CR, Cronbach's alpha, and rho_A were greater than 0.7, indicating that the scale measurements were reliable and valid.

Table 3
Mean and standard deviation values related to the constructs.

Construct	Mean	SD
Behavioral intention	5.34	1.25
Perceived usefulness	5.52	1.32
Perceived ease of use	5.36	1.35
Trust in technology	4.78	1.41
Customer perceived value	4.98	1.40
Functional value	5.06	1.44
Emotional value	5.28	1.35
Social value	5.21	1.33

Table 4
Reliability and convergent validity results.

Construct	Item	Loading	CR	Cronbach's alpha	rho_A	AVE
Behavioral intention	BI1	0.836	0.886	0.807	0.811	0.722
	BI2	0.891				
	BI3	0.819				
Perceived usefulness	PU1	0.908	0.888	0.749	0.757	0.799
	PU2	0.879				
Perceived ease of use	PEOU1	0.885	0.875	0.713	0.714	0.777
	PEOU2	0.878				
Trust in technology	TT1	0.896	0.936	0.897	0.898	0.830
	TT2	0.918				
	TT3	0.919				
Customer perceived value	CPV1	0.785	0.865	0.767	0.779	0.682
	CPV2	0.810				
	CPV3	0.880				
Functional value	FV1	0.854	0.891	0.816	0.817	0.731
	FV2	0.854				
	FV3	0.858				
Emotional value	EV1	0.824	0.863	0.766	0.776	0.678
	EV2	0.836				
	EV3	0.809				
Social value	SV1	0.845	0.904	0.841	0.842	0.759
	SV2	0.889				
	SV3	0.880				

The results listed in Tables 4 and 5 indicate that discriminant validity exists in both cases. The AVE value corresponding to each latent variable exceeds 0.5, and the square root of the AVE corresponding to each construct was more significant than the correlation values. Notably, all the values satisfied the recommendations related to discriminant validity.

4.3. Analysis of the structural model

The results obtained from the structural model are listed in Table 6. The path coefficients were analyzed using a Student's *t*-test based on a significance level of 0.05. All the hypotheses were confirmed by the results. The behavioral intention to use UAM as public transportation was found to be influenced by PU, PEOU, trust in technology, and customer perceived value. PU strongly influenced behavioral intention to use UAM as public transportation (H1: structural path coefficient (β) = 0.186; $p < 0.001$), followed by PEOU (H2: β = 0.478; $p < 0.001$), trust in technology (H4: β = 0.150; $p < 0.001$), and customer perceived value (H6: β = 0.126; $p < 0.05$).

Trust in the technology and customer perceived value describe the effect of PEOU and PU, respectively. The results indicate that PEOU (H3: β = 0.427; $p < 0.001$) and customer perceived value (H7: β = 0.337; $p < 0.001$) substantially influence PU. Furthermore, trust in technology considerably influences PEOU (H5: β = 0.440; $p < 0.001$). These results provide strong evidence for the predictiveness of the proposed theoretical model.

Table 6
Summary of the results obtained from the structural model in relation to the hypotheses.

Hypothesis	Path	Path coefficient	T-Statistics	Significance	Hypothesis testing result
H1	PU -> BI	0.478	11.579	***	supported
H2	PEOU -> BI	0.186	3.682	***	supported
H3	PEOU -> PU	0.427	6.901	***	supported
H4	TT -> BI	0.150	3.719	***	supported
H5	TT -> PEOU	0.440	8.961	***	supported
H6	CPV -> BI	0.126	2.419	*	supported
H7	CPV -> PU	0.337	5.832	***	supported
H8	FV -> CPV	0.615	14.153	***	supported
H9	FV -> TT	0.416	6.824	***	supported
*H*10	EV -> CPV	0.108	2.434	*	supported
*H*11	EV -> TT	0.137	2.121	*	supported
H12	SV -> CPV	0.207	4.720	***	supported
H13	SV -> TT	0.209	2.995	**	Supported

Note. BI: behavioral intention; PU: perceived usefulness; PEOU: perceived ease of use; TT: trust in technology; CPV: customer perceived value; FV: functional value; EV: emotional value; SV: social value; $*p < 0.05$, $**p < 0.01$, and $***p < 0.001$.
Note. $*p < 0.05$, $**p < 0.01$, and $***p < 0.001$.

The results confirmed that functional, emotional, and social values significantly affect trust in technology. Functional value has the greatest effect on trust in technology (H9: β = 0.416; $p < 0.001$), followed by social value (H13: β = 0.209; $p < 0.01$), and emotional value (*H*11: β = 0.137; $p < 0.05$) has the least effect. The results confirm the positive effects of functional, social, and emotional values on trust in technology. Functional value is the most important factor in trust in technology.

Additionally, the factors affecting customer perceived value were measured along three dimensions: functional, social, and emotional. Functional value considerably impacts customer-perceived value (H8: β = 0.615; $p < 0.001$). Moreover, social value significantly influences customer perceived value (H12: β = 0.207; $p < 0.001$); however, the least influential factor is emotional value (*H*10: β = 0.108; $p < 0.01$). Overall, all other significant paths mildly affected consumer perceived

Table 5
Discriminant validity results.

	BI	PU	PEOU	TT	CPV	FV	EV	SV
BI	**0.850**							
PU	0.757	**0.894**						
PEOU	0.655	0.661	**0.882**					
TT	0.560	0.511	0.440	**0.911**				
CPV	0.657	0.634	0.694	0.665	**0.826**			
FV	0.616	0.627	0.668	0.649	0.825	**0.855**		
EV	0.654	0.703	0.664	0.573	0.678	0.682	**0.823**	
SV	0.580	0.621	0.686	0.585	0.694	0.664	0.726	**0.871**

Notes: BI: behavioral intention; PU: perceived usefulness; PEOU: perceived ease of use; TT: trust in technology; CPV: customer perceived value; FV: functional value; EV: emotional value; SV: social value.

value.

The structural path coefficient estimates (β) and the correlation coefficients (R^2) are depicted in Fig. 2. The R^2 values indicated that the variance in behavioral intention, customer perceived value, PU, and trust in technology in relation to using UAM as public transport were 65 %, 72.25 %, 49.6 %, and 47.1 %, respectively. Notably, PEOU exhibited the lowest R^2 value of 19.3 %.

5. Discussion

This study modeled structural equations to analyze the behavioral intention to use UAM as public transportation. The TAM was used in this study, and trust in technology and customer-perceived value, as well as functional, emotional, and social values, were integrated into the model to better understand user behavior. An online survey was conducted to collect user opinions regarding the use of UAM as public transport, and the PLS method was applied to test the proposed model and the corresponding hypotheses.

The results of the PLS-based structural equation modeling demonstrated that PU and PEOU positively influenced the behavioral intention to use UAM as public transport. The findings revealed that PU influenced behavioral intention more strongly than PEOU in the TAM construct. Kim et al. (2022) and Al Haddad et al. (2020) reported a significant effect of the TAM on behavioral intention. Trust in technology positively influences behavioral intention and is a key factor influencing the successful adoption of UAM (Al Haddad et al., 2020). A positive correlation was identified between customer perceived value and behavioral intention. Chen (2008) reported that customer perceived value affects passenger satisfaction and intention to purchase public transport services. Trust in technology was identified as a strong influence on PEOU, and customer perceived value was found to significantly affect PU.

Trust in technology was significantly correlated with functional, emotional, and social values. We found that functional value, followed by social and emotional values, is the most influential and essential factor that validates the feasibility and utility of UAM, fostering the users' trust in and intention to use this technology. Our findings are consistent with those reported in several previous studies, including the study conducted by Watanabe et al. (2020), who emphasized the influence of functional and emotional values on consumers' trust and purchase intent. Karjaluoto et al. (2012) suggested that the perceived value related to functional, emotional, social, and monetary factors is strongly related to trust, and these are important considerations when selecting and purchasing a product or service that enhances customer service.

All the hypotheses were confirmed by these findings. Functional value was found to be the most influential factor in perceiving the value of UAM as public transport. A strong correlation was found between social, emotional, and customer-perceived values. This finding supports the results reported in previous studies. Lu and Wang (2020) indicated that all the aforementioned factors significantly and positively affect customer perceived value. In addition, these factors affect customers' behavioral intentions to use transportation services. This is consistent with the findings reported by Tsai et al. (2021), who found that when travelers enjoy their journeys, their value perceptions of the journeys increase. This reaffirms the importance of customer perceived value in relation to user behavior in a sharing economy.

The results obtained from the TAM, with trust in technology and customer perceived value as factors, indicate the following. Trust positively influences PEOU and behavioral intention, whereas customer perceived value positively affects PU and behavioral intention. Notably, PU had a stronger influence on behavioral intention than PEOU. Furthermore, functional, emotional, and social values significantly affected trust in technology and customer perceived value. Additionally, functional value was identified as the most important factor, followed by social and emotional values.

Various strategies can significantly enhance the functional, emotional, and social dimensions related to transportation based on UAM. Technology, including advanced air traffic management systems, innovative propulsion technologies, and robust infrastructure development, assumes a pivotal role in improving the functional value of UAM. These technologies collectively contribute to the reliability and efficiency of UAM systems (Straubinger et al., 2020). Prioritizing user experience has become paramount for increasing emotional value. Tailoring UAM services to prioritize passenger comfort, safety, and convenience and implementing user-friendly interfaces, comfortable vehicle designs, and streamlined boarding processes foster positive emotional responses (Shaheen et al., 2018). Furthermore, UAM can enhance inclusivity and sustainability, thereby increasing the social

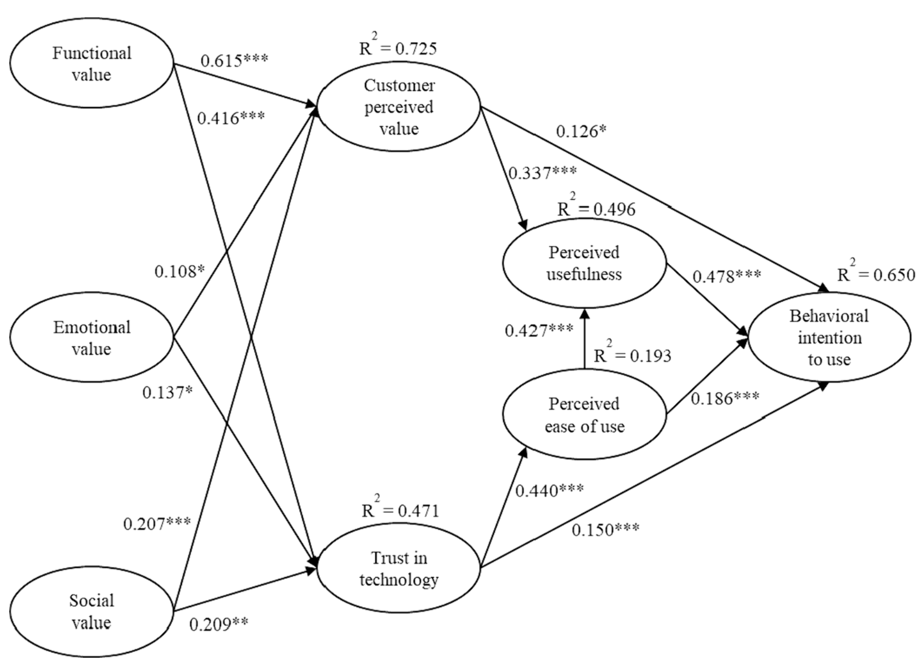

Fig. 2. Path analysis results.

value of this technology (Straubinger et al., 2021). Strategies such as ensuring accessibility for diverse communities, minimizing environmental impact through electric or hybrid propulsion, and actively engaging with local communities during the planning and implementation phases can enhance social responsibility. By integrating these strategies, technological advancements can be promoted in the field of UAM transportation and the related emotional and social dimensions can be conscientiously addressed, thereby presenting a comprehensive and sustainable approach toward UAM research.

These findings yielded the conclusion that customers are concerned about the ease of use of UAM owing to the lack of experience regarding this technology. A reduced R^2 value in this context signifies that the variables considered in the analysis possess restricted explanatory capability regarding the respondents' concerns on the ease of use of UAM. This underscores the intricacy of the respondents' reservations regarding the ease of use of UAM. This emphasizes the need for a highly exhaustive exploration of supplementary variables to improve the predictive accuracy of the model.

The following limitations were found in this study and should be addressed in future research. Although in this study, the age range of the participants was not explicitly specified, the majority fell between 25 and 33 years old, potentially skewing the age distribution. Future studies should account for this distribution and provide a clearer delineation of the age range of participants. Second, the participants belonged to one country only. Public transportation services, however, vary based on country. The traits found were conceivable, and the analysis of different parts was likely to produce useful information. Additionally, this study did not examine individual differences among survey respondents. Furthermore, PLS has the limitation of only applying to small datasets, potentially compromising the reliability and generalizability of this method.

6. Conclusion

This study proposes a research model to analyze the effects of trust and customer perceived value on the acceptance of UAM as public transport. The three structural relationships identified were the TAM, trust in technology, and customer perceived value. The suggested model and hypotheses were analyzed using the PLS method with sample data collected from 573 South Koreans. The findings revealed that behavioral intention to use is significantly influenced by PU and PEOU. Trust in technology positively influences behavioral intention and PEOU, whereas customer perceived value positively affects behavioral intention and PU. In addition, functional value positively affects trust in technology and customer perceived value, and social and emotional values positively influence trust in technology and customer-perceived value. The results validated the importance of trust and customer value in relation to using UAM as public transport. The results also demonstrate that trust and customer perceived value depend on the functional, emotional, and social values related to using UAM as public transportation. Even though the study's findings offered relevant data regarding the adoption of UAM, several issues need to be addressed in future studies. In particular, the ability of a product to achieve its functional, utilitarian, or physical goals is related to functional value, which includes factors such as quality, availability, performance, price, and safety (Sweeney & Soutar, 2001; Sweeney et al., 1999; Watanabe et al., 2020). Future research should explore the association of these factors in relation to the acceptance of UAM as public transport. Additionally, future research should incorporate other factors related to social and emotional values, such as environmental concerns, visual pollution, and enjoyment. Future studies should address the moderating effects of individual variables, such as gender, age, place of residence, and household income, that could influence the adoption of shared mobility and expand on our results. Finally, optimal sample-size thresholds could be defined and their impacts on precision can be explored by refining the PLS application.

CRediT authorship contribution statement

Rattawut Vongvit: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Writing – original draft. **Kyuho Maeng:** Writing – review & editing. **Seul Chan Lee:** Conceptualization, Funding acquisition, Investigation, Supervision, Writing – original draft, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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