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What result in older persons' acceptance of electric bikes in developing countries? An empirical evidence in Hanoi, Vietnam

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Abstract. The elderly are a potential segment of electric bicycles (EBs); however, so far the understanding of the factors contributing to the choice of this mode for older persons in developing countries has been rather limited – particularly compared to that in developed countries. The current study aims at exploring people's intention to accept EB in later life in Hanoi, Vietnam using the data from 360 older persons (at least 55 years old) to empirically analyse a conceptual framework formulated based on the Model of Goal-Directed Behaviour (MGDB) and the Theory of Planned Behaviour (TPB). Desire is found to be the major contributor to intention, which is found to be significantly higher for younger and employed respondents. Desire is facilitated by subjective norms and attitude but is deterred by perceived crash risk. Perceived behavioural control and descriptive norms are irrelevant predictors. This study is one of the first research on the elderly's intention to ride an EB in low- and middle-income countries.

1. Background

The development of healthy and sustainable travel for older persons (≥ 55 years old) is a critical challenge for the cities because of the stable increase in the percentage of this group that is forecast to hit over 16% in 2050 [1]. An obvious characteristic of older persons' lifestyle is the decrease in physical and cognitive capacities but they have more time to pursue their hobbies and travel interest [2]. If they cannot participate in physical activities, they will be likely to confront health risks, such as social isolation, depression, a faster reduction in physical function, the severe diseases (e.g., diabetes, obesity, cancer, high blood pressure, and heart disease) [3]. In addition, aging leads to balance issues, hearing and vision reduction/loss, the reduced ability to respond to sudden traffic situations, most of which prevent older persons from driving or riding high-speed vehicles like the motorcycle safely [4]. Some reports have emphasized that in order to keep fit and maintain a healthy status, the elderly need some physical activities and social activities, which can be obtained through cycling - a core element of active transportation [5,6]. However, cycling cannot be an ideal choice for older persons, particularly in emerging countries where the lack of dedicated infrastructure and facilities is the largest barrier to travel by bicycle. This is widely proven to raise the serious safety concern for persons.



Besides, adverse weather conditions with too hot or too cold temperatures and heavy rain are other impediments. Cycling on medium and long distances or hilly roads may require so much physical effort that the elderly are afraid of engaging in this mode.

An emerging alternative to cycling for older persons the electric bicycle (EB) which is basically an improved version of a traditional bicycle with an electric engine using a battery. Compared to traditional bicycles, the power assistance enables an EB to run at higher speed of up to 30 Km/h. The EM can, on the one hand, enable users to obtain some benefits from physical activities. It may, on the other hand, be well suitable for injured or older persons as it requires less physical and muscular attempt. EB has been significantly emerged in China and some European countries [7]. For example, China – the largest EB market has over 150 million units by 2015 while EBs make up about 10% of all bicycle-based trips in the Netherlands [8–10]. In many countries, the elderly are considered a considerable contributor to the EB growth [5]. Notwithstanding, the literature on facilitators and barriers to adopt EBs for people in later life has been much less than that for adults. The authors of [10] implemented in-depth interviews with 27 early adopters of EMs in Sacramento, the US to understand their experience in utilizing this mode. Whereas, with a similar method, the authors of [11] explore the benefits and shortcomings of EB use based on the sample of 8 students in the Netherlands. A study in Switzerland [12] analyses the use of EB in connection with the use of traditional cycling. One of the studies benefited from the largest sample is [13] whose authors examine trips using EBs of 1398 Austrian people for three purposes, including work, shopping, and recreations. Using the data from 890 EB users, a research in Norway looks at the determinants of actual choice of EBs [14]. Only Johnson and Rose [5] investigate the decision on buying EB for older persons aged at least 65 years old in Australia. Accordingly, little is known about the influential factors of intention to adopt EBs in a developing country.

The current study aims at exploring people's intention to accept EB in later life in Hanoi, Vietnam using the data from 360 older persons (at least 55 years old) to empirically analyse a conceptual framework formulated based on the Model of Goal-Directed Behaviour (MGDB) and the Theory of Planned Behaviour (TPB). The 55 thresholds was chosen for considering one as an older person in the current research because it is the normal retirement age for female workers in Vietnam.

The rest of this paper includes four parts. Section 2 presents the establishment of the research framework. Next, Section 3 describe data collection and analytical methods. Subsequently, results and discussions are provided in Section 4 before Section 5 concludes this article.

2. Research framework

A substantial body of existing literature concerns the formulation of behavioural intention that is the primary determinant of actual behaviour. The two most significant theories widely used are the Model of Goal-Directed Behaviour and the Theory of Planned Behaviour. This study adopt a MGDB and TPB combination extended by descriptive norms, perceived crash risk, and control variables (Figure 1).

2.1. Model of Goal-Directed Behavior (MGDB) and Theory of Planned Behavior (TPB)

The TPB proposed by Ajzen [15] is an extended version of the theory of reasoned action that includes two main antecedents of behavioural intention, including subjective norms and attitude. The extension is made through the addition of perceived behavioural control, which allows decision-makers to consider the potential interference by internal or external obstacles. Conceptually, perceived behavioural control is related to the chances of conducting a behaviour or resources required for acting. Whereas, subjective norms, which is sometimes indicated as injunctive norms, are defined as an individual's responses to the judgement and opinion of his/her relatives or other significant persons (e.g., friends or colleagues). Attitude is involved in the individual's positive or negative assessment of performing a target behaviour [16]. The TPB's constructs have commonly been utilized in recent travel behaviour analyses [17–22] in which attitude, subjective norms, and perceived behavioural are found be positively associated with the intention.

Notably, Perugini and Bagozzi [23] has adopted an improved version of the TPB, called the MGDB. The MGDB includes similar constructs (attitude, subjective norms, perceived behavioural control, and intention) but the relationships between factors are re-hypothesized based on the introduction of a new one, that is, desire. Desire refers to the mind's motivational state in which reasons and appraisals to perform a behaviour are transformed into a motivation to do so [23]. Desire is posited as the most proximal predictor of intention, which is defined as how willing a person is to implement an action. It triggers motivational functions for the determinants of decision-making process. As such, other influential factors (i.e., subjective norms, perceived behavioural control, and attitude) directly and positively impact desire (rather than intention) [24,25]. According, four hypotheses are proposed as follows:

H1: Desire has a positive effect on intention.

H2: Subjective norms have a positive effect on desire.

H3: Perceived behaviour control has a positive effect on desire.

H4: Attitude has a positive effect on desire.

H5: Attitude has a positive effect on desire.

H6: Attitude has a positive effect on desire.

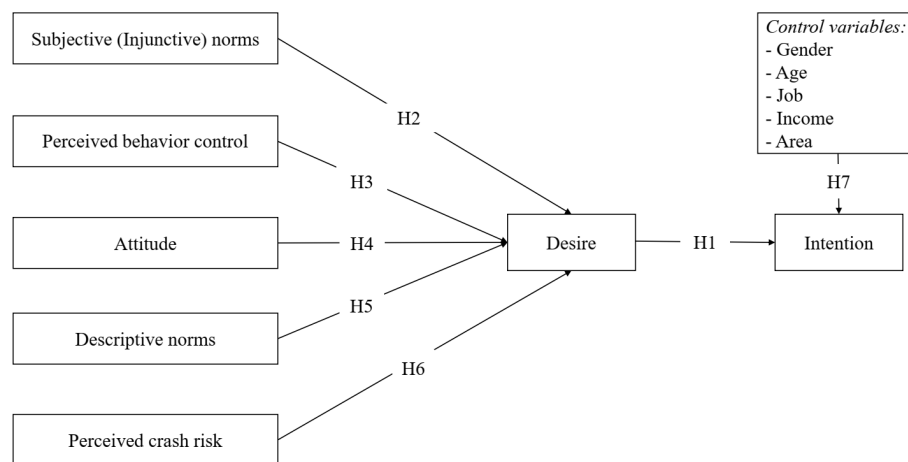


Figure 1. Proposed research framework.

2.2. External factors: descriptive norms and perceived crash risk

Many earlier authors have claimed the shortcoming of the TPB in capturing the social pressure on the intention to perform a particular behaviour [26,27]. Specifically, they suggest the inclusion of descriptive norms as a potential predictor besides subjective norms. Descriptive norms is similar to a behavioural rule or guide attributable to social environment. However, unlike subjective norms, descriptive norms is formulated by what most people do [28]. According to Richter et al. [29], it is important to distinguish the two types of norms. For example, the majority of people believe that purchasing organic food is worthwhile to do (i.e., subjective norms with positive effects on intention); however, most keep buying conventional products (i.e., descriptive norms with a negative impact on intention). In this study, we expect descriptive norms to be a positive factor of desire.

H5: Descriptive norms have a positive effect on desire.

The perception of risk refers to a subjective evaluation of the likelihood of undergoing a negative event or consequences of adopting a behavior [30]. Perceived risk is one of the most common factors that are incorporated into the extensions of TPB to better account for behavioural intention [20,31,32]. In most cases, the greater risk perception, the lower intention [33–36]. For the current study, perceived crash risk involves the elderly's identification of and concern about the probability of engaging a crash due to riding by an EB. This construct is typically suitable for the context of this

research since older persons always place significant emphasis on safety issues [5]. Additionally, some recent evidence have reported that riding electric vehicles like an electric bicycle would be a health-risk behavior because of this mode's silent operation and lighter body [37].

H6: Perceived crash risk has a positive effect on desire.

2.3. Control variables

Personal characteristics are undoubtedly important predictors of mode choices [38,39]. When examining the (potential) penetration of EBs, previous authors have considered gender, age, job, monthly household income, and living area [13,14]. The current study hypothesizes that.

H7: Control variables have a significant effect on intention.

3. Data and methods

3.1. Research setting

Our study was carried out in Hanoi – the capital of Vietnam with the population of 8.3 million inhabitants. Generally, the travel in Hanoi is dependent largely on the motorcycle whose modal split is about 80%. The subsidized public transport system, despite being improved recently with the inauguration of one BRT corridor and one metro line, meets 8%-9% of travel demand [40].

EB has been the first electric vehicle type appearing in Vietnam. EB in Vietnam is legally defined as a conventional bicycle; therefore, the same road rules are applied to the users of conventional and electric bicycles, such as the use of EMs without registration. For this reason, there are not official statistics on the number of EMs in operation. Most of EBs are made in China; however, the shares of Vietnamese brands, such as Pega, DKBike, Kymco, and Sufat have been increasing. The survey of VAMM reports that the total of electric two wheelers (both EBs and electric motorcycles) sold in 2017 reached nearly 500,000, 30% higher than the 2016 sales. Notably, the use of EMs is expected to increase the popularity of EMs, at least for teenagers [41].

3.2. Measurement

A three-part questionnaire was developed to collect the data for testing the proposed research model (Figure 1). The first part was a cover letter that provides a definition of EB and clearly suggests that only those aged 55 or older should take part in the survey. The subsequent part gathered socio-demographical information corresponding to the control variables: gender, age, monthly household income, job status, and living area. The last part included indicators adopted based on the existing literature [20,23,42] to measure the latent constructs: intention, injunctive norms, descriptive norms, and perceived behavioural control, attitude, desire, and perceived crash risk. Before being used officially, the questionnaire was improved through the comments of 5 transport experts, three of who were older persons, and pilot tests with 3 other older persons.

Table 1. Items of constructs.

Code	Factors/Statements
DN	Descriptive norms
DN_1	Some of my friends are using EBs
DN_2	Some of my relatives are using EBs
DN_3	Others who are important to me are using EBs
IN	Subjective (Injunctive) norms
IN_1	Many persons who are important to me believe that I should adopt an EB
IN_2	Many persons who are important to me recommend me to make a try with an EB
PBC	Perceived behavioural control
PBC_1	I am affordable to buy an EB
PBC_2	It is mostly up to me when making a decision on transportation mode choice
PBC_3	If I wish, I can own and use an EB immediately
Att	Attitude

Att_1	Riding an EB is a good travel solution for me
Att_2	Using an EB brings many benefits for me
Att_3	Switching to an EB is necessary for me
Risk	Perceived crash risk
Risk_1	Riding is an EB is dangerous for the elderly because its operation is nearly silent.
Risk_2	Riding is an EB is dangerous for the elderly because its body is not strong and its safety equipment is limited
Des	Desire
Des_1	I would like to experience in riding an EB
Des_2	I would like to the dynamics of riding an EB
Des_3	I desire physical activities thanks to riding an EB
Des_4	I desire other benefits of using an EB (e.g., lighter structure and environmentally friendly)
Int	Intention
Int_1	I consider an EB as one of my first choice at that age
Int_2	I think seriously about shifting to EBs
Int_3	I have an intention to utilize EBs in the short term

3.3. Survey and sample

The large-scale survey took place from 5 to 18 February 2023. Five students of University of Transport and Communications, who were trained carefully, accessed public locations (e.g., department stores, markets, and parks) to seek potential participants. In case of an eligible person completed a face-to-face interview, he/she received 20,000 VND (approximately \$1).



Figure 2. Face-to-face interviews with the elderly in public places in Hanoi.

At the end of the survey, 385 responses were collected; however, 25 were eliminated because of conflict and unreliable answers. Consequently, the final sample comprised 360 responses. As can be seen in Table 2, slightly more female participants were interviewed. Two quarters of respondents were younger than 70 while over 60% were living in a household earning less than 20 million VND per month. More than half (55.83%) were retired or unemployed. The distribution based on living area was nearly balanced.

Table 2. Sample description (N=360).

Variable	Frequency	Percent
<i>Gender</i>		
Male	177	49.17

Female	183	50.83
<i>Age</i>		
55-70	243	67.50
71 or older	117	32.50
<i>Monthly household income (million VND)</i>		
< 20	222	61.67
At least 20	138	38.33
<i>Job</i>		
Employed	159	44.17
Unemployed/retired	201	55.83
<i>Living area</i>		
Urban	183	50.83
Non-urban	177	49.17

3.4. Methods

Partial least squares structural equation modelling (PLS-SEM) is a statistical method, which has recently been increasingly used in social and behavioural sciences [22,43]. According to [44,45], PLS-SEM is an effective approach for examining complex interrelationships between multiple latent constructs included in conceptual frameworks. PLS-SEM is a non-parametric technique, which does not require multivariate normality, making it more robust to small sample sizes and non-normal data [46]. As well as this, PLS-SEM has been widely used in predictive studies, especially those developed from well-established theories [47]. For these reasons, we apply PLS-SEM using SmartPLS 3.0 to analyze the relationships among the constructs.

4. Results and discussions

4.1. Measurement model evaluation

The measurement models are evaluated by testing the indicator reliability, internal consistency, convergent validity, and discriminant validity of the constructs, as suggested by [47].

As can be seen from Table 3, the outer loading values of the indicators range between 0.720 and 0.978, exceeding the threshold of 0.708 [47]; therefore, the indicator reliability is confirmed. The minimum value of Cronbach's Alpha and composite reliability are 0.778 and 0.863 respectively, both satisfying the suggested level of 0.7 [48], thus implying that the internal consistency is acceptable. Table 3 also reveals that the average variance extracted (AVE) values of seven constructs range from 0.680 to 0.892, meeting the satisfactory level of 0.5 [47]. Hence, the convergent validity of the latent constructs is ascertained. A satisfactory level of discriminant validity is also attained in that all of the Heterotrait-Monotrait Ratio (HTMT) values are lower than the recommended cut-off value of 0.85 [47] (Table 4).

Based on the tests of both validity and reliability, the measurement models are validated successfully. In the subsequent subsection, this study will assess the structural model.

Table 3. Confirmatory factor analysis.

Constructs/Items	Outer loadings	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
<i>Attitude</i>		0.841	0.904	0.760
Att_1	0.914			
Att_2	0.921			
Att_3	0.772			

<i>Descriptive norms</i>			0.778	0.863	0.680
DN_1	0.938				
DN_2	0.800				
DN_3	0.720				
<i>Desire</i>			0.896	0.928	0.764
Des_1	0.788				
Des_2	0.902				
Des_3	0.894				
Des_4	0.906				
<i>Subjective norms</i>			0.907	0.942	0.883
IN_1	0.959				
IN_2	0.963				
<i>Intention</i>			0.915	0.945	0.892
Int_1	0.922				
Int_2	0.948				
Int_3	0.978				
<i>Perceived behavioural control</i>			0.903	0.915	0.783
PBC_1	0.938				
PBC_2	0.777				
PBC_3	0.931				
<i>Perceived crash risk</i>			0.829	0.921	0.854
Risk_1	0.932				
Risk_2	0.916				

Table 4. HTMT criteria.

	Attitude	Descriptive norms	Desire	Intention	Perceived behavioural control	Perceived crash risk	Subjective norms
Attitude							
Descriptive norms	0.139						
Desire	0.845	0.211					
Gender	0.133	0.088	0.132				
Intention	0.670	0.291	0.735				
Perceived behavioural control	0.138	0.303	0.143	0.136			
Perceived crash risk	0.613	0.282	0.562	0.717	0.065		
Subjective norms	0.302	0.459	0.417	0.514	0.223	0.350	

4.2. Structural model evaluation

In testing the structural model, this research utilizes PLS bootstrapping with 5000 bootstraps and 360 cases to reveal the path coefficients and their significance [49]. Before moving to the structural model relationship, the PLS-SEM model fit is considered using the standard root mean square residual (SRMR) criterion. The result shows that the SRMR value is 0.076, less than 0.08 as suggested by [50]; therefore, the proposed model in this study is a considerably good fit.

The predictive capacity of the structural model is measured by estimating predictive accuracy and predictive relevance, represented by R^2 and Q^2 values respectively. According to [47], R^2 value ranges from 0 to 1, referring to the amount of variance in each endogenous latent construct that is explained by the exogenous latent constructs in the model. In the current study, R^2 values of desire and intention are 0.604 and 0.523 respectively (Table 5), indicating a moderate level of predictive accuracy [47]. Regarding predictive relevance, Q^2 value greater than 0 indicates that the model has predictive relevance for the endogenous constructs, and higher Q^2 value indicates better predictive power [47]. The finding shows that Q^2 of desire and intention are 0.454 and 0.465, respectively; thus implying that the predictive relevance was appropriate (Table 5).

Table 5. Model fit and prediction capacity results.

Constructs	R^2	Q^2
Desire	0.604	0.454
Intention	0.523	0.465
SRMR=0.076		

The results presented in Table 6 and Figure 3 indicate that out of the seven proposed hypotheses, four hypotheses are accepted (H1, H2, H4, H6), two hypotheses are declined (H3, H5), and one hypothesis is partially accepted (H7). H1, H2, and H4, which were based on Goal-Directed Behaviour (MGDB) and Theory of Planned Behaviour (TPB) are accepted (Table 6, Figure 3). Specifically, people's intention to accept EB in later life is positively influenced by desire ($\beta_{Des \rightarrow Int} = 0.661$, $p = 0.000$). In addition, subjective norms and attitude have positive impact on desire ($\beta_{IN \rightarrow Des} = 0.191$, $p = 0.000$; $\beta_{Att \rightarrow Des} = 0.636$, $p = 0.000$). Surprisingly, older persons' intention to accept EBs is not affected by perceived behavioural control, thereby rejecting H3 ($\beta_{PBC \rightarrow Des} = -0.006$, $p = 0.698$). H5 is also declined since descriptive norms have no significant influence on desire ($\beta_{DN \rightarrow Des} = 0.026$, $p = 0.381$). Perceived crash risk negatively influences desire ($\beta_{Risk \rightarrow Des} = -0.104$, $p = 0.014$), thus H6 is accepted. Regarding H7, the findings only show significant impact of age and job on intention ($\beta_{Age \rightarrow Int} = -0.229$, $p = 0.000$; $\beta_{Job \rightarrow Int} = 0.207$, $p = 0.000$), while gender, income, and area appear to not affect intention ($\beta_{Gender \rightarrow Int} = 0.061$, $p = 0.135$; $\beta_{Income \rightarrow Int} = -0.030$, $p = 0.514$; $\beta_{Area \rightarrow Int} = -0.047$, $p = 0.261$), therefore H7 is partially accepted.

The indirect and total effects of constructs on intention are also shown in Table 6. Attitude and subjective norms have positive indirect influences on intention ($\beta_{Att \rightarrow Int} = 0.420$, $p = 0.000$; $\beta_{IN \rightarrow Int} = 0.126$, $p = 0.000$). Additionally, the indirect impact between perceived crash risk and the older persons' intention to accept EBs is confirmed with $\beta_{Risk \rightarrow Int} = -0.069$, $p = 0.015$. Regarding the total effects, among four constructs influencing intention, desire has the strongest positive impact with the coefficient value of 0.661, followed by attitude (0.420), and subjective norms (0.126). Meanwhile, perceived crash risk is the only deterrent of the intention (-0.069).

Table 6. Effect results.

	Direct Effects			Indirect Effects			Total Effects		
	Sample Mean	Standard Deviation	P Values	Hypothesis Decision	Sample Mean	Standard Deviation	P Values	Sample Mean	Standard Deviation
Desire → Intention	0.661***	0.028	0.000	H1- Accept				0.661***	0.028
Subjective norms → Desire	0.191***	0.042	0.000	H2 - Accept				0.191***	0.042
Perceived behavioural control → Desire	-0.006	0.057	0.698	H3 - Decline				-0.006	0.057
Attitude → Desire	0.636***	0.043	0.000	H4 - Accept				0.636***	0.043
Descriptive norms → Desire	0.026	0.033	0.381	H5 - Decline				0.026	0.033
Perceived crash risk → Desire	-0.104*	0.044	0.014	H6 - Accept				-0.104*	0.044
Gender → Intention	0.061	0.041	0.135					0.061	0.041
Age → Intention	-0.229***	0.052	0.000					-0.229***	0.052
Job → Intention	0.207***	0.053	0.000	H7				0.207***	0.053
Income → Intention	-0.030	0.044	0.514					-0.030	0.044
Area → Intention	-0.047	0.042	0.261					-0.047	0.042
Attitude → Intention					0.420***	0.034	0.000	0.420***	0.034
Descriptive norms → Intention					0.017	0.022	0.379	0.017	0.022
Perceived behavioural control → Intention					-0.005	0.038	0.697	-0.005	0.038
Perceived crash risk → Intention					-0.069*	0.030	0.015	-0.069*	0.030
Subjective norms → Intention					0.126***	0.028	0.000	0.126***	0.028

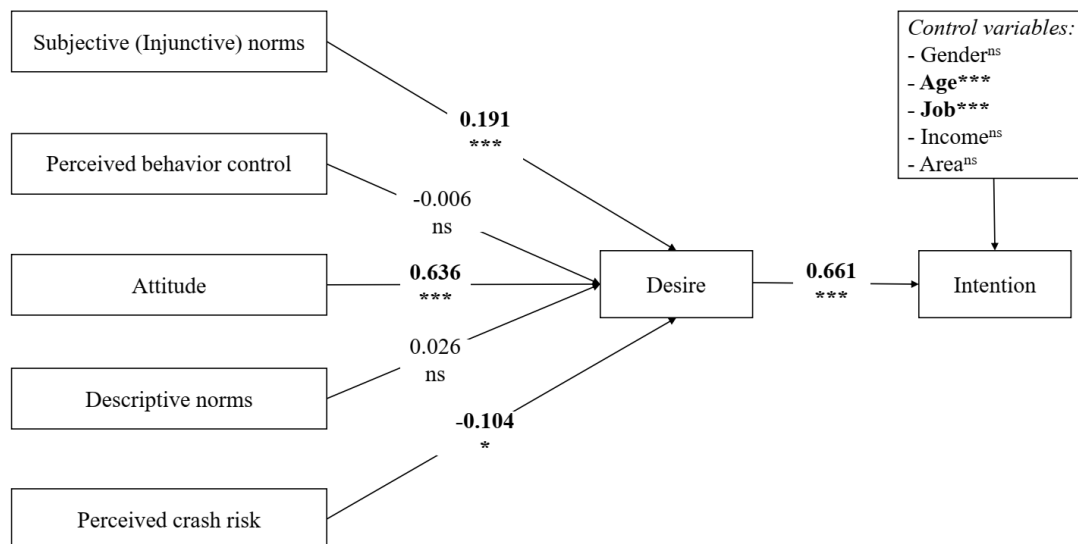


Figure 3. Hypothesis testing result (^{ns} not significant; * $p < 0.05$; *** $p < 0.001$).

4.3. Discussions

Our findings confirm the critical role of shaping intention [23]. Therefore, holding a strong desire is the key to strengthening intention. In this sense, it is important to understand the antecedents of desire to boost it. Attitude is the strongest facilitator to desire. It can be explained by the fact that older persons tend to become more conservative [51] – mirrored by the reliance of their decision-making upon personal attitude. Interestingly, some past evidence like [24] offers a contradicting report wherein the link between attitude and desire is insignificant.

As expected, subjective norms are positively associated with desire [24]. However, the impact of the norms for older persons is not large. Interestingly, earlier studies highlight the strong effects on the desire of the young persons. Hence, our study extends the understandings of the effects of subjective norms for various age groups.

The current study finds that perceived behavioural control is not statistically significant for determining the desire to the EB adoption. Similar result is indicated for the case of the drinking desire [24]. The insignificant impact of perceived behavioural control may stem from its definition. To be specific, the confidence or capacity of implementing a behaviour (i.e., behavioural control) is more inclined to be related to the willingness to intention instead of a motivational function (i.e., desire). Another possible and simpler explanation is that the EB desire is out of the impact of the control.

Although descriptive norms appear to be a significant determinant of healthy and green behaviour [29]; however, the effect of this construct is insignificant in the context of older persons' intention to use EBs. This can be explained by the current limited use of this mode in the daily travel of Hanoi inhabitants. In addition, the use of EBs may not coincide with positive comments on them; thus, the effect of descriptive norms is found so weak. Interestingly, some prior evidence also supports our findings by indicating that descriptive norms tend to have a stronger impact for the young(er) samples [52].

Congruent with the existing literature [20,38], perceived crash risk is a significant barrier to the intention to adopt EBs for the elderly. Clearly riding an EB in the mixed traffic flows in Hanoi is much more risky.

As for control variables, the respondents older than 70 years old tend to have less intention to adopt an EB, possibly because of their reduced travel demand at that age range. They may choose transportation services or be accompanied by their relatives rather than owning a private vehicle.

Employed respondents are more likely to intend to choose EBs since they would like an alternative to motorcycles on commuting roads [5].

5. Implications and conclusions

Exploration of older persons' travel mode choice is a research gap in Vietnam and many other low- and middle-income countries. Through adopting a theoretical framework formed based on MGDB, TPB, and two external factors (descriptive norms and perceived crash risk) together with five control variables, the current study has enriched our knowledge of the determinants of older persons' intention to accept EBs. Desire is found to be the major contributor to intention, which is found to be significantly higher for younger and employed respondents. Desire is facilitated by subjective norms and attitude but is deterred by perceived crash risk. Perceived behavioural control and descriptive norms are irrelevant predictors. In order to promote the prevalence of EBs among the elderly, it is important to relieve perceived crash risk by improving the quality of EBs and better advertising the safety functions of EBs. Besides, free training courses or experience in EBs would be desirable. The policies should be tailored based on the consideration of age and occupational status (i.e., significant predictors). Formulating a (more) positive attitude towards EBs is crucial. Since attitude is a comprehensive belief based on evaluating various aspects [15]; therefore, multifaceted strategies should be formulated.

Several limitations should be considered when discussing this research's findings as follows. Failure to apply probabilistic sampling led our findings to be poorly generalizable more or less. However, since the population of Hanoi older persons is unknown; therefore, our sample can be acceptable when it comes to make attempt to conduct an exploratory research. Equally important, our proposed model omitted to include constructs representing the characteristics of a new travel mode. As such, the integration with the technology acceptance model would result in a higher predictive level. Finally, the transportation condition in Hanoi is typically motorcycle-dependent; therefore, the findings would be valid for cities with similar travel contexts.

CRedit author statement

Thi Hong Mai Nguyen: Conceptualization, Methodology, Software, Formal analysis, Writing – Original draft. **Phuong Mai Nguyen:** Data curation, Writing – Original draft preparation, Writing – Reviewing and Editing. **Thi Phuong Mai Tran:** Visualization, Investigation. **Thi Thu Hien Tran:** Visualization, Investigation. **Minh Hieu Nguyen:** Conceptualization, Methodology, Writing – Original draft preparation, Writing – Reviewing and Editing, Funding acquisition.

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