Encouraging the Use of Urban Green Space: the Mediating Role of Attitude, Perceived Usefulness and Perceived Behavioural Control

Abstract

Urban green space (UGS) contributes to the psychological and physical well-being of urban population. Therefore, public authorities have been identifying ways to encourage the use of UGS. Although prior studies identified important UGS attributes, the influence of these attributes on UGS use remains inconsistent. To address this inconsistency, the mediating effects of attitude, perceived usefulness and perceived behavioural control were investigated in the present study. A telephone survey was conducted in Hong Kong. The results of this survey showed that the three factors have a mediating role between UGS attributes and the behavioural intention to use UGS. The findings suggested that UGS attributes do not directly influence behaviour, but rather indirectly via attitudinal factors and perceived behavioural control. This conclusion provides insightful implications for public authorities and UGS management. The findings indicated that while UGS attributes would influence users' appreciation and their use of UGS, promotional campaigns should be launched to change users' attitudes and to position their use of UGS as a social trend.

Keywords

urban green space, attitude, mediation, visit, promotion

1. Introduction

Hong Kong is one of the world's densest cities, with an average population density of 6,544 persons per km^2 (Census and Statistics Department, 2011). In addition, more than 80% of the total area of Hong Kong comprises a hilly terrain that is unfavourable for urban development (A. Y. Lo & Jim, 2012; Ye, 1998). Tang, Wong, and Lee (2007) described Hong Kong as a 'land-hungry' city where the competition for land use is high. This has also caused physical constraints on urban greening in Hong Kong (Jim, 2000). Regardless of the constraints, the government acknowledges the importance of urban green spaces (UGS) and their positive effects such as enhanced psychological and physical well-being of the population (Planning Department, 2005). The provision of UGS is widely regarded as an important indicator of sustainable development, for example, indicators of urban sustainability (Mega & Pedersen, 1998), environmental dimensions for being a green community (United States Environmental Protection Agency, 2013) and natural capital indicators of environmental sustainability for urban areas (Olewiler, 2006).

Prior studies identified important attributes of UGS, which are regarded as important

Wiedemann, 2005). However, other studies exhibited inconsistent results, such as those in Schipperijn, Stigsdotter, Randrup, and Troelsen (2010) who failed to identify a reliable predictor of UGS use. A. Y. Lo and Jim (2010) found that UGS quality is not correlated with visit frequency. Therefore, the important attributes of UGS are yet to be clearly and comprehensively identified (Maruani & Amit-Cohen, 2007). Schipperijn et al. (2010) suggested that these inconsistent findings are due to contextual differences of the studies. Wang, Brown, Liu, and Mateo-Babiano (2015) suggested adopting behavioural theories to better understand users' attitudes and behavioural intentions in using UGS. According to the theory of planned behaviour (TPB), a robust and widely adopted attitude–behaviour model, in which attitude, compared with belief, is a more stable evaluative disposition that predicts the behaviour of

individuals (Ajzen, 1991). In the context of UGS, we argue that beliefs are formed through association with UGS attributes. These beliefs are mediated by attitudes in influencing the behaviours of users.

This study aims to investigate the mediating effects of attitudinal measures, namely, attitude, perceived usefulness and perceived behavioural control. The findings would fill the gap of the relationship between UGS attributes and users' behaviour. Filling this gap is important to enable policy makers and planners develop a better understanding of why and how frequent users visit UGS. This finding would have significant implications for decision making and the effective usage of valuable land resources, particularly in a compact city such as Hong Kong and in a global context with increasing urban intensification.

2. Literature Review and Conceptual Framework

2.1 UGS attributes

Previous research has examined a few important physical characteristics of UGS, such as park facilities and features, park maintenance, distance, size and perceived safety (Bedimo-Rung et al., 2005; Hillsdon, Panter, Foster, & Jones, 2006; Van Herzele & Wiedemann, 2003). These characteristics are important factors that influence the use of UGS. Meanwhile, a comprehensive list of important attributes which a UGS should possess is yet to be produced (Maruani & Amit-Cohen, 2007). For example, Schipperijn et al. (2010) conducted a study focusing on socio-economic variables, size and distance to green spaces. However, a reliable predictor for the frequency of most used UGS was not found, particularly when a UGS has reasonable size (> 5 hectares) within a reasonable distance (< 600 meters). One of the possible explanations is that desirable planning criteria regarding the location, quantity and use of UGS vary among cities because of contextual and cultural diversity. Therefore, policymakers and planners should develop a reasonable understanding of the specific needs and preferences of city dwellers, in addition to general solutions for UGS because of the uniqueness of each UGS (Schipperijn et al., 2010; Wan & Shen, 2015).

Besides an objective assessment of environmental features, Millington et al. (2009) suggested a commonly used method, namely, the self-reported environmental perception by users. Scott, Evenson, Cohen, and Cox (2007) reported that perceived attributes is a better predictor of behaviour than objectively measured environmental factors. Although objective and subjective assessments may not be well-correlated (Kaczynski, Potwarka, Smale, & Havitz, 2009), Schipperijn et al. (2010) explained that the subjective measurement of factors is associated with the objective measurement of factors through users' experience. Perceived environmental attributes had been proven to influence the quality of life (Sugiyama, Thompson, & Alves, 2009), leisure activities (Giles-Corti et al., 2005; Sugiyama, Leslie, Giles-Corti, & Owen, 2009), stress restoration (Grahn & Stigsdotter, 2010) and psychological well-being (Gidlöf-Gunnarsson & Öhrström, 2007). Although perceived safety and presence of wildlife had been often considered in prior studies (Bedimo-Rung et al., 2005; Grahn, 1991; Van Herzele & Wiedemann, 2003), perceived safety is a psychological construct rather than an attribute of UGS, and the presence of wildlife is not applicable in Hong Kong where UGS sites are small, have limited ecological features and have poor environmental quality (A. Y. Lo & Jim, 2012). In the present study, three perceived attributes, namely, facilities, naturalness and perceived accessibility are proposed to be included in the conceptual framework, and these attributes are considered important for UGS (Bedimo-Rung et al., 2005;

Grahn & Stigsdotter, 2010; Home, Bauer, & Hunziker, 2010; Wang et al., 2015). Therefore, the following hypotheses are formulated.

Hypothesis 1 (H1): Perceived provision of facilities relates positively to the behavioural intention to use UGS.
Hypothesis 2 (H2): Perceived naturalness relates positively to the behavioural intention to use UGS.
Hypothesis 3 (H3): Perceived accessibility relates positively to the behavioural intention to use UGS.

2.2 The theory of planned behaviour (TPB)

The theory of reasoned action (TRA) (Ajzen, Heilbroner, Fishbein, & Thurow, 1980) is a model that reliably demonstrates the relationship between attitude and behaviour (Burton, 2004). This model suggests that attitude and subjective norm are two key factors influencing an individual's intention to behave, and the behavioural intention subsequently influences actual performance of the behaviour. Attitude refers to an individual's subjective evaluation of a behaviour, that is, whether the individual favours or does not favour the behaviour (Fishbein & Ajzen, 1975). Subjective norm is an individual's perceived social influence from other people such as friends and family members (Fishbein & Ajzen, 1975). The key assumption of TRA is that individuals can control the conduct of a behaviour (Armitage & Conner, 2001; Tonglet, Phillips, & Read, 2004). Liska (1984) argued that behaviour may be facilitated or constrained by internal factors such as knowledge and skills and by external factors such as convenience. Extending from the TRA, Ajzen (1991) developed TPB by including an additional factor, perceived behavioural control (PBC), into the model. PBC refers to an individual's perceived ability and ease to perform certain behaviour.

TPB is a general and parsimonious theory that includes the major factors in explaining different behaviours (Armitage & Conner, 2001; Heath & Gifford, 2002). The review paper by Armitage and Conner (2001) showed that the efficacy of TPB in explaining behaviours has been well-proven. For example, prior attitude–behaviour studies had applied TPB in the area of smoking (Godin, Valois, Lepage, & Desharnais, 1992), diet (De Bruijn et al., 2007; Povey, Conner, Sparks, James, & Shepherd, 2000), the use of online platforms (Cheung & Vogel, 2013; Mathieson, 1991), driving violations (Parker, Manstead, Stradling, Reason, & Baxter, 1992) and pro-environmental behaviours (Bamberg & Schmidt, 2003; Tonglet et al., 2004). TPB had also been applied in predicting behaviours to use UGS (Glanz, Rimer, & Viswanath, 2008; Rhodes, Brown, & McIntyre, 2006; Wang et al., 2015). Thus, the following hypotheses are proposed based on the TPB.

Hypothesis 4 (H4): Attitude relates positively to the behavioural intention to use UGS.
Hypothesis 5 (H5): Subjective norms relate positively to the behavioural intention to use UGS.
Hypothesis 6 (H6): PBC relates positively to the behavioural intention to use UGS.
Hypothesis 7 (H7): Behavioural intention to use UGS relates positively to behaviour.

2.3 The mediating role of attitude, perceived usefulness and PBC

While the perceived attributes significantly influence users' behaviour in the use of UGS, the TPB model by Ajzen (1991) assumes that all other factors, such as socio-demographics, general beliefs and values, indirectly influence behaviour intentions via the three components, namely, attitude, subjective norms and PBC. Miller (1956) suggested that although individuals may hold many beliefs (an internal cognitive content), they can only invest their efforts to a limited number of them. Attitudes are fairly stable evaluative dispositions that determine the behaviour of individuals towards an object. In the context of UGS use, a high number of UGS attributes, including facilities, green features and maintenance, shape behaviours. Fishbein and Ajzen (1975) explained that beliefs are formed through association with certain attributes of a specific object. Therefore, as discussed previously, UGS users cannot invest efforts in a wide range of attributes. These attributes instead help users acquire attitudes that exhibit a more stable disposition towards UGS and that, in turn, influence behaviour. The following hypotheses on the mediating effects of attitudes are proposed.

Hypothesis 8a (H8a): Attitude mediates the positive relationship between perceived provision of facilities and behavioural intentions to use UGS.

Hypothesis 8b (H8b): Attitude mediates the positive relationship between perceived naturalness and behavioural intentions to use UGS.

Hypothesis 8c (H8c): Attitude mediates the positive relationship between perceived accessibility and behavioural intentions to use UGS.

Stern, Dietz, and Guagnano (1995) argued that the prediction effect of general attitude on behaviour is uncertain. By contrast, general attitude predicts a specific attitude that yields more accurate results in predicting behavioural intention (Do Valle, Rebelo, Reis, & Menezes, 2005). Balram and Dragićević (2005) developed an attitudinal measurement on perceived usefulness of UGS, which is operationalised as how individuals perceive the benefits in using UGS, such as recreation, relaxation, contribution to the quality of life and increment of property value. Perceived usefulness is considered a more specific attitude than the general attitude towards UGS. Therefore the following hypotheses are proposed.

Hypothesis 9 (H9a): Perceived usefulness relates positively to behavioural intention to use UGS.

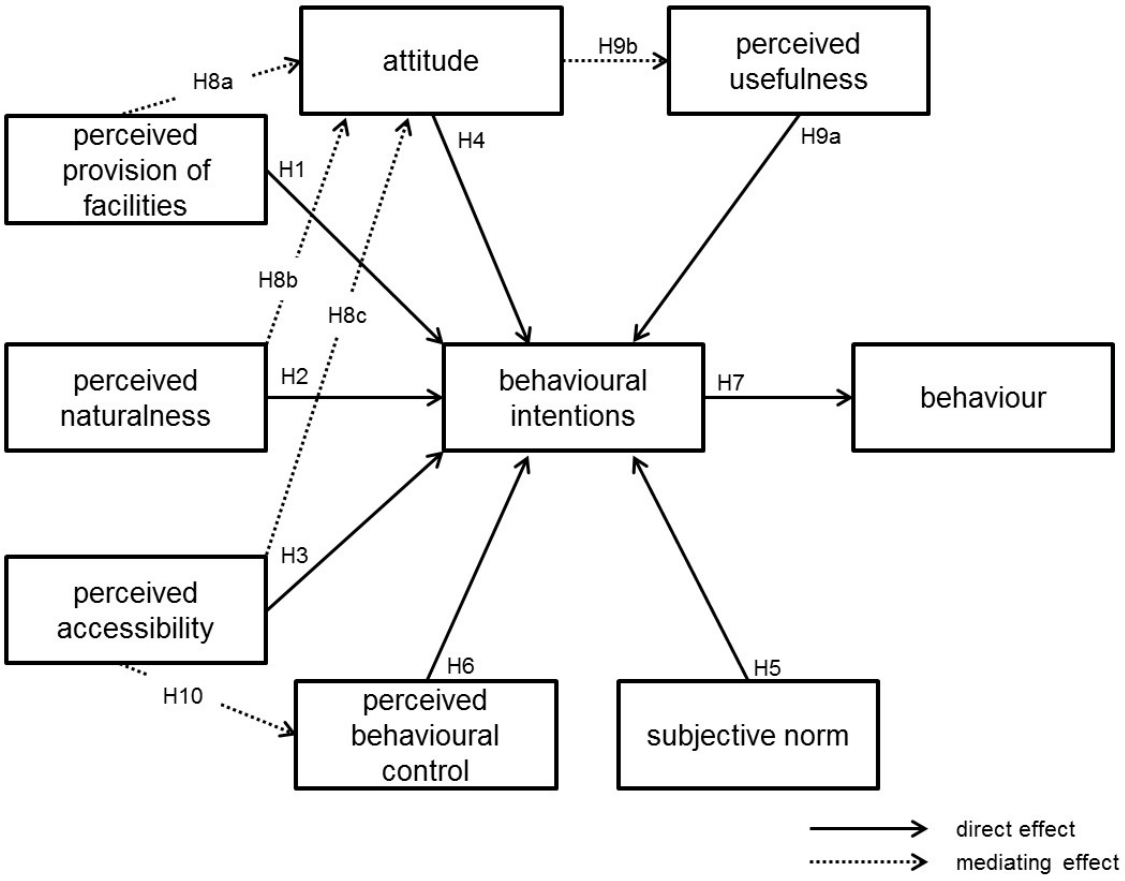
Hypothesis 9 (H9b): Perceived usefulness mediates the positive relationship between attitude and behavioural intentions to use UGS.

In a recent study by Wang et al. (2015), perceived accessibility is found as a stronger predictor of UGS than physical proximity. This result is consistent with that in the study by Holman, Donovan, and Corti (1996), who found that perceived proximity and accessibility (i.e., major roads) influence the frequency of using UGS. Although the construct of accessibility may be conceptually similar to the idea of remote access in Wong (2009), accessibility should include hours of operation and the corresponding price, as well as locational convenience (Wan & Shen, 2015). As suggested by Van Herzele and Wiedemann (2003), prices and hours of operation are attributes that evaluate the attractiveness of UGS. Given that location, hours of operation and prices are attributes of accessibility, these attributes influence the perceived ease or difficulty of the use of UGS, that is, PBC. The following hypothesis is proposed.

Hypothesis 10 (H10): PBC mediates the positive relationship between perceived accessibility and behavioural intentions to the use of UGS.

Drawing upon the aforementioned literature, a conceptual framework is developed, as shown in Figure 1.

Figure 1 The conceptual framework



3. Questionnaire Design and Data Collection

The questionnaire used for this study was designed based on the UGS literature and the TPB theoretical framework (Ajzen, 1991, 2002; Balram & Dragićević, 2005; Bonnes, Passafaro, & Carrus, 2011; Carrus, Passafaro, & Bonnes, 2004; S. Lo, Yiu, & Lo, 2003; Wang et al., 2015; Wong, 2009) (See Appendix A). The questionnaire contained items for the nine variables shown in Figure 1. A seven-point Likert scale was used to measure the variables, wherein 7 indicates a positive view and 1 a negative view. Questions that solicited demographic information, such as gender, age, education level and monthly income, are also included.

The survey was conducted between 6 p.m. and 10 p.m. on weekdays through computer-assisted telephone interviews. All Hong Kong residents aged 18 years old and above were selected as the target population of the survey. Telephone numbers acquired from residential telephone directories of the local telecommunication service provider, Hong Kong Telecommunications Limited, were selected randomly by the computer system. Upon

reaching the target household, a person aged 18 or above was identified among those present according to the 'next birthday' rule.

While mobile phones have become increasingly popular, conducting a landline telephone survey may exclude potential mobile-only respondents and lead to non-coverage bias (Keeter, 1995). This bias is insignificant when the percentage of the population without landline telephone is low (Blumberg, Luke, & Cynamon, 2006). In Hong Kong, the penetration rate of landline telephone in households is 100.3%, that is, a density of 100.3 lines per 100 households (Office of the Communications Authority, 2015). This penetration rate is among the highest in the world (Hong Kong Trade Development Council, 2013); thus, landline telephone survey is still considered a valid, although imperfect, data collection method that would cover the entire population (Lau, 2015). Moreover, Blumberg and Luke (2007) suggested statistical control for demographic differences that can attenuate the non-coverage bias, particularly for young adults and low-income groups. Therefore, demographic variables are controlled during the statistical analysis in this study.

A total of 263 valid responses were collected, with a response rate of 12%. Hair, Ringle, and Sarstedt (2011) suggested a rule of thumb wherein the minimum sample size for the partial least square (PLS) analysis should be 10 times the largest number of hypothesised relationships directed to a particular dependent variable. As shown in Figure 1, the behavioural intention variable has the largest number (i.e., seven) of variables directed to it. Therefore, the minimum sample size required for this study is 7 x 10, that is, 70. Alternatively, statistical power analysis can be performed to obtain the required sample size (Akter, D'Ambra, & Ray, 2011). By using the G*Power 3.1 software (Faul, Erdfelder, Lang, & Buchner, 2007), the adequate sample size can be calculated based on the significance level (α) of the hypothesis test, the effect size (f^2) and the highest number of predictors (n_p) directed to a dependent variable (Cohen, 1988). The sample size required for this study is 153 ($\alpha = 0.05$; $f^2 = 0.15$; $n_p = 7$). An effect size of 0.15 means that a medium-level relationship strength would be detected by the statistical analysis (Cohen, 1988), and this effect size is commonly used to estimate the adequacy of the sample size (Akter et al., 2011). Therefore, the sample size of 263 in this study is adequate.

The profile details of the respondents and that of the corresponding population are presented in Table 1. The sample profile in this study is generally similar to the population profile in Hong Kong in terms of gender, age and personal monthly income; however, the low-education group is under-represented (Census and Statistics Department, 2011).

Table 1 Respondent Profile

Demographic Variable	Sample (N)	Sample (%)	Population Census (%)	Difference[a]
Gender				
Male	108	41.06%	46.71%	-5.64%
Female	155	58.94%	53.29%	5.64%
Age				
18-24	36	13.69%	10.45%	3.24%
25-34	42	15.97%	18.07%	-2.10%
35-44	48	18.25%	18.92%	-0.67%
45-54	62	23.57%	21.49%	2.08%
55-64	48	18.25%	15.38%	2.87%
>=65	27	10.27%	15.69%	-5.42%
Education Level				
Primary	30	11.41%	37.60%	-26.19%
Secondary	128	48.67%	41.38%	7.29%
Post-secondary	105	39.92%	21.02%	18.90%
Personal Monthly Income (HK$)				
<10K	119	45.25%	39.98%	5.27%
10K-20K	65	24.71%	32.87%	-8.15%
20K-30K	30	11.41%	12.01%	-0.60%
30K-40K	16	6.08%	6.10%	-0.01%
>40K	28	10.65%	9.05%	1.60%
Refused to answer	5	1.90%		

[a] Difference is calculated by subtracting the census percentage from the survey percentage.

4. Data Analysis

4.1 Measurement model

Structural equation modelling (SEM) is a method used to measure latent, unobserved concepts based on multiple observed indicators (Chin, 1998a; Jöreskog & Sörbom, 1989). The estimation of structural equation models has two major statistical approaches, namely, covariance-based and variance-based PLS approaches (Hair et al., 2011). PLS, compared with covariance-based SEM, is more suitable for theory development because the approach is insensitive to small sample sizes and does not have distributional assumptions (Hair et al., 2011; Jöreskog & Wold, 1982; Lu, Kwan, Thomas, & Cedzynski, 2011; Reinartz, Haenlein, & Henseler, 2009). The current study used PLS because its requirements are less limiting, and the sample size was relatively small. The statistical software application 'SmartPLS 2.0' (Ringle, Wende, & Will, 2005) for PLS-based path modelling was used to measure the causal model.

The PLS measurement model was evaluated by examining convergent and discriminant validity, as well as the composite reliability of the indicators. Convergent validity and composite reliability tested the relationships among indicators within the same constructs that should be highly correlated with each other. The measurement scales were evaluated based on the following criteria (Chin, 1998b; Fornell & Larcker, 1981): (i) all indicator factor loadings should be significant and exceed 0.5, (ii) composite reliability should exceed 0.7 and (iii) average variance extracted (AVE) by each construct should exceed 0.5.

All standard factor-loading values obtained in the confirmatory factor analysis of the measurement model exceeded 0.5 and were significant at p = 0.01. The composite reliabilities of the constructs ranged from 0.85 to 0.97, and the AVE ranged from 0.57 to 0.90. Therefore, the criteria for convergent validity were met. The Cronbach's alpha scores ranged from 0.76 to 0.95 (Table 2). A generally acceptable low limit was 0.7 (Hair, Black, Babin, & Anderson, 2013), and the constructs exhibited strong internal reliability.

Table 2 Measurement Model

Constructs	**Indicators**	**Factor Loadings**	**Average Variance Extracted (AVE)**	**Composite Reliability (CR)**	**Cronbach's Alpha (α)**
Perceived Provision of Facilities (FAC)	FAC1	0.68	0.59	0.85	0.76
	FAC2	0.79			
	FAC3	0.81			
	FAC4	0.77			
Perceived Naturalness (NAT)	NAT1	0.82	0.69	0.87	0.78
	NAT2	0.85			
	NAT3	0.82			
Perceived Accessibility (ACC)	ACC1	0.86	0.68	0.86	0.76
	ACC2	0.87			
	ACC3	0.73			
Attitude (ATTD)	ATTD1	0.86	0.75	0.94	0.92
	ATTD2	0.87			
	ATTD3	0.90			
	ATTD4	0.89			
	ATTD5	0.80			
Perceived Usefulness (PU)	PU1	0.88	0.73	0.91	0.87
	PU2	0.89			
	PU3	0.88			
	PU4	0.75			
Subjective Norm (SUBN)	SUBN1	0.95	0.90	0.97	0.95
	SUBN2	0.96			
	SUBN3	0.95			
Perceived Behavioural Control (PBC)	PBC1	0.76	0.57	0.89	0.85
	PBC2	0.71			
	PBC3	0.81			
	PBC4	0.79			
	PBC5	0.75			
	PBC6	0.71			
Behavioural Intention (BINT)	BINT1	0.85	0.79	0.92	0.87
	BINT2	0.91			
	BINT3	0.90			
Behaviour (BEH)	BEH1	0.92	0.87	0.95	0.93
	BEH2	0.94			
	BEH3	0.95			

Furthermore, the discriminant validity of the indicators tested whether indicators within different constructs are uncorrelated (Campbell & Fiske, 1959). The assessment of discriminant validity requires that the square root of AVE should be larger than the correlations between two constructs in the model (Chin, 1998b). All constructs met this requirement (Table 3).

Table 3 Correlations among Constructs

Construct	FAC	NAT	ACC	ATTD	PU	SUBN	PBC	BINT	BEH
FAC	**0.77**								
NAT	0.71	**0.83**							
ACC	0.41	0.45	**0.82**						
ATTD	0.35	0.35	0.45	**0.87**					
PU	0.63	0.57	0.56	0.61	**0.85**				
SUBN	0.35	0.31	0.26	0.54	0.50	**0.95**			
PBC	0.44	0.47	0.62	0.45	0.53	0.43	**0.76**		
BINT	0.34	0.27	0.32	0.50	0.55	0.52	0.52	**0.89**	
BEH	0.24	0.20	0.22	0.31	0.40	0.37	0.40	0.75	**0.93**

Note: Figures in bold are the square roots of the AVE.

4.2 Structural model

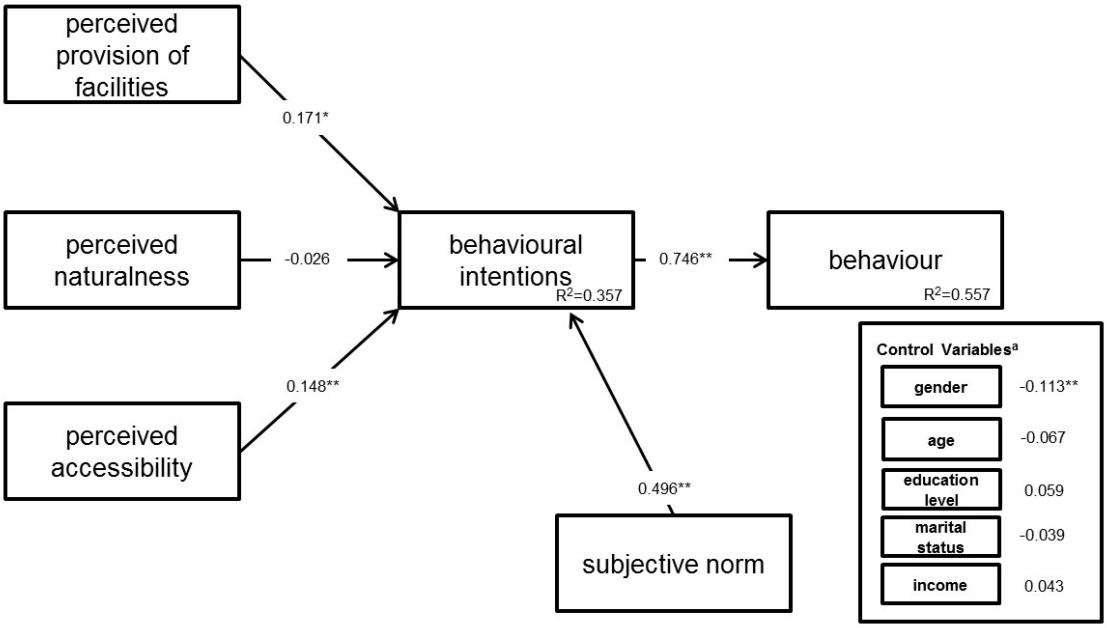
The structural model was evaluated by examining the structural paths, t-statistics and variance explained (i.e., R^2 value). Path significances were determined by running the model using a bootstrap resampling routine involving 263 cases and 1,000 samples. This is a nonparametric method to assess the significance level of PLS estimates (Chin, 1998b), in which sub-samples are generated by randomly selecting a case from the dataset. Hypothesis tests were conducted to examine the proposed model of the present study.

According to Baron and Kenny (1986), the test to determine mediation has four steps: (i) the independent variable (e.g., X) should significantly predict the dependent variable (e.g., Y), (ii) the independent variable should significantly predict the mediating variable (e.g., M), (iii) the mediating variable should significantly predict the dependent variable after controlling for the independent variable and (iv) to estimate a mediating effect, a full mediation should refer to the complete mediation of the mediating variable on the X–Y relationship in which the effect of X on Y while controlling for M should be zero. Partial mediation is established when the X–Y relationship remains significant but is substantially reduced.

To fully account for the differences among UGS users, five control variables, namely, gender, age, educational level, marital status and monthly income, were included. As suggested by prior studies, these control variables were selected because of their potential influence on UGS use (Jim & Shan, 2013; A. Y. Lo & Jim, 2012; Payne, Mowen, & Orsega-Smith, 2002; Roovers, Hermy, & Gulinck, 2002) and their ability to attenuate non-coverage bias in the landline telephone survey (Blumberg & Luke, 2007).

Following the four steps, Figure 2 shows the results of the first run of the PLS analysis. The model included the three perceived UGS attributes as well as subjective norm, behavioural intention and behaviour. The results showed that two perceived UGS attributes, namely, provision of facilities ($\beta = 0.171$, $t = 2.31$, $p < 0.05$) and accessibility ($\beta = 0.148$, $t = 2.73$, $p < 0.01$), significantly influence behavioural intention to use UGS. By contrast, perceived naturalness is not a significant predictor of behavioural intention. In addition, one of the TPB components, subjective norm, was significantly correlated with behavioural intention ($\beta = 0.496$, $t = 8.11$, $p < 0.01$). Finally, the path from behavioural intention to behaviour was also observed as significant ($\beta = 0.746$, $t = 24.40$, $p < 0.01$).

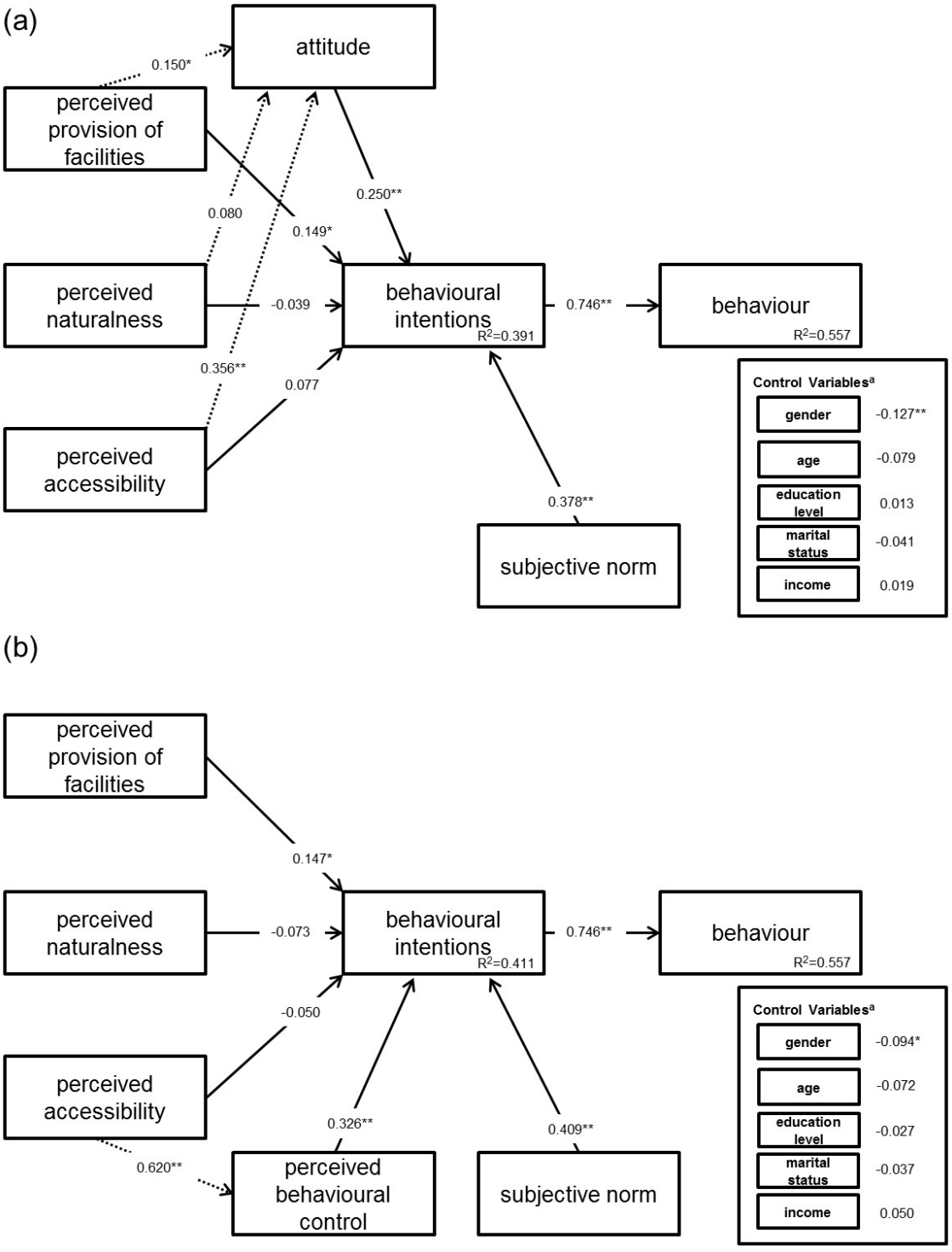
Figure 2 Direct effects (* $p < 0.05$; ** $p < 0.01$)



[a] Five paths were established between the control variables and the dependent variable of behavioural intentions.

The mediating role of the mediating variables was separately assessed. Figure 3 shows the PLS path models that include (a) attitude (ATTD) and (b) PBC. After including attitude as mediator, the path between perceived provision of facilities (FAC) and behavioural intentions (BINT) remained significant ($\beta = 0.149$, $t = 2.08$, $p < 0.05$), whereas the relationship weakened (i.e., β change from 0.171 to 0.149). Meanwhile, the relationship between perceived accessibility (ACC) and INT became non-significant after ATTD was added to the model. Given that the paths from FAC to ATTD ($\beta = 0.150$, $t = 2.02$, $p < 0.05$), ACC to ATTD ($\beta = 0.356$, $t = 5.85$, $p < 0.01$) and ATTD to BINT ($\beta = 0.250$, $t = 3.80$, $p < 0.01$) were significant, the partial mediation of the path from FAC to BINT and the full mediation of the path from ACC to BINT by ATTD are empirically proven. Mediating effect could not be tested because perceived naturalness (NAT) was not significantly correlated with BINT. Moreover, according to Figure 3(b), after PBC was included in the model, the path from ACC to BINT became non-significant, whereas the paths from ACC to PBC ($\beta = 0.620$, $t = 15.68$, $p < 0.01$) and PBC to BINT ($\beta = 0.326$, $t = 4.19$, $p < 0.01$) were significant. Therefore, PBC fully mediated the path from ACC to BINT.

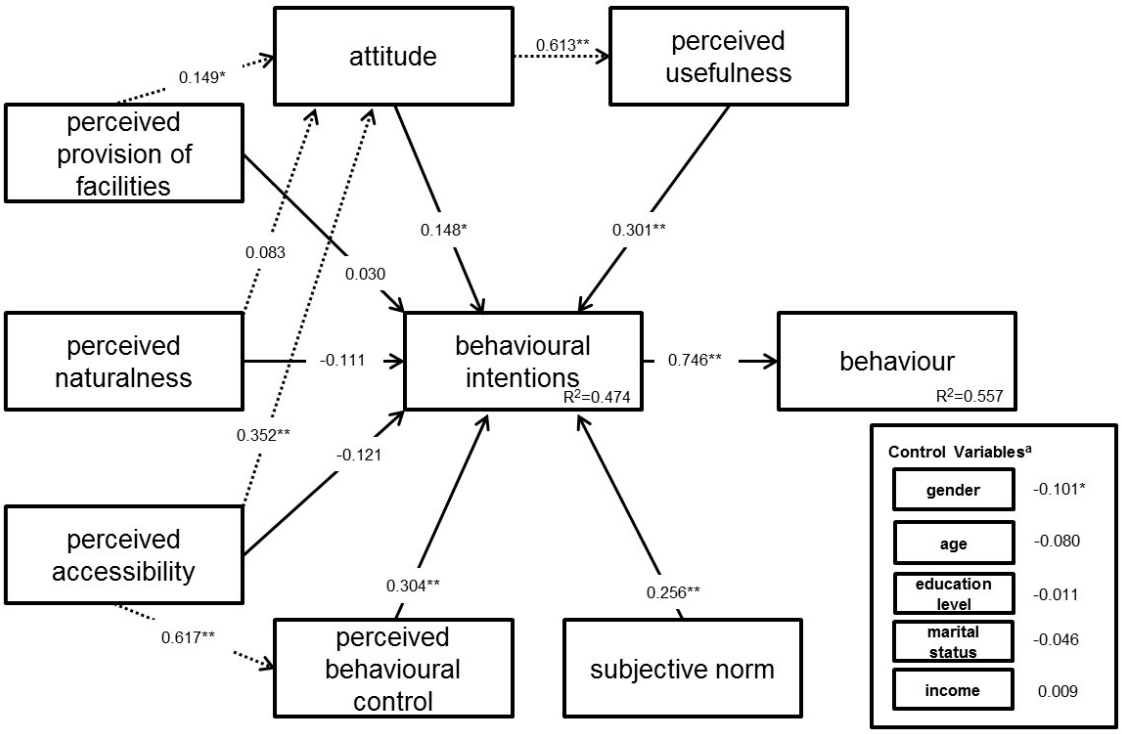
Figure 3 Mediating effects of (a) attitude and (b) perceived behavioural control (* $p < 0.05$; ** $p < 0.01$)



[a] Five paths were established between the control variables and the dependent variable of behavioural intentions.

Finally, Figure 4 shows the PLS path analysis with the inclusion of the mediating variable, perceived usefulness (PU). The results showed that the path from ATTD to BINT remained significant. A comparison of the beta value in the model excluding PU showed that the beta value decreased from 0.234 to 0.148. The relationships between ATTD and PU ($\beta = 0.613$, $t = 14.74$, $p < 0.01$) and PU and BINT ($\beta = 0.301$, $t = 3.51$, $p < 0.01$) were significant. These findings provided empirical evidence that PU mediated the relationship between ATTD and BINT.

Figure 4 Mediating effects of perceived usefulness and the full model
(* $p < 0.05$; ** $p < 0.01$)



[a] Five paths were established between the control variables and the dependent variable of behavioural intentions.

Overall, except for H2 and H8b, all of the proposed hypotheses in the conceptual framework were supported. Among the five control variables, only gender was significantly correlated with behavioural intentions. The negative significant relationship indicated that females have a higher level of intention to use UGS than males.

Hair et al. (2011) proposed that R^2 values of 0.25, 0.50 and 0.75 in the structural model of PLS can be interpreted as weak, moderate and substantial, respectively. The model in Figure 4 shows moderate amounts of variance in BINT (R^2=0.474) and in BEH (R^2=0.577), which can be explained by the proposed predictors and mediators included.

PLS does not provide alternate methods for model validation, such as χ^2, GFI and other related measures, as covariance-based SEM (Henseler & Sarstedt, 2013). The criterion goodness of fit (GoF) for PLS was proposed by Tenenhaus, Vinzi, Chatelin, and Lauro (2005) as the geometric mean of the average communality and the average R^2. GoF is regarded as small (0.35), medium (0.50) and large (0.61) (Latan & Ghozali, 2012). The model in this study had a GoF value of 0.54. Thus, the model was acceptable.

5. Discussion

The findings of this study provide insightful information for policymakers, designers and planners to enable them to utilise scarce land resource more effectively. In relation to the direct effects of the three UGS attributes on behavioural intentions to use UGS, the results suggest that behavioural intention is influenced by perceived provision of facilities and perceived accessibility. These results are consistent with earlier studies that indicated the influence of well-equipped facilities, accessibility to the public (Bonnes et al., 2011) and accessibility (Wang et al., 2015). However, unlike prior studies (Coley, Sullivan, & Kuo, 1997; Giles-Corti et al., 2005), perceived naturalness was not regarded as a significant predictor of behavioural intention. The crowded living space in Hong Kong drives a higher demand to use UGS, and people tend to tolerate poor air quality and noise (Lam, Ng, Hui, & Chan, 2005). Moreover, A. Y. Lo and Jim (2012) suggested that specific environmental functions of UGS, such as soil erosion prevention, habitat for wildlife and noise abatement, are considered less important by Hong Kong citizens because of the prevalence of small UGS along roads in the city that lack natural features.

In addition, the results showed that attitude, subjective norm and PBC were significantly correlated with behavioural intention. The relationships between the two perceived UGS attributes, namely, facilities and accessibility, towards urban greening were mediated by attitude. The relationship between attitude and behavioural intention is mediated by perceived usefulness. Finally, the influence of perceived accessibility on behavioural intention was mediated by PBC. These findings are consistent with the theoretical propositions suggested by Ajzen (1991) and Fishbein and Ajzen (1975) and with the empirical findings of attitude–behaviour research in different fields (Beck & Ajzen, 1991; Do Valle et al., 2005; Heath & Gifford, 2002). While a well-designed and maintained UGS can help fulfil users' needs and encourage UGS usage (Bonnes et al., 2011; Burgess, Harrison, & Limb, 1988), the mediating effects inform policy makers to focus on UGS attributes and to the attitudes, subjective norms and PBC of users in encouraging UGS use.

Among the five control variables included in the PLS analysis, female users had higher level of behavioural intentions in using UGS than males. Although a number of prior studies have investigated demographic differences (A. Y. Lo & Jim, 2012; Shan, 2014), these studies focused only on differences in perception of and motivation to use UGS. Therefore, the exact influence of gender on behavioural differences is suggested to be addressed in future research.

Future research should also address several limitations of this study. One limitation is the relatively small sample obtained in Hong Kong and the underrepresentation of the low-education group. Therefore, future research should verify the results of this study with a larger and more representative sample. In addition, the increasing trend of mobile-only population may cause significant non-coverage bias of landline telephone survey in future; thus, further studies should consider using a dual sampling frame, that is, landline telephone list and mobile phone list (Hu, Balluz, Battaglia, & Frankel, 2011). UGS in Hong Kong can feature a unique urban setting. Therefore, the findings of this study may or may not be generalised in other areas and contexts. Future research may apply the model in different settings and with different groups. While all measures in the survey were based on self-reports, bias may still exist in the results.

6. Conclusions

This study investigated the mediating role of attitude, perceived usefulness and PBC in understanding UGS use. The results showed that the relationship between perceived provision of facilities and behavioural intention is mediated by attitude, perceived usefulness and PBC, whereas that between perceived accessibility and behavioural intention is mediated by PBC. These findings addressed the knowledge gap that although UGS attributes influence user perception and evaluation, the attitudes of users should also be considered in encouraging the use of UGS.

To change attitude, perceived usefulness and PBC, UGS management or public authorities can launch promotional programmes that highlight alternative benefits and use of facilities. These programmes are particularly important to compact cities because physical constraints may hinder improvement of UGS quality. However, changing the attitudes of people would also increase their use and visits. The implications for encouraging the use of UGS include:

- The need to focus on people's attitudes and perceived usefulness. This can be achieved by educational and promotional programmes. From the marketing or promotional perspective, attitudes can be changed by a variety of strategies (Schiffman, Kanuk, & Wisenblit, 2010), such as changing motivational function by highlighting the prominent needs to use UGS. For example, promotional messages should not only focus on one's own physical or psychological benefits, but also illustrate how UGS use may change lifestyles, social relationships, and property values. This can heighten the perceived usefulness of individuals.

- The need to enhance knowledge and perceived accessibility of UGS. As PBC concerns people's own knowledge about performing a behaviour. Therefore, directional signage to show the locations of UGS and usage instructions of the facilities may help encourage a higher level of UGS usage. For example, a promotional programme may highlight how to use facilities in UGS. In this study, accessibility is operationalised as locational convenience, opening hours and charges. Therefore, UGS management should continuously consult users' opinions for reviewing the appropriateness of opening hours and charges.

- The need to position the use of UGS as a social norm and trend through marketing communication and public relation events. For example, using a promotional campaign to illustrate the popularity of using UGS. This approach is similar to the attitude–change strategy mentioned previously by associating with an admired group or event or identifying a celebrity to promote UGS use. Ohanian (1990) suggested that the promotional message could be more persuasive if a celebrity is credible and attractive. Therefore, celebrities, e.g. athletes, pop-stars, may serve as a role model and enhance the popularity of UGS use.

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Appendix 1

Constructs		Indicators	Adapted from
Perceived Provision of Facilities (FAC)	FAC1	Urban green spaces provide facilities for all weather conditions.	Lo et al., 2003; Wong, 2009; Van Herzele & Wiedemann, 2003
	FAC2	Urban green spaces provide sufficient ancillary facilities. (e.g., drinking, washroom)	
	FAC3	Urban green spaces provide sufficient catering services.	
	FAC4	Urban green spaces provide sufficient seating.	
Perceived Naturalness (NAT)	NAT1	Urban green spaces provide green areas and features (e.g., trees, grass).	
	NAT2	The air quality is good in urban green spaces.	
	NAT3	Urban green spaces provide natural environment.	
Perceived Accessibility (ACC)	ACC1	Urban green spaces are conveniently located near my home.	
	ACC2	The opening hours of urban green spaces are convenient.	
	ACC3	The facilities in urban green spaces are free of charges.	
Attitude (ATTD)	ATTD1	If one had more contact with nature in the city, he/she would feel less stress.	Carrus et al., 2004
	ATTD2	The presence of green in the city makes us feel more alive.	
	ATTD3	In the city, people need nature for psychological restoration.	
	ATTD4	In the city, one can ease tensions just by looking at a green area.	
	ATTD5	Being in a city green area can also help improve relationships with others.	
Perceived Usefulness (PU)	PU1	I use urban green spaces to relax.	Balram and Dragićević, 2005
	PU2	I use urban green spaces for recreation.	
	PU3	Urban green spaces contribute to my quality of life.	
	PU4	Urban green spaces would increase my property value.	
Subjective Norm (SUBN)	SUBN1	My friends would think I should use urban green spaces.	Ajzen, 1991; Wang, 2015
	SUBN2	My family would think I should use urban green spaces.	
	SUBN3	My co-workers or schoolmates would think I should use urban green spaces.	
Perceived Behavioural Control (PBC)	PBC1	I have plenty of opportunities to use urban green spaces.	
	PBC2	I have sufficient time to use urban green spaces.	
	PBC3	Using urban green spaces is convenient and easy.	
	PBC4	I know where urban green spaces are.	
	PBC5	I know how to go to urban green spaces.	
	PBC6	I know how to use the facilities at urban green spaces.	
Behavioural Intention (BINT)	BINT1	I plan to visit/use urban green spaces.	
	BINT2	I intend to visit/use urban green spaces in the next 4 weeks.	
	BINT3	I will visit/use urban green spaces every time I have an opportunity.	
Behaviour (BEH)	BEH1	I have visited/used urban green spaces in the past 4 weeks.	
	BEH2	I have been visiting/using urban green spaces regularly in the past 4 weeks.	
	BEH3	I have been visiting/using urban green spaces often.	