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RESEARCH ARTICLE

Green purchase behavior towards green housing: an investigation of Bangladeshi consumers

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Abstract

Worldwide green products are getting popularity and acceptance due to energy crisis, climate change, and other environmental degradations which reveal the upcoming challenges of the twenty-first century. In construction industry, green housing (GH) is an emerging concept towards environmental sustainability. However, this study intends to consider the green purchase intention of Bangladeshi consumers towards GH through augmented theory of planned behavior (TPB) implantation. To investigate proposed hypotheses, the structural equation modeling (SEM) approach is applied on a sample set of 319 valid responses residing in Dhaka City and aging over 20 years. The empirical results infer that attitude and consumers' perceived behavioral control are significant features of green purchase intention and have a vital role in green purchase behavior. In contrast, environmental concern, environmental knowledge, and subjective norm have no direct effect on the green purchase intention of consumers towards GH in Bangladesh. Instead, environmental knowledge and environmental concern indirectly affect the green purchase intention. The findings of the present study can contribute to the existing literature to understand Bangladeshi consumers' green purchase intention and their green purchase behavior and promote GH which can play a robust role in environmental sustainability.

Keywords Green purchase behavior · Green housing · Environmental sustainability

Introduction

Intensive industrial development along with economic growth is increasingly leading to the adverse ecological degradation which affects individuals' organisms and their economic and social status (Maichum et al. 2016). Bangladesh, an emerging economics in South Asia, is developing rapidly in industrial sectors, resulting in vulnerability to environmental degradation causing emission of greenhouse gas due to excessive consumption of fossil fuel (IDCOL 2019). Consequently, consumers in this part are concerning about their environment degradation and its effects (Bonini and Oppenheim 2008). These environmental issues have been intensified because of rapidity in urbanization. As a result, to attain sustainable urbanization, green housing (GH) is discovered as a well-liked strategy in both developed and developing nations (Zhang et al. 2018a) like Bangladesh. Researchers define that GH, an urban residential buildings to which standard building codes are followed, can significantly reduce the amount of energy required for residences and at the same time, lessen GHG emission (Climate Colab 2014). Thus, GH proves to be a significant realm of research for ensuring ecological sustainability (Chou et al. 2017; Hu et al. 2014).

Bangladesh contains around 28% urban area of the total population which is approximately 41.5 million people who are living in urban areas of Bangladesh and is expected 1.5 times current level to reach 63 million by 2.8% mean population growth rate in 2025 (Ahmad 2015). In the 7th Five Year

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Plan (2016–2020), it is found that housing deficit raised from 1.13 to 4.6 million units for 2001 to 2010 in urban areas (Ahmad 2018). For an instance, Dhaka, one of the most populated cities around the globe, is the residence of over 17.4 million people and more are moving in (A. Rahman 2019). As a result, buildings have 40% share in total energy consumption of Bangladesh due to alarming rate urbanization and rapid energy demand (Ahmad 2015). Consequently, the Nationally Determined Contribution of Bangladesh focusing on climate commitments aims to moderate overall energy consumption in commercial buildings at 25% (IDCOL 2019). Although construction sector especially the building construction is increasing remarkably, green buildings have not been yet constructed increasingly (Climate Colab 2014).

Worldwide, sustainable development drives consumers to amend their understandings and concentrations which are gradually related to buying of products (Chou et al. 2017). Thus, green consumerism is one of the talked topics, regarded as complex, and affected by diverse factors like housing when consumers intend to buy the green products by spending significant expenses (Zhang et al. 2018a). To conduct this case study of Bangladeshi perspective, the social psychological model is utilized to evaluate the consumers' green purchase intention concerning GH. The study adopts a well-known model such as the extended theory of planned behavior (TPB) by Ajzen (1985) to explore the purchasing intention antecedents and its determinants (Liu et al. 2018; Maichum et al. 2016).

With an aim of unfolding determinants which significantly affect consumers' green purchase intention following green purchase behavior, this research work attempts to bridge research gap, although the connection is ambiguous among purchasing intention following purchase behavior of GH and its determinants for Bangladesh. Though several previous studies have been conducted on GH in other developing and developed countries (Chou et al. 2017; Hu et al. 2014; Zalejska-Jonsson 2014), determining consumers' green purchase behavior towards GH is still uninvestigated in Bangladesh. Especially, this study proposes an augmented version of the TPB model and also focuses on consumers' opinions and attitudes to investigate their actual green purchase behavior. Hence, the prime research question is stated as "What are the determinants affect consumers' behavioral intention and green purchase behavior in the Bangladeshi GH?

Theoretical framework and hypothesis development

To investigate the individuals' intention (behavior), Ajzen (1985) proposed an epic model named TPB. Behavioral intention is computed through three basic factors within the TPB framework, namely, attitude (ATT), perceived behavioral control (PBC), and subjective norm (SN) (Ajzen 2002). Prior studies employed the TPB model to observe the purchase intention motivation (consumers' green purchase behavior) for green products along with environmental knowledge. Environmental concern and knowledge are imperative elements which influence consumers' behavioral intention and green purchase behavior regarding green products (Paul et al. 2016). Moreover, consumers' environmental concern is significantly affected by the cost, quality, and green products performance (Vazifehdoust et al. 2013; Zalejska-Jonsson 2014).

TPB has implemented to forecast consumers' intention and behavior in extensive ranges of consumer researches involving green hotels (Han et al. 2010; Kun-Shan and Yi-Man 2011), electric vehicles (Wang et al. 2016), and energy conservation (Macovei 2015a). To examine consumers' green purchase behavior, TPB is also considered to be a highly powerful model (Bamberg 2003) specifically for green products (Kumar et al. 2017). For instance, Maichum et al. (2016) recommended that subjective norm, perceived behavioral control, and attitude are significant factors of Thai consumers' purchase intentions for green products.

Gilg et al. (2005) recommended that green consumption is an emerging research area and the role of environmental concern on green consumption is yet to be discovered, while Macovei (2015b) also recommended that consumers' attitude is directly predicted by environmental concern with respect to a certain behavior. Environmental knowledge is the other side of the coin to help to form the ideas and general knowledge on how a product interacts with ecology and leads to sustainable development (Ohtomo and Hirose 2007). Additionally, Ohtomo and Hirose (2007) discovered that consumers' attitude-behavior gap occurs due to lack of knowledge concerning green products with respect to environmental concern and actual purchasing behavior. For this reason, environmental concern and knowledge are regarded as proportionately substantial to determine consumers' green purchase behavior, respectively (Diamantopoulos et al. 2003; Scott and Vigar-Ellis 2014).

Hence, environmental concern and knowledge have integrated with perceived behavioral control, subjective norm, and attitude to the TPB model as the antecedents of consumers' green purchase behavior to postulate a proposed research model. Perceived behavioral control, attitudes towards behavior, and subjective norms (Zhang et al. 2018a) and environmental concerns were considered equally important in determining green consumer behavior in the perspective of GH (Liu et al. 2018). However, existing study differs from the earlier mentioned studies, as it expands the range of features that might stimulate consumers' green purchase intention following green purchase behavior towards Bangladeshi GH. Indeed, extending TPB model is unprecedented in any

study within the socioeconomic context of Bangladesh to determine consumers' purchase behavior towards GH. The proposed model can contribute to the existing literature, as there is no current study that determines consumers' green behavioral intention and purchase behavior through TPB model in the Bangladeshi GH. Moreover, the gap in the literature of green consumer behavior in Bangladesh would be bridged by the comprehensive conceptual model, which scrupulously clarifies the consumers purchase behavior and behavioral intention of GH in Bangladesh.

Environmental knowledge

Environmental knowledge means that individuals' knowledge of the essentials, fundamental relations, and environmental responsibilities which leads to sustainable development (Taufique et al. 2016; Hill and Lynchehaun 2002) demonstrated that one's environmental knowledge has a substantial effect on environmental issues. Thus, the consumers having environmental knowledge are informed and conscious about ecological issues which drive their purchase intention to green products (Mahesh and Ganapathi 2012; Wang et al. 2014a). In another study, Mostafa (2006) demonstrated that attitude towards green products enhances the purchase intention through environmental knowledge. However, Moorman et al. (2004) noted that subjective knowledge is influenced consumers' level of environmental knowledge they have. Furthermore, Kim et al. (2014) showed that environmental knowledge increases individuals' beliefs which enhance their ability to control the situation, resulting in increasing perceived behavioral control. Lobo and Greenland (2017) argued that purchase of eco-friendly products is uplifted by environmentally friendly attitude. Due to environmental problems, eco-friendly innovation has been developed with the help of environmental knowledge (Ben Amara et al. 2020). Hence, we have hypothesized following:

- **H1a**: Environmental knowledge has a positive influence on subjective norm.
- **H1b**: Environmental knowledge has a positive influence on perceived behavioral control.
- **H1c**: Environmental knowledge has a positive influence on attitude.
- **H1d**: Environmental knowledge has a positive influence on green purchase intention.

Environmental concern

Environmental concern is regarded as an individual's concern level to the ecological issues (Hines et al. 1987). Environmental concern is also considered a cognitive measure to foretell an individual's friendly ecological behavior, environmental problems awareness, and willingness level to resolve the problems (Yeonshin Kim and Choi 2005; Prakash and Pathak 2017; Straughan and Roberts 1999). Additionally, environmental concern indicates an individual's responsibility sense to conserve the ecology and their emotional attachment through environmental protection involvement (Lee 2008; Prakash and Pathak 2017). Earlier studies found that assessment of individuals' environmental concern is required to be elucidated the ecological issues at their individual level rather than collective orientations, which range from waste recycling behavior (Wang et al. 2014b) to green purchase behavior (Mostafa 2006; Prakash and Pathak 2017).

Moreover, it was found that environmental concern directly influences the green products attitude and consumers' purchase intention (Mostafa 2007; Paul et al. 2016). Consumers having environmental concern, positive attitudes towards GH are directly associated with that results in turning their high-level purchasing intention (Zhang et al. 2018a). While the increasing environmental-level concern influences subjective norm, these environmental concerns can predict the perceived behavioral control for energy conservation and also minimize the complexity perception with respect to resources, time, and other factors (Bamberg 2003). Decision-making of consumers is directly determinant by environmental concern (Zhang et al. 2018a). Consequently, the proposed hypotheses are as follows:

- **H2a**: Environmental concern has a positive influence on subjective norm.
- **H2b**: Environmental concern has a positive influence on perceived behavioral control.
- **H2c**: Environmental concern has a positive influence on attitude.
- **H2d**: Environmental concern has a positive influence on green purchase intention.

Subjective norm

Subjective norm means the perceived social pressure which influences the execution or non-execution of any evident behavior (Han et al. 2010). Park (2000) defined subjective norm as an individual's opinion which has an impact on his or her decision-making. Several studies found that perceived social pressure is a substantial factor of consumers' green purchase behavior towards green products (Chen and Tung 2014; Dean et al. 2012; Kun-Shan and Yi-Man 2011; Zukin and Maguire 2004). Both inconvenience tolerance and strong subjective norms arise the green purchase intention by purchasing the eco-friendly product (Lobo, A., & Greenland, S. 2017). Subjective norm, perceived social pressure, is an imperative element of intention to purchase GH (Liu et al. 2018) which postulated the following hypothesis:

- **H3**: Subjective norm has a positive influence on green purchase intention.

Perceived behavioral control

Ajzen (2002) demonstrated perceived behavioral control as the extent to difficulty in performing any particular behavior or an individual's perceived ease, is determined. Individuals' ability and motivation influence to accomplish a given behavior rather than when the individual has only one or neither factor (Zhou et al. 2013). TPB model recommended the developing perceived behavioral control as an essential precedent to creating intention. Perceptual cues from perceived behaviors are vital elements to assess products before purchasing (Li et al. Li et al. 2002). Furthermore, self-efficacy and convenience/availability are key features of food purchasing (Olsen 2004). To control behavior, individual's ability and confidence are positively related to purchase intention regarding green products (White Baker et al. 2007). In light of aforementioned arguments, the proposed hypothesis is stated as follows:

- **H4**: Perceived behavioral control has a positive influence on green purchase intention.

Attitude

An interaction or summary evaluation in memory concerning a certain object is called attitude (Fazio 1995). Prior studies found that attitude reveals the psychological assessment of a product by consumers (Eagly and Chaiken 1995; Schiffman et al. 2007). It determined that environmental attitudes create and directly influence the consumer's purchasing intention (Irland 1993). Attitude is a vital feature to foretell the consumers' intentions to spend in case of green products (Tsen et al. 2006). In various cultures, attitude arises the behavioral intention (Mostafa 2007). In the context of GH, attitude is found to have a significant impact towards consumers' behavioral intention (Liu et al. 2018; Zhang et al. 2018a) which drives their green purchase behavior. If green homes are available at less than 5% premium higher than traditional homes, then consumers have a positive attitude to buy green products (Patel and Chugan 2016). Higher education is also the nourishing environment concerns (Liere and Dunlap (1980). People, having green products knowledge, have intentions and attitudes to increase consumption of green products (Zhang et al. 2018). H5 has been proposed to assess the influence of attitude on GH purchasing.

- **H5**: Attitude has a positive influence on green purchase intention.

Green purchase intention towards green purchase behavior

Green purchase intention (GPI) means the consumers' keenness to buying eco-friendly products thinking of the welfare of the environment (Akehurst et al. 2012; Chan 2001; Dagher and Itani 2014). On the other hand, green purchase behavior (GPB) is regarded as consumers' cognitive actions to which they buy eco-friendly products and avoid those products that are detrimental to the society and environment (Mostafa 2007; Rahman 2018). Thus, GPB is determined by consumer's behavioral intention and willingness to go with green products (Joshi and Rahman 2015). In Asian context, the TPB model is widely used to validate consumers' GPI and green behavior (Han et al. 2010; Prakash and Pathak 2017; Zhou et al. 2013). Familiarity of green concept boosts up the organic and green food consumption (Rezai et al. 2012). In several previous studies on green products, scholars found an underlying relationship between GPI and GPB (Kanchanapibul et al. 2014; Kang et al. 2013; Lai and Cheng 2016; Wang et al. 2014b). Additionally, previous studies demonstrated that consumers' green purchase intention is directly (indirectly) induced by environmental concern through perceived behavioral control, subjective norm, and attitude, respectively (Chen and Tung 2014). This relationship led to postulate the following hypothesis:

- **H6**: Green purchase intention has a positive influence on green purchase behavior.

In light of aforementioned discussion and hypotheses, the proposed research framework is illustrated in Fig. 1.

Methodology

Questionnaire design

To achieve the study objectives, a 5-point Likert scale is utilized through the measurement variables for each construct (which are adapted from the relevant studies) (see Appendix Table 6). A structured questionnaire both in local (Bengali) and in international (English) language has been distributed through a survey to collect the data from the target population (see Appendix Table 6). It ranges from "strongly disagree = 1 to strongly agree = 5." Before proceeding to the formal survey, the interviews of the university scholars and researchers in this field were accompanied to enhance the measurement scales in terms of reliability and validity in case of Bangladesh. Improvements and modifications were undertaken after the consideration of their suggestions by addition and deletion in the questionnaire. Additionally, the questionnaire

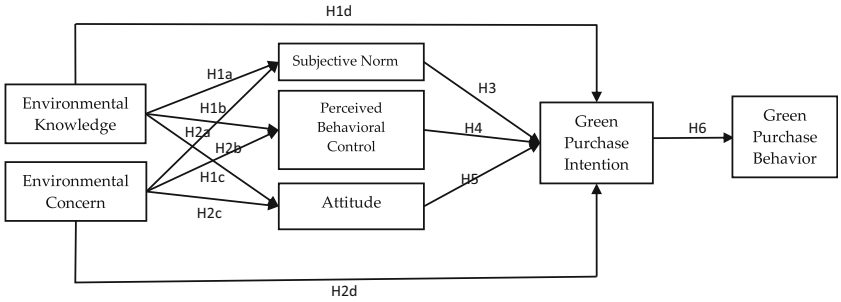

Fig. 1 Research model

wording also was modified to make it more readable and ease of understanding.

Sample and data collection

Dataset was collected by using structured questionnaires which were intended to target those respondents who aged over 20 years and education levels comprised at least higher secondary school certificate (HSC). Higher education is also the nourishing environment concerns (Liere and Dunlap 1980). Several researchers found that the investigation of green context is complex to generalize by minors as they face complexity while making decision (Chan 2001). As a result, the sample comprised adults who were 20 years or older. Moreover, various researchers recommend that less educated people have difficultly to comprehend the topic under investigation paralleled to higher educated people (Paul et al. 2016). Questionnaire in both local (Bengali) and international (English) language is freely available as per respondent's ease of understanding. Thus, this study employed a convenience sampling technique along with a judgmental approach to select respondents who reside at Dhaka City, the capital of Bangladesh. Before collecting formal data, a pilot test was conducted. A total of 46 consumers, who had green purchase intention and showed green purchase behavior earlier towards GH, were interviewed for the pilot test that examined the questionnaire reliability and validity, respectively.

In light of experts' opinions and recommendation, we have revised the questionnaire to make it simple, readable, and easy to understand. Afterwards, another round of pilot testing has been conducted and a dataset from 55 consumers is collected to re-evaluate the reliability. With the help of second pilot testing, the final version of the questionnaire has been distributed in both local (Bengali) and international (English) language for data collection. A face-to-face interview survey was employed to gather responses from the respondents, as face-to-face interview is regarded as a tool of controlling personal interaction (Szolnoki and Hoffmann 2013) and reducing the non-response rates within the survey environment (Kinnear and Taylor 1987). Nunnally Jr (1970) suggests that a sample size should be 300 or more in order for the estimation of Cronbach's alpha coefficient to be precise sufficiently.

Following Strohmaier et al. (2019) and Strohmaier et al. (2020), the minimum sample size is 142 with 0.80, 0.05, and 0.10 statistical power, level of probability, and effective size rate, respectively. Therefore, 356 questionnaires were distributed including respondents who have had a previous experience of purchasing GH and 342 were returned that shows approximately 96% response rate. Out of 342, twenty-three questionnaires were incomplete, which were not included for the analysis. However, 319 valid respondents were included as our effective sample for further study. We also have provided information sheets and approval forms to respondents that explained the objective of the study. In addition, the confidentiality and anonymity were ensured in this study.

Measures

The detail of each variable and its subdimensions are elaborated briefly in Appendix Table 6. These were implemented from related literature, and to some extents, they were amended to fit with the study. The study adopted a total of seven constructs; green purchase intention, subjective norm, environmental concern, environmental knowledge, attitude, green purchase behavior, and perceived behavioral control. First, three subdimensions of environmental knowledge have taken from the study of Mostafa (2006). Second, three items to environmental concern were taken from Hartmann and Apaolaza-Ibáñez (2012) and Zimmer et al. (1994). Third, subjective norm scale with three items is taken from Maichum et al. (2016) and Liu et al. (2018). Forth, three items to measure perceived behavioral control were taken from Armitage and Conner (2001), Zhang et al. (2018b), and Kim and Han (2010). Fifth, attitude scale with four items was adopted from previous studies Paul et al. (2016) and Maichum et al. (2016). Sixth, green purchase intention was computed from three subdimensions based on Liu et al. (2018) and Zhang et al. (2018a). Finally, green purchase behavior scale with three items was chosen from Lee (2008).

Data analysis

Structural equation modeling (SEM) has been conducted to do data analysis by using the moment structures analysis (AMOS

23 software). In earlier studies, SEM is found to be a widely accepted multivariate analysis technique in behavioral and psychological studies. The model comprises latent and manifest variables. Additionally, SEM, measurement model, is also handy to conduct validity and reliability analysis through confirmatory factor analysis (CFA).

Findings and analysis

Descriptive statistics

Tables 1 and 2 illustrate the respondent's demographic characteristics and descriptive statistics, respectively. After eliminating the questionnaires that were incomplete and invalid responses, the study comprised 319 respondents: 216 males (67.71%) and 103 females (32. 29%). The largest proportion of the respondents is male, which indicates that in the most of the cases, males act as powerful influencers in purchasing GH relative to females. The premier percentage of the respondents fell into the range of 41–50-year-old age group (41.38%), followed by the second largest proportion of 31–40-year-old age group (33.23%) because these age groups have more economic power than the other age groups. Around 90% of the respondents were married; in contrast, nearly 10.03% were unmarried. The highest proportion of the household monthly income of the respondents fell into the range of 35,001–45,000 BDT or more (55.17%); conversely no respondents fell into the level of 0–15,000 BDT (0%) in purchasing GH. Among all the respondents, the highest proportion earned a master degree (41.69%) following the second largest proportion (33.86%) of the respondents who had a bachelor degree. Therefore, respondents' demographic characteristics revealed a positive linkage among household income, age range, and education level. The descriptive statistics in Table 2 infers that all under-considered items have a mean value higher than 3.

Reliability and validity

By employing CFA, the study ambition is to test the reliability and validity analysis of proposed theoretical framework (see Table 3). To gauge internal consistency, Cronbach's alpha is utilized and found that all under-considered items have a value greater than 0.7 threshold value to gauge internal consistency including items (Shahzad et al. 2019; Hair et al. 1998). Consequently, the values revealed the adequate reliability of all constructs. Additionally, the composite reliability (CR) also is applied to compute construct reliability ranging from 0.797 to 0.955, expressing good convergent validity (Fornell and Larcker 1981). Factor loading and average variance extracted (AVE) are used to estimate the convergent validity and all of the factor loadings are close to or above the acceptable level of 0.6 (Chin et al. 1997). The AVE values for the seven

Table 1 Respondent's demographic characteristics

Variable	Description	Frequency	Percentage	Cumulative percent
Gender	Male	216	67.71	67.71
	Female	103	32.29	100.0
Age	21–30	29	9.09	9.09
	31–40	106	33.23	42.32
	41–50	132	41.38	83.7
	51–60 or more	52	16.30	100.0
Marital status	Married	287	89.97	89.97
	Unmarried	32	10.03	100
Household monthly income	0–15,000 BDT	0	0	0
	15,001–25,000 BDT	19	5.96	5.96
	25,001–35,000 BDT	124	38.87	44.83
	35,001–45,000 BDT or more	176	55.17	100.0
Having children	0	35	10.97	10.97
	1	74	23.20	34.17
	2	141	44.20	78.37
	3 or more	69	21.63	100.0
Education	HSC	25	7.84	7.84
	Bachelor	108	33.86	41.70
	Masters	133	41.69	83.39
	Higher education	53	16.61	100.0

Source: Author's calculation

Table 2 Descriptive statistics

	N	Minimum	Maximum	Mean	Std. deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. error	Statistic	Std. error
EC_1	319	1.00	5.00	3.7429	.81442	− .691	.137	.655	.272
EC_2	319	1.00	5.00	3.6897	.81703	− .730	.137	.748	.272
EC_3	319	1.00	5.00	3.6552	.76081	− .708	.137	.628	.272
EK_1	319	1.00	5.00	3.6364	.80840	− .934	.137	.999	.272
EK_2	319	1.00	5.00	3.6897	.81703	− .695	.137	1.061	.272
EK_3	319	1.00	5.00	3.6583	.80046	− .638	.137	.535	.272
ATT_1	319	1.00	5.00	3.6865	.73256	− .883	.137	1.342	.272
ATT_2	319	1.00	5.00	3.7116	.72569	− .890	.137	1.227	.272
ATT_3	319	1.00	5.00	3.6270	.84788	− .450	.137	−.085	.272
ATT_4	319	1.00	5.00	3.6019	.76157	− .520	.137	.591	.272
PBC_1	319	1.00	5.00	3.3950	.82078	− .501	.137	.205	.272
PBC_2	319	1.00	5.00	3.4138	.76762	− .274	.137	−.065	.272
PBC_3	319	1.00	5.00	3.3856	.81181	− .460	.137	.091	.272
SN_1	319	1.00	5.00	3.4389	.94263	− .570	.137	.311	.272
SN_2	319	1.00	5.00	3.4357	1.01317	− .664	.137	.255	.272
SN_3	319	1.00	5.00	3.3824	.95057	− .389	.137	.160	.272
GPI_1	319	1.00	5.00	3.5110	.77644	− .240	.137	.263	.272
GPI_2	319	1.00	5.00	3.5298	.73431	− .343	.137	.037	.272
GPI_3	319	1.00	5.00	3.5110	.73483	− .325	.137	.264	.272
GPB_1	319	1.00	5.00	3.4639	.78775	− .366	.137	.311	.272
GPB_2	319	1.00	5.00	3.4013	.80220	− .705	.137	.458	.272
GPB_3	319	1.00	5.00	3.2288	.71440	− .106	.137	.002	.272
Valid *N* (list wise)	319								

Source: Author's calculation

measures are higher than 0.5, showing convergent validity at the construct level (Shahzad et al. 2019).

The outcomes of the measurement model indicated a good fit to the data of the conceptual model fit (chi-square = 244.195, chi-square/[degree of freedom] = 1.299, root mean square error of approximation [RMSEA] = 0.031, goodness of fit index [GFI] = 0.936, comparative fit index [CFI] = 0.988).

Table 4 indicates the discriminant validity, and it infers that correlations of AVE with other constructs for each construct must be less than the AVE square root, representing adequate discriminant validity (Chin et al. 1997). To represent an adequate discriminant validity, each construct was higher than its correlations with other constructs (Shahzad et al. 2019; Chin et al. 1997; Fornell and Larcker 1981). Therefore, the theoretical model shows adequate validity and reliability.

Structural model: hypothesis testing and goodness of fit statistics

By taking into account the AMOS 23.0 software, the study structural model was assessed to compute statistics of the goodness of fit. Primarily, the values of CFA fit indices showed an adequate model fit (chi-square = 387.811, chi-square [degree of freedom] = 1.979, goodness of fit index [GFI] = 0.906, comparative fit index [CFI] = 0.958, root mean square error of approximation [RMSEA] = 0.055). According to the results of the structural model (Table 5 and Fig. 2), seven of the twelve hypotheses were supported and other five hypotheses were not supported. Based on the results, attitude ($\beta = 0.41$; $t = 5.016$; $p = ***$; $p < 0.001$) and perceived behavioral control ($\beta = 0.34$; $t = 4.408$; $p = ***$; $p < 0.001$) were meaningfully influenced by consumers' environmental concern in purchasing GH, whereas the environmental concern showed no significant influence on subjective norm ($\beta = -0.07$; $t = -0.740$; $p = 0.459$; $p > 0.05$) and green purchase intention ($\beta = 0.06$; $t = 0.683$; $p = 0.494$; $p > 0.05$).

Similarly, environmental knowledge presented a significant influence on attitude ($\beta = 0.36$; $t = 4.494$; $p = ***$; $p < 0.001$) and perceived behavioral control ($\beta = 0.36$; $t = 4.665$; $p = ***$; $p < 0.001$), but revealed no significant impact on subjective norm ($\beta = 0.04$; $t = 0.394$; $p = 0.693$; $p > 0.05$) and green purchase intention ($\beta = 0.03$; $t = 0.333$; $p = 0.739$; $p > 0.05$), Therefore, H1b, H1c, H2b, and H2c were supported and H1a, H1d, H2a, and H2d were not supported in the study. On the other hand, perceived behavioral control ($\beta = 0.20$; $t = 2.837$; $p = 0.005$; $p < 0.01$) and attitude ($\beta = 0.37$; $t = 4.247$; $p = ***$; $p < 0.001$) were found to have a positive and significant influence towards green purchasing intention of GH; however, the subjective norm ($\beta = 0.00$; $t = 0.058$; $p = 0.954$; $p > 0.05$) was found to have an insignificant influence on green purchase intention. Hence, H4 and H5 were supported. In contrast, H3 was not sustained.

Table 3 Construct reliability and validity

Variables	Items	Estimated (loadings)	Cronbach's alpha	CR	AVE
Environmental concern	EC-1	0.81	0.836	0.837	0.631
	EC-2	0.77			
	EC-3	0.80			
Environmental knowledge	EK-1	0.83	0.825	0.827	0.616
	EK-2	0.72			
	EK-3	0.80			
Attitude	ATT-1	0.68	0.830	0.832	0.555
	ATT-2	0.84			
	ATT-3	0.74			
	ATT-4	0.71			
Perceived behavioral control	PBC-1	0.90	0.914	0.914	0.780
	PBC-2	0.86			
	PBC-3	0.89			
Subjective norms	SN-1	0.96	0.955	0.955	0.877
	SN-2	0.92			
	SN-3	0.94			
Green purchase intention	GPI-1	0.84	0.916	0.918	0.788
	GPI-2	0.94			
	GPI-3	0.88			
Green purchase behavior	GPB-1	.73	0.793	0.797	0.568
	GPB-2	.83			
	GPB-3	.69			

Results discussion, contributions, and conclusion

Results discussion

Previous studies on determining consumers' green purchase behavior towards GH have not explained the antecedents in the context of Bangladesh. The present study incorporated the extended TPB model to evaluate the actual green purchase behavior of Bangladeshi consumers towards GH. The study has several aspects of findings. First, green purchase intention showed to be the most significant determinant which influences consumers' green purchase behavior of GH. Our findings represent that consumers who have high intention to purchase GH, in the most of the cases, are the actual buyers of GH in Bangladesh. Likewise, perceived behavioral control indicates to have the most significant and positive influence on green purchase intention. That means green consumers hold enough information regarding different aspects of adopting GH, which motivates to change their conventional behavior facilitating their purchase intention, showing the consistency with earlier researches (Ajzen 2002; Zhang et al. 2018a). Second, consumers' attitude towards purchasing GH was discovered a significant and positive impact on green purchase intention, which illustrates that consumers', who hold positive attitudes towards GH, intention is often enticed by their attitudes and they go for green. The findings are alike with previous researches (Chen and Tung 2014; Maichum et al. 2016). However, environmental concern was found to have solely negative and insignificant influence on the subjective norm of GH.

Thus, the result of the study suggests that consumers' green purchase behavior can be predicted by green purchase intention which can also be forecasted by attitude and perceived behavioral control. Third, environmental concern shows a significant influence towards attitude and perceived behavioral control which denotes that consumers, who have emotional attachments with ecology, often think about ecological issues and problems in adopting any conventional products. Consequently, these insights help them to form positive attitudes towards purchasing in Bangladesh, supported by the

Table 4 Discriminant validity

	GPI	EC	EK	ATT	PBC	SN	GPB
GPI	*0.888*						
EC	0.403	*0.794*					
EK	0.399	0.635	*0.785*				
ATT	0.521	0.627	0.611	*0.745*			
PBC	0.429	0.560	0.569	0.545	*0.883*		
SN	− 0.028	− 0.038	− 0.003	− 0.121	0.043	*0.936*	
GPB	0.536	0.742	0.506	0.586	0.621	− 0.023	*0.754*

Italicized values in diagonal line indicate the AVE square root

Table 5 Hypothesis testing and structural results

			Standardized estimate	*T* value	*p* value	Result
SN	<---	EC	− 0.07	− 0.740	0.459	Not supported
PBC	<---	EC	0.34	4.408	***	Supported
ATT	<---	EC	0.41	5.016	***	Supported
SN	<---	EK	0.04	0.394	0.693	Not supported
PBC	<---	EK	0.36	4.665	***	Supported
ATT	<---	EK	0.36	4.494	***	Supported
GPI	<---	PBC	0.20	2.837	0.005	Supported
GPI	<---	EC	0.06	0.683	0.494	Not supported
GPI	<---	EK	0.03	0.333	0.739	Not supported
GPI	<---	SN	0.00	0.058	0.954	Not supported
GPI	<---	ATT	0.37	4.247	***	Supported
GPB	<---	GPI	0.56	8.194	***	Supported

***$p < 0.001$

earlier studies (Chen and Tung 2014; Greaves et al. 2013; Paul et al. 2016). Finally, environmental knowledge was found to have a significant and positive influence on attitude (Liao and Li 2019) and perceived behavioral control. Kumar (2012) illustrated that consumers' environmental knowledge and attitude are positively associated with purchasing green products. In contrast, the study indicated that environmental knowledge was found to have no significant influence on subjective norm and green purchase intention, which yield that in Bangladesh, environmental knowledge does not play a robust role in influencing subjective norm and green purchase intention.

Theoretical contributions

The findings of the study contribute to the existing knowledge and literature in the context of analyzing consumers' green purchase behavior towards green housing in Bangladesh for a number of reasons.

Firstly, this study generates a new quantitative knowledge domain of the determinants which affect the green purchase behavior of Bangladeshi consumers of green housing. Additionally, with the use of SEM, the study found reliable findings which help to generalize the targeted population, as SEM has the capacity to generate a reliable and accurate calculation of probability distribution of the observed data.

Secondly, with the application of extended TPB model, this study applied an extended research model to test the proposed hypotheses in a new context (Bangladesh) and an emerging product (i.e., green housing). This study is compatible with earlier studies that have illustrated the green purchase intention and green purchase behavior towards green products (Ajzen 2002; Greaves et al. 2013; Zhang et al. 2018a).

Thirdly, the study postulated a hypothesis between consumers' green purchase intention and green purchase behavior of green housing with the use of the extended TPB model which is unique in the context of Bangladesh as, to date, no such studies have been conducted nationally or internationally. Consequently, this study contributes to predicting the green purchase behavior patterns of green housing in Bangladesh.

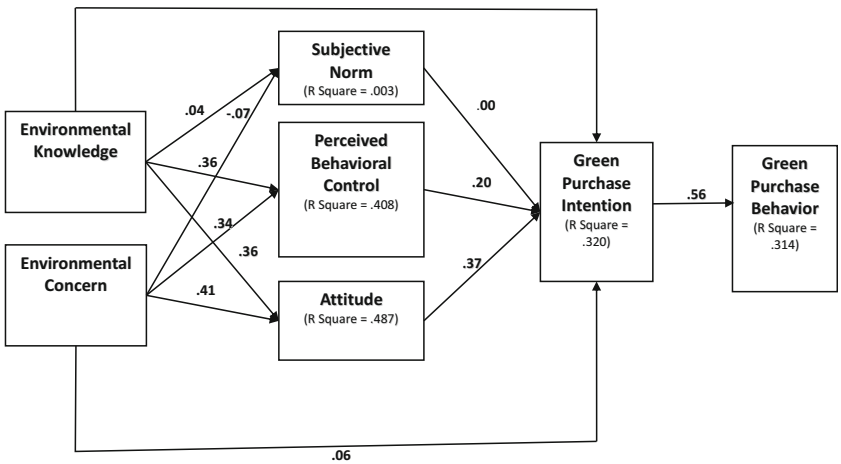

Fig. 2 Structural model results

Implications to practice

The findings of this research would generate new insights for the practitioners and marketers with respect to planning the sustainable development goal and will provide a reference of decision-making in designing sound strategies to promote green housing in Bangladesh. The results of the study illustrated that environmental concern and environmental knowledge showed an insignificant influence on subjective norm and green purchase intention. Similarly, subjective norm indicated an insignificant relationship with green purchase intention which is significantly and positively induced by attitudes and perceived behavioral control. Consequently, marketers should emphasize on illustrating the consequences of environmental degradations in order to make Bangladeshi consumers knowledgeable of purchasing GH.

In most of the cases, it is unfolded that majority of the Bangladeshi consumers possess inadequate knowledge about GH but gradually they will express positive attitudes to this kind of green products if a wide range of promotional initiations are undertaken (Maichum et al. 2016). In the arena of awaking people, education in schools, the government can formulate several premeditated developments to recover environmental concern or awareness through enterprise training, and social propaganda (Zhang et al. 2018a). Although young and savvy consumers are more positive towards GH than adults, majority of them cannot afford to adopt GH due to unemployment or low income. The government should provide incentives comprising tax incentives, direct grants, and soft loans (Zhang et al. 2018b) as GH market in Bangladesh is still in the infant stage. By the same token, private firms can also come forward in promoting GH with a partnership of the government to vitalize GH market and subsidize GH purchaser.

Conclusions

With an aim at investigating the consumers' green purchase intention following green purchase behavior of GH in the context of Bangladesh, the study concludes that attitude and perceived behavioral control were the major antecedents towards green purchase intention of GH, whereas environmental knowledge, environmental concern, and subjective norm were found to have an insignificant relationship with green purchase intention. Additionally, consumers' green purchase intention was found to have the most significant influence on their green purchase behavior of GH. Furthermore, consumers' perceived behavioral control and attitudes were positively and significantly influenced by environmental concern and environmental knowledge, respectively. The findings of the study could prove to have a robust and significant value to the proposed theoretical framework. Moreover, the proposed model with all the measurement scales employed in the study was also confirmed to be appropriate. Therefore, the study can help marketers and practitioners in promoting GH and contribute to conserving ecology.

Limitations and scope for further research

The present research work is not free from all kinds of shortcomings. Thus, these shortcomings will be considered if further study is conducted. First is an inadequate sample size which can be enlarged by adding a diverse group of respondents who actually reflect the consumer market. Additionally, to find out exact housing demands and segment consumer markets, a deep research is needed for future purposes. Second, the participants of the study were limited to Dhaka City in where majority of them were financially sound. Due to the convenience sampling, most of the sample demographics are married and high education level. Thus, future study can be conducted in the other divisional cities or metropolitan areas where the results of this study can be compared with, which can be fruitful to the policymakers in designing strategies.

Mediating role of attitude between "environmental knowledge" and "green purchasing behavior" can be another research direction to further dig out deeply. Finally, consumers' green purchase intention does not guarantee their actual purchasing behavior. Therefore, future research needs to be conducted to investigate other determinants which drive consumers' green purchase intention towards undertaking their actual purchasing behavior.

Appendix

Table 6 List of measurement items

Constructs	Items and statements	Sources
Environmental concern	EC1: Mankind is severely abusing the environment.	Hartmann and Apaolaza-Ibáñez (2012)
	EC2: Limits to growth beyond which our industrialized society cannot expand emerge.	
	EC3: Humans must live in harmony with nature to survive.	Zimmer et al. (1994)
	EK1: I know the reasons to purchase GH which helps to protect the environment.	Mostafa (2006)

Table 6 (continued)

Constructs	Items and statements	Sources
Environmental knowledge	EK2: I understand the environmental phrases and symbols on the package of GH. PK3: I know that buying GH is environmentally safe.	
Subjective norm	SN1: My family thinks that I should purchase GH over conventional housing. SN2: My close friends think that I should purchase GH over conventional housing. SN3: Most people who are important to me think that I should purchase GH over conventional housing.	Maichum et al. (2016) Liu et al. (2018)
Perceived behavioral control	PBC1: I am confident that I can purchase GH over conventional housing when I want. PBC2: I see myself capable of purchasing GH in the future. PBC3: I have the resources, time, and willingness to purchase GH.	Armitage and Conner (2001) Zhang et al. (2018) Kim and Han (2010)
Attitude	ATT1: I think that purchasing GH is favourable. ATT2: I think that purchasing GH is a good idea. ATT3: I think that purchasing GH is safe. ATT4: I think the advantages of GH over conventional housing.	Maichum et al. (2016) Paul et al. (2016)
Green purchase intention	GPI1: I would like to purchase GH. GPI2: I would like to live in GH. GPI3: I would like to recommend GH to my family and friends.	Liu et al. (2018) Zhang et al. (2018)
Green purchasing behavior	GPB1: I prefer GH because of its ecofriendly features. GPB2: I have purchased GH because they are environmentally-friendly. GPB3: I have purchased GH even if they are more expensive than the non-green ones. GPB4: Before final purchasing of GH, I have checked the ingredients or components to see if it contains environmentally damaging things.	Lee (2008)

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