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Formation of citizens' intentions to purchase prefabricated housing in China: Integrating theory of planned behavior and norm activation model

Journal:	*Engineering, Construction and Architectural Management*
Manuscript ID	ECAM-05-2023-0473.R1
Manuscript Type:	Original Article
Keywords:	Construction, Management, Questionaire survey
Abstract:	

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Formation of citizens' intentions to purchase prefabricated housing in China: Integrating theory of planned behavior and norm activation model

Abstract

Purpose- This study aims to develop an improved understanding of the formation of citizens' purchase intention to increase the adoption of prefabricated housing (PH).

Design/methodology/approach- An integrative model of theory of planned behavior (TPB) and norm activation model (NAM) was proposed based on previous studies. To verify the conceptual model, an analysis was conducted after data collection from a questionnaire survey. Lastly, findings were presented by explaining the formation of purchase intention in the egoistic and altruistic contexts. Practical implications were likewise discussed.

Findings- Findings manifest that citizens' purchase intention is influenced by egoistic and altruistic cognitions. An effective strategy is to show citizens the pro-environmental features of PH to promote its adoption because they value the environmental performance of housing. Meanwhile, consumers' social fitness also plays an essential role in decision-making, and the dual contradiction in the PH market is revealed.

Originality/value- This study extends the knowledge of psychological decision-making theories in the field of purchase intention toward PH by proposing an integrative framework of TPB and NAM. Results indicate a systematic and comprehensive understanding of consumers' decision-making in the PH domain. Moreover, results of this research contribute to specifying and refining the applicable contexts of TPB and NAM by adding two antecedents: subjective knowledge and environmental concern. This research contributes to the literature by being one of the first to investigate purchase intention toward a high-cost product with invisible technological innovation.

Keywords Prefabricated housing, Purchase intention, Theory of planned behavior, Norm activation model

1. Introduction

With the rapid urbanization over the last four decades, construction activities have become the primary reason for resource consumption and carbon emission in China (Teng *et al.*, 2018). Evidence suggests that the construction sector accounts for around 40% of energy consumption, 25% to 40% of greenhouse gas emissions, and about 17% of water consumption globally (Alghoul *et al.*, 2017). However, this situation becomes markedly deteriorating and disturbing in the Chinese context (Dou, 2021; Wang *et al.*,

2021). This development leads to high pressure to realize economic and social sustainability and achieve carbon peaking and carbon neutrality in China according to the United Nations Framework Convention on Climate Change (Hu *et al.*, 2022). Consequently, the adoption of housing with superior sustainability must be enhanced because housing is a significant component of construction products, and the uptake of sustainable housing is likely to trigger an overall change owing to its nationwide scope (Cao *et al.*, 2015; Hu *et al.*, 2022). Prefabricated housing (PH) refers to housing where practitioners can manufacture construction components in factories or certain controlled production sites, transport these components to construction sites, and accomplish on-site assembly (Tam *et al.*, 2007; Teng and Pan, 2020). Compared with traditional in-situ housing, PH is able to achieve evident reduction in resource depletion (Hong *et al.*, 2020), less damage to our ecosystem, and better energy saving (Cao *et al.*, 2015), and also realize more efficient construction and beneficial labor transference (Teng and Pan, 2020).

In recent years, the Chinese government has implemented many incentive policies to facilitate the development and adoption of PH, aiming to decrease resource consumption and carbon emission, save labor costs, and promote productivity and quality (Shen *et al.*, 2021). At present, the government is about to explore appropriate approaches to apply PH to the nationwide residential housing market for wider environmental and social benefits (Dou, 2021). Nearly all Chinese local governments have been encouraging developers to adopt PH with various incentive policies when they start new projects (Shen *et al.*, 2021). These subsidy policies are currently formulated mainly for developers and stakeholders in the supply chain, with minimal focus on consumers' attitudes and intentions toward PH. Meanwhile, many scholars have conducted research on the relations among various stakeholders and how to integrate the supply chain to manage their relationships to achieve lower price and better development of PH (Li *et al.*, 2020; Zhou *et al.*, 2019). Some papers have concentrated on the type of roles of the government and developers in seeking ways to realize a more widespread adoption of PH in newly built residential projects (Dou, 2021; Song *et al.*, 2021). However, limited research has focused on consumers' attitude and their purchase intention to PH, while consumers play a significant role in the housing market, and their preferences and choice will generally influence the intentions and behaviors of other stakeholders (Clemons, 2008). Low intentions to purchase will decrease the demand for PH in the housing market and make developers reluctant to adopt or expand PH in their new projects (Hwang and Tan, 2012). This situation can

hurt or even ruin previous effort to further expand and develop this new beneficial technology. In addition, most consumers lack a good knowledge of PH (Shen *et al.*, 2021), which may prevent its further acceptance and development of PH.

Given the need to raise the intentions to adopt PH, more focus should be given to conducting research on psychological factors, which can enhance or inhibit consumers' attitudes and behaviors (Judge *et al.*, 2019). Theory of planned behavior (TPB) is often applied to study self-interest-based intentions involving individuals' decision-making processes (Zheng *et al.*, 2018). Evidently, purchasing intentions toward a house belong to this research field. Meanwhile, PH is distinguished by its low carbon emission and pro-environment features. The norm activation model (NAM) is widely utilized regarding pro-social and pro-environmental intentions and shows a powerful ability to explain and predict such behaviors (Han, 2014; Werff and Steg, 2015). On the bases of two complementary theories for decision-making, a framework integrating TPB and NAM was proposed to study the factors and influencing paths on purchase intentions toward PH. In practice, this paper attempts to present specific suggestions for the government and relevant stakeholders who have been aiming to raise sustainability in housing regarding methods that can be markedly efficient in promoting the development of PH.

2. Literature review

2.1 Purchase intention toward PH

Given that housing cost is a significant outlay for most families, the behavior of housing purchase deserves substantial attention and consideration for the majority of individuals (Adabre and Chan, 2019). The range of various and complex considerations when choosing a house can contain the price, location, supporting facilities, room layout, quality, and safety (Adabre and Chan, 2019; Judge *et al.*, 2019). At present, direct and indirect financial subsidy policies for developers are implemented to offset the higher price of PH, leading citizens to buy it at the same price as traditional in-situ housing in the same neighborhood. Developers adopt PH in their newly built projects combined with traditional in-situ housing so that consumers will not be concerned with housing location and supporting facilities around their community. In addition, the housing industry aims to follow and suit consumers' habits in this vital housing sector. That is, PH is designed the same as traditional in-situ housing regarding room layout and building facade. The Chinese government has applied prefabricated construction to public housing for several years, proving that the safety and earthquake resistance

features of PH is acceptable in reality (Zhang *et al.*, 2014). Evidently, the above analysis indicates that psychological factors play a crucial role when making decisions with respect to housing purchases owing to other factors that no longer work in the current situation.

The Chinese government has exerted extensive effort to support the stakeholders of PH and provided various subsidies to developers. Nevertheless, the adoption of PH in China is still low compared with many developed countries (Cao *et al.*, 2015; Zhang *et al.*, 2014). Consumers care more about the quality and performance of housing, while most of them have minimal knowledge of PH (Shen *et al.*, 2021). Consumers' purchase intention toward PH is clearly vital for further development (Clemons, 2008). Accordingly, more studies should be conducted to generate an accurate and systematic understanding of how to increase the acceptance of PH in decision-making. Some researchers have used TPB or extended TPB to explain purchase intention in terms of self-interest and rational thoughts (Kim *et al.*, 2018; Moon, 2021). However, there is doubt that citizens have sufficient knowledge to make this rational decision in the initial phase of PH development. Some scholars have applied NAM or expanded NAM to illustrate purchase willingness for pro-environment products. Nevertheless, whether or not NAM can play a significant role in decision-making on high-investment behaviors remains unclear. In addition, prefabricated construction is a type of invisible technology that is not easy for residents to observe and feel the difference from traditional in-situ housing. Given the aforementioned features, this research aims to clarify factors and influencing paths with an integrative framework on this high-cost product with invisible technological innovation.

2.2 Theory of planned behavior

TPB was first proposed by Ajzen (1991) after theory of reasoned action (TRA). Thereafter, he added perceived behavioral control into TRA, thereby creating the new TPB (Ajzen, 1991). TPB is a popular theory applied to predict human behaviors and intentions by recognizing vital factors, including attitude (AT), subjective norms (SN), and perceived behavior control (PBC). AT means the evaluation of approval or disapproval of individuals' behavior, including emotional factors referring to the feeling of certain behavior and cognitive factors referring to the reason for performing a certain action (Wang, *et al.*, 2019).

AT emphasizes on individuals' own emotions, while SN focuses on the influence and views of the surroundings (Kim *et al.*, 2018). SN means individuals are influenced

by those around them that are important to them or have common interests (Tonglet *et al.*, 2004). Accordingly, people seem more likely to perform some behaviors when they can easily find support for this behavior from their surroundings, while those who deem that the majority of their referents are against this behavior are less likely to be motivated to conduct a certain behavior (Kim *et al.*, 2018).

PBC stands for an individual's sense of simplicity or difficulty in conducting a certain behavior (Ajzen, 1991). PBC is the perception of an individual's capacity resulting from previous experience and perceived difficulties (Kim *et al.*, 2018). Anticipated difficulties can be derived from time, money, and opportunity (Armitage and Conner, 2001). Accordingly, an individual will have a high degree of PBC if they deem there are sufficient resources that will make a certain behavior simple and feel assured to conduct it (Ajzen, 1991; Armitage and Conner, 2001). The intention to act a certain behavior means the extent of effort individuals will exert to perform such a behavior, and they are more likely to achieve this behavior with more intention to perform it (Kim *et al.*, 2018). Hence, behavioral intention is impacted by AT, SN, and PBC (Ajzen, 1991; Armitage and Conner, 2001).

In recent years, TPB has been regarded as one of the most popular and powerful models for explaining purchase intentions and consumption choices from a psychological perspective (Ashaduzzaman *et al.*, 2022; Ding *et al.*, 2023; Hamzah and Tanwir, 2021; Kim *et al.*, 2021; Lehberger *et al.*, 2021; Shin *et al.*, 2022; Vafaei-Zadeh *et al.*, 2022). Hamzah and Tanwir (2021) reported that Malaysian purchase intention toward hybrid vehicles could be explained through extended TPB. Similarly, Vafaei-Zadeh *et al.* (2022) found that constructs from TPB had a positive impact on the purchase intention of electric vehicles in Malaysia. Obviously, vehicles are a type of high-cost product like PH. Lehberger *et al.* (2021) proposed that the rapid growth of buying nonperishable food could be analyzed by extending TPB when the coronavirus pandemic started. Meanwhile, Shin *et al.* (2022) discussed factors influencing the intention to travel of consumers during this pandemic by extended TPB. Ashaduzzaman *et al.* (2022) predicted collaborative consumption through a TPB-based model. On the bases of the aforementioned research, it is reasonable to explore the purchase intention toward PH by TPB because of the relevance and similarity between PH and the above research objects.

2.3 Norm activation model

NAM was proposed and measured by Schwartz to illustrate altruistic or pro-social

intentions and behaviors (Schwartz, 1973), such as blood donation (Schwartz, 1973), assisting in danger (Schwartz, 1976), and volunteer activities (Schwartz, 1977). The initial and extended NAM models have been widely utilized later to explore and explain pro-environmental intentions and behaviors in various fields, including electronic product recycling (Nnorom *et al.*, 2009), electricity-saving behavior (Zhang *et al.*, 2013), decision-making on pro-environmental convention (Han, 2014), adoption of new energy vehicles (He and Zhan, 2018), and purchase willingness of green housing (Hwang and Tan, 2012; Sang *et al.*, 2020). Given that many researchers consider pro-environmental intentions and behaviors as a branch of altruistic or pro-social intentions and behaviors because individuals acting in pro-environmental behaviors will benefit other people (Song *et al.*, 2023). NAM has been taken as a popular and predictive model for pro-environmental intentions and behaviors by several researchers (De Groot and Steg, 2009; He and Zhan, 2018; Rafael *et al.*, 2019; Werff and Steg, 2015).

Purchase willingness toward PH can be regarded as a pro-environmental intention, given that the government and developers markedly emphasizes on its environment-friendly characteristics (Cao *et al.*, 2015; Wu *et al.*, 2019). Compared with traditional in-situ housing, PH can provide few functional benefits at the same price in major cities in Mainland China. Normal residents reasonably connect this purchase option with pro-environmental intentions (Shen *et al.*, 2021). Currently, some scholars have demonstrated that NAM can provide sufficient explanations for pro-environment purchase intentions and behaviors (Chan *et al.*, 2022; Jhawar *et al.*, 2023; Kang, 2022; Majeed *et al.*, 2023). Jhawar *et al.* (2023) found that the green purchase behaviors of tourists could be analyzed by an extended NAM. Similarly, Kang (2022) explained travelers' intention to choose the Hyperloop with variables from NAM, which was regarded as a type of pro-environmental service. Chan *et al.* (2022) explored the environmental practices of companies in Malaysia using the NAM-based model. Majeed *et al.* (2023) researched the pro-environment behaviors of consumers in the context of green hotels. Consequently, NAM is an appropriate theory to explore citizens' intentions to purchase PH because of the similar features between the purchase intention toward PH and objects in the aforementioned research.

NAM consists of three variables: personal norm (PN), awareness of consequence (AC), and ascription of responsibility (AR). PN is stated as a moral obligation to act or prevent certain behaviors(Schwartz, 1977). AC is described as whether an individual is aware of the negative consequence of not selecting pro-social options or not acting altruistically (De Groot and Steg, 2009). AR is defined as people's inner ethics of owing

responsibility for the negative consequences of their own behaviors (De Groot and Steg, 2009).

Although extensive research in the pro-environmental field has supported and proved NAM, the relationships among the three variables remain controversial (De Ruyter and Wetzels, 2000). Two types of influencing paths among variables have been applied in previous studies. Model A, which is shown at the top of Figure 1, urges that AC is positively related to AR when the latter is positively related to PN (Han and Hwang, 2015; Steg and De Groot, 2010). This situation indicates that individuals are likely to owe the responsibilities to themselves only if they are aware of the negative consequence of their actions and their moral obligations are activated thereafter (Zhang *et al.*, 2013). Model B, which is at the bottom of Figure 1, shows that AC and AR can simultaneously influence PN (Harland *et al.*, 2007; Vaske *et al.*, 2015).

Han (2014) found that the interpretation of NAM as a sequential model is significantly powerful. Vaske *et al*. (2015) revealed a positive correlation between AC and AR, in which both could affect PN. Consequently, the current study adopts the mediator model of NAM and creates a correlation between AC and AR to explore the inner relations among key variables in NAM.
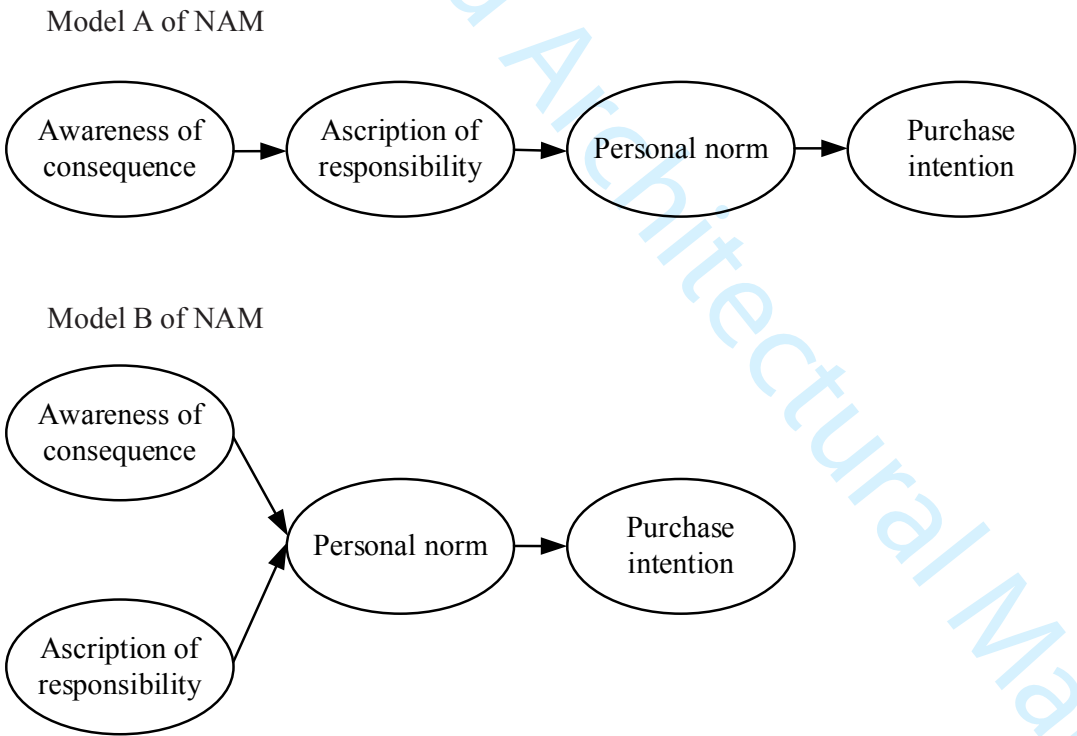
Model A of NAM

Model B of NAM

Figure 1. Different interpretations for influencing paths of NAM

2.4 Proposed framework and hypotheses

The conceptual framework is shown in Figure 2. Apart from the integrative framework of TPB and NAM, subjective knowledge (SK) and environmental concern (EC) are adopted, and their various relationships will be investigated.

Some scholars have argued that either TPB or NAM is not adequate to fully explain intentions or behaviors (Han, 2014; Kim *et al.*, 2018; Rafael *et al.*, 2019), and that emerging characteristic theories can realize more effective explanations and predictions of individuals' behavior (Kim *et al.*, 2018). Previous research has investigated the relationship between AC and PN. Moreover, some researchers have indicated that AC would not directly influence PN without the mediation of AR (Han and Hwang, 2015). Others have asserted that AC positively influences AR and PN (Harland *et al.*, 2007; Zhang *et al.*, 2013). De Groot and Steg (2009) found that AR is significantly related to PN for the reduction of car use. Zhang *et al.* (2013) proposed that AR and AC are related to PN, and they thought PN is impacted by individuals' perception of consequences or feelings of responsibility. The following hypotheses are developed based on the preceding research:

H1. AC will be positively related to AR.

H2. AR will be positively related to PN.

H3. AC will be positively related to PN.

H4. PN will be positively related to PI.

Numerous scholars have suggested that people's awareness has an impact on the variables in TPB or NAM (De Groot and Steg, 2007; Kim *et al.*, 2018; Steg and De Groot, 2010). De Groot and Steg (2007) discussed that an individual's awareness has a significant influence on PBC and AT regarding pro-environmental behaviors. Kim *et al*. (2018) indicated that people's awareness could be regarded as their social responsibility and norm in their communities. Steg and de Groot (2010) noted that awareness resulting from specific problems would lead to the norm of the group and agreements from others. The current study uses previous findings and the applicable fields of TPB and NAM as bases in classifying awareness into subjective knowledge and environmental concern (Liu *et al.*, 2018; Moon, 2021; Yeow and Loo, 2022). SK represents egoistic and rational cognition, while EC stands for altruistic and pro-environmental awareness. Hence, the following hypotheses are the results:

H5. SK will be positively related to PI.

H6. SK will be positively related to AT.

H7. SK will be positively related to PBC.

H8. SK will be positively related to PN.

H9. SK will be positively related to AC.

H10. EC will be positively related to AT.

H11. EC will be positively related to PBC.

H12. EC will be positively related to AC.

H13. EC will be positively related to AR.

H14. EC will be positively related to PI.

Previous studies have also revealed inner relationships among variables in TPB (Yeow and Loo, 2022; Zhang *et al.*, 2017). Zhang *et al.* (2017) proposed that SN is positively related to AT, PBC, and PN. Some researchers indicated the relationships among variables in the merging theory framework (Han and Hyun, 2017; Zhang *et al.*, 2017). Han and Hyun (2017) suggested that AC has an impact on AT, and SN is associated with PN. Therefore, the following hypotheses are formulated：

H15: AT will be positively related to PI.

H16: AT will be positively related to PN.

H17: SN will be positively related to AT.

H18: SN will be positively related to PBC.

H19: SN will be positively related to PN.

H20: SN will be positively related to PI.

H21: PBC will be positively related to PI.

H22: AC will be positively related to AT.

H23: AC will be positively related to SN.

3. Methodologies

3.1 Questionnaire design

This questionnaire was first reviewed by two professors and five doctors to assess its rationality. After that, we performed a pilot study prior to the final administration to ensure that items are simple to understand for normal people and specific questions are clear and suitable for obtaining the necessary data for the next analysis. A total of 16 respondents took part in the pilot study. Then, we modified the original questionnaire based on this feedback. A brief introduction on PH and a short comparison between PH and traditional in-situ housing were added ahead of the demographic questions to make the survey easily understood by normal individuals with limited knowledge of

construction and housing. We found that attitude toward PH is distinguished between normal citizens and practitioners in PH. Therefore, occupation was taken as an essential demographic variable in this research.

The final questionnaire consists of demographic and specific questions. We designed five demographic questions to determine the gender, age, income, education, and occupation of the respondents (Liang and Zhang, 2019). Meanwhile, 27 specific questions were designed to estimate using a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). Specific questions were designed to glean meaningful data to support and prove the relationships among variables in the hypothesized model (see Figure 2). Measurement items for the integrative framework were adapted from mature questionnaires of previous research, which were shown in Table A1 in the Appendix. SK was adapted from research explaining the intention to adopt green buildings (Liu *et al.*, 2018), while EC was developed from relevant studies (Hamzah and Tanwir, 2021; Moon, 2021). Moreover, the measurement items of AT, SN, and PBC were adapted from TPB-based research (Armitage and Conner, 2001; Kim *et al.*, 2021). For AC, AR, and PN, items were developed by referring to NAM-based framework in previous research (Schwartz, 1977; Wang *et al.*, 2019). Lastly, PI was adapted from studies exploring people's intentions (Kim *et al.*, 2018; Wang *et al.*, 2019). In summary, the design of this questionnaire is suitable for the current research since it passed expert review and was revised based on the feedback of the pilot study.

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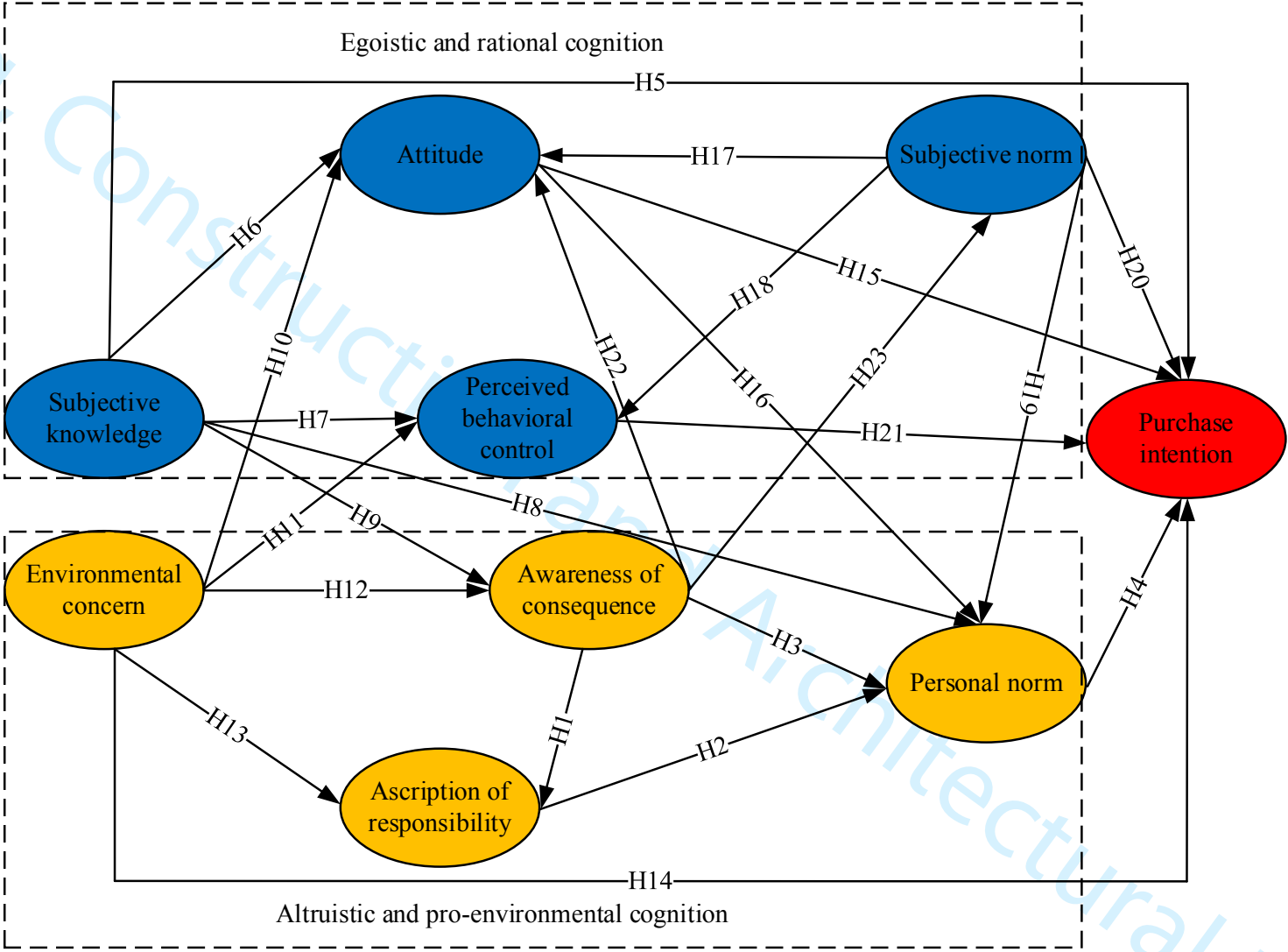31
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Figure 2. Hypothesized model for the integrative framework of TPB and NAM

3.2 Participants and questionnaire administration

Given that this study will further investigate the influence of occupation on attitude toward purchase intentions, questionnaires of the final version were handed out to two groups of respondents. Half were distributed to practitioners working on PH projects, while the other half was distributed to normal residents living in cities where the local government facilitated the development of PH and developers started to construct PH on a significant scale in new housing projects. These cities include Shenzhen, Guangzhou, Fuzhou, Ningbo, Wuhan, Zhengzhou, Taiyuan, Beijing, Tianjin, Shenyang, and Harbin. The total number of questionnaires was 400, which was distributed in February and March 2022. All respondents were informed that the survey was voluntary and they could withdraw at any time. Respondents were also informed that their feedback would remain anonymous and confidential according to academic ethics. To ensure high-quality data, individual interpretation was constantly available for all participants when they encountered difficulties in answering some specific items. Lastly, fragmentary and markedly similar responses were excluded from the effective samples. The total number of valid responses for the succeeding analysis was 241, leading to a response rate of 60.25%.

Table 1 displays the summary of the respondents' demographic information. The sample contained slightly more male respondents (N=126, 52.3%) than females (N=115, 47.7%). The largest proportion of respondents (n=150, 62.2%) were between 25 and 35 years old and had the most significant intention to purchase housing. The 36–45 age group accounted for 20.3%, who were more likely to purchase their second housing. The majority of the respondents were highly educated, in which 40.7% and 41.9% held bachelor's and master's degrees, respectively. These figures indicate that young people in first- or second-class cities were significantly better educated than the average in China. For monthly income, only 6.2% of the respondents earned below 2,000 RMB, and 29.9% earned more than 10,000 RMB per month, which mirrored the current situation of individuals' salaries in first- or second-class cities in China. About half of the respondents (n=127, 52.7%) had working experience in PH projects, and the rest were normal residents, which precisely meets the requirement of the experimental design to further study the influence of occupation on purchase intention toward PH.

Table 1. Demographic characteristics of respondents.

Characteristics	Category	Frequency (N = 241)	Percentage (%)
Gender	Male	126	52.3
	Female	115	47.7
Age(years)	18-25	30	12.4
	26-35	150	62.2
	36-45	49	20.3
	46-55	10	4.1
	Over 55	2	0.8
Education	High school or below	2	0.8
	Junior college	18	7.5
	Bachelor's degree	98	40.7
	Master's degree	101	41.9
	Doctor's degree	22	9.1
Monthly income (RMB)	Less than 2,000	15	6.2
	2,001-5,000	55	22.8
	5,001-10,000	99	41.1
	Over 10,000	72	29.9
Occupation	Related to prefabricated housing	127	52.7
	Others	114	47.3

3.3 Statistical procedures

This hypothesized model was examined using the structural equation modeling (SEM) technique after data collection. In particular, the research performed a two-stage SEM method to test the measurement model and structural model. We ran a confirmatory factor analysis (CFA) to examine this measurement model for its reliability and validity. After that, we evaluated this structural model by testing its fitness and calculated the path coefficient to verify the proposed hypotheses. RMSEA as an indicator for absolute fit, $\chi2/df$ as an indicator for parsimonious fit. Moreover, IFI, TLI, as well as CFI were adopted for incremental fit in this research. Previous research recommended $\chi2/df$ was not more than 2.0, RMSEA was not more than 0.08, and the mentioned three indicators were not less than 0.90 (Liang and Zhang, 2019). This study applied AMOS v26.0 and SPSS v26.0 to conduct data analyses.

4. Data analysis

4.1 Assessment of the measurement model

This research estimated the reliability and validity of constructs using CFA. We used Cronbach's alpha to examine its reliability, which means the items from one construct can realize consistency (Flynn *et al.*, 1994). The former researcher recommended Cronbach's alpha not less than 0.70 (Cronbach, 1951). Thereafter, we examined convergent and discriminant validity according to previous research (Liang and Zhang, 2019). Convergent validity shows whether or not question items of the construct are correlated, and discriminant validity indicates whether or not constructs can be distinguished from others (Xue *et al.*, 2020). Former research recommended the value of standardized factor loading (FL) was not less than 0.70, composite reliability (CR) was not less than 0.70, and average variance extracted (AVE) was not less than 0.50 to achieve an acceptable convergent validity (Liang and Zhang, 2019). In addition, previous studies showed the square root of AVE was higher than the inter-construct correlations to realize discriminant validity (Xue *et al.*, 2020). Table 2 shows the abbreviations of nine latent constructs.

Figure 5 presents the final measurement model, where we use e (i.e., e1, e2, e3) to stand for vectors of the measurement errors in the endogenous variables. The goodness-of-fit is acceptable when $\chi2$ / df = 1.613, RMSEA = 0.051, IFI = 0.949, TLI =0.937, and CFI = 0.948. Table 3 shows the indicators mainly to examine the reliability and convergent validity of nine latent constructs in this research. As we can see, Cronbach's alpha values of every construct are not less than 0.70, all the values of CR are not less than 0.70, and all the values of AVE are not less than 0.50, indicating acceptable reliability and convergent validity according to previous research (Liang and Zhang, 2019). Moreover, M stands for mean value while SD stands for standard deviation. The Skewness and kurtosis of each construct are within ± 2.0, suggesting the collected data satisfy the requirement of normal distribution (Kline, 2015). Figures set in boldface represent the square roots of AVE, which are higher than any figure below the diagonal standing for inter-construct correlations (see Table 4). Hence, the results imply acceptable discriminant validity of nine constructs. Also, all the correlation values are not higher than 0.90, proving the absence of multicollinearity (Xue *et al.*, 2020).

Table 2. Glossary of abbreviations

Abbreviations	Constructs
SK	Subjective knowledge
EC	Environmental concern
AT	Attitude
SN	Subjective norm
PBC	Perceived behavioral control
AC	Awareness of consequence
AR	Ascription of responsibility
PN	Personal norm
PI	Purchase intention

Table 3. Descriptive statistics

Constructs	M	SD	Skewness (std. error)	Kurtosis (std. error)	Cronbach's alpha	CR	AVE
SK	3.51	1.133	-0.228(0.091)	-0.853(0.182)	0.847	0.8528	0.6603
EC	3.86	0.924	-0.553(0.091)	-0.053(0.182)	0.768	0.7781	0.5542
AT	2.91	0.874	0.033(0.091)	-0.147(0.182)	0.773	0.7815	0.5447
SN	2.67	0.981	0.161(0.091)	-0.361(0.182)	0.883	0.8852	0.7212
PBC	3.25	0.849	-0.001(0.091)	-0.124(0.182)	0.768	0.7673	0.5239
AC	3.64	0.871	-0.262(0.091)	-0.287(0.182)	0.859	0.8574	0.6672
AR	3.28	0.893	-0.113(0.091)	-0.297(0.182)	0.853	0.8548	0.6629
PN	2.92	0.907	0.089(0.091)	-0.211(0.182)	0.844	0.8421	0.6401
PI	2.74	0.847	-0.133(0.091)	-0.005(0.182)	0.827	0.8333	0.6255

Table 4. Results of discriminant validity

NO.	Constructs	1	2	3	4	5	6	7	8	9
1	SK	**0.813**								
2	EC	-0.015	**0.744**							
3	AT	-0.250	0.048	**0.738**						
4	SN	-0.004	0.130	0.552	**0.849**					
5	PBC	0.484	0.109	0.243	0.496	**0.724**				
6	AC	0.013	0.537	0.246	0.214	0.244	**0.817**			
7	AR	-0.076	0.434	0.344	0.234	0.204	0.619	**0.814**		
8	PN	-0.281	0.263	0.592	0.418	0.245	0.487	0.607	**0.800**	
9	PI	-0.539	0.035	0.722	0.382	0.229	0.226	0.428	0.740	**0.791**

4.2 Assessment of the structural model

Structural model assessment was run to verify the hypothesized model after completing the measurement model assessment. We regarded gender, age, education, income, and occupation as the control variables in the final structural model to

investigate their influence on purchase intention. Figure 6 shows the estimated results of this structural model, and this model can pass the goodness-of-fit test. The value of $\chi 2 / df$ is 1.745, RMSEA is 0.056, IFI is 0.919, TLI is 0.902, and CFI is 0.917, indicating the hypothesized model can fit the collected data well. In this figure, solid lines stand for the significant path coefficient while dashed lines stand for the not significant path coefficient. In addition, we mark *** when the value of p is less than 0.001, ** when the value of p is less than 0.01, * when the value of p is less than 0.05, and n.s. when the value of p is more than 0.05.

5. Discussion

Given that PH is an emerging product in the residential field, some studies have investigated the complicated relationships among various stakeholders (Dou, 2021; Ekanayake *et al.*, 2022; Song *et al.*, 2021; Wu *et al.*, 2019). However, little research has been conducted to investigate the psychological factors and formation process of residents' purchase intention. The present study proposed an integrative framework to explain the formation of consumers' purchase intention toward PH, showing theoretical and practical implications.

5.1 Influence of egoistic and rational cognition on purchase intention

Figure 6 shows that all three constructs from TPB and subjective knowledge have direct and indirect effects on consumers' purchase intention toward PH. This result indicates that egoistic and rational cognition plays an essential role in the formation of purchase intention toward PH. From the perspective of TPB, AT, SN, and PBC are significantly related to purchase intention. Compared with AT (standardized path coefficient $\beta=0.326$) and PBC($\beta=0.387$), SN($\beta=0.183$) appears to lack a strong impact. However, SN has a significant effect on AT($\beta=0.518$) and PBC($\beta=0.510$). This result implies SN plays a critical role in purchase intention when the inner relations within TPB are considered, indicating social fitness works in this context.

It is reasonable for common consumers to purchase PH relying on their egoistic and rational cognition because housing cost is a significant outlay for most families (Adabre and Chan, 2019). The results are consistent with the TPB-based research focusing on high-cost products (Yeow and Loo, 2022; Yuen *et al.*, 2020). Yuen *et al*. (2020) found that TPB determinants have a statistically significant influence on the adoption of autonomous vehicles for the public. Yeow and Loo (2022) proposed that rational factors from TPB are stronger than other factors in predicting computer

purchase intention in the context of Malaysia, where individuals regard computers as a high-cost product.

However, the influence of SK runs counter to the results obtained by previous researchers (Liu *et al.*, 2018). Liu *et al*. (2018) reported consumers who owned more subjective knowledge often have a better attitude and higher purchase intention. This discrepancy can be interpreted by the inclusion of the invisible innovative property of PH. Moon (2021) proposed that consumers may feel confused with a negative attitude to purchase intention in the early stage of electric vehicles, which are regarded as a type of environmental-innovative product. This finding can partially illustrate that consumers with higher subjective knowledge have negative attitudes and purchase intentions toward PH because they are concerned with the uncertainty of this product with technological innovation (Moon, 2021). Similarly, PH can also be considered as an environmental-innovative product like electric vehicles, and it is justified for consumers to avoid purchasing PH to reduce their risks and uncertainty when facing this high-cost product. Furthermore, the technological innovation of PH is invisible, unlike the evident and known innovative characteristics of electric vehicles. That is, normal consumers can hardly distinguish PH from traditional in-situ housing, and only practitioners in PH nearly know the difference. Hence, that is the reason why occupation is the only significant control variable, and practitioners in PH have statistically different attitudes and purchase intentions from normal consumers. Hameed (2012) proposed that awareness of innovation is the beginning of the initiation stage in technological innovation adoption processes. Awareness of innovation is followed by attitude formation of adoption in this sequential model (Hameed *et al.*, 2012). Only practitioners in PH can seemingly pass through the stage of awareness of innovation and have access to the next stage, which is defined as attitude formation of adoption in technological innovation adoption theory. Hameed (2012) stated that individuals tend to show hesitation or avoidance toward technological innovation in the stage of attitude formation of adoption. This finding can precisely be in accord with the attitude of practitioners of PH. Figure 3 shows why practitioners have relatively negative purchase intentions toward PH compared with normal consumers from the perspective of innovation adoption processes.
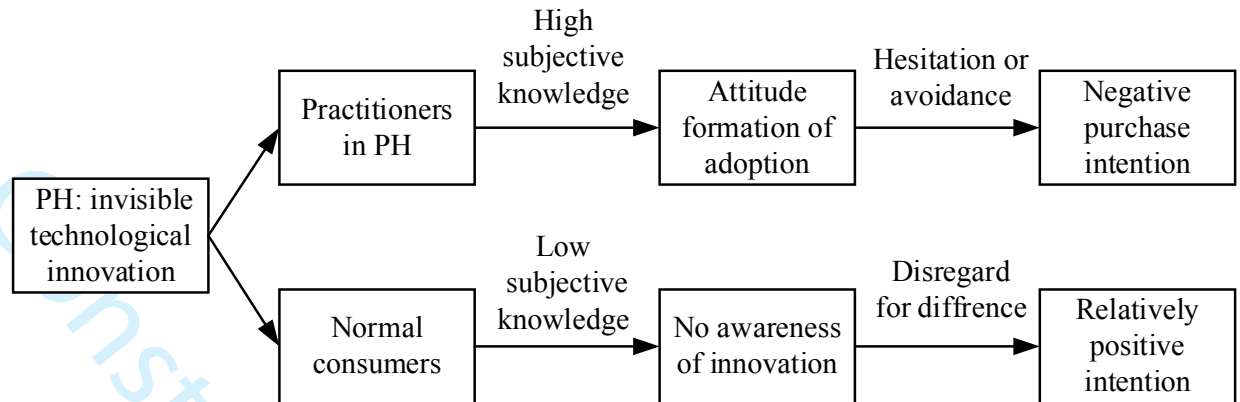
Figure 3. Interpretation for the influence of subjective knowledge on purchase intention from the perspective of innovation adoption processes.

5.2 Influence of altruistic and pro-environmental cognition on purchase intention

For NAM, Figure 6 clearly indicates the effectiveness of the sequential procedure model (i.e., AC→AR→PN→PI), suggesting that people's decision to purchase PH is activated by AC at the very beginning. Therefore, the application of NAM as a sequential process model is efficient in explaining purchase intention to PH, remaining consistent with the results of previous studies (Han and Hwang, 2015; Kim *et al.*, 2018; Schwartz, 1973). All three constructs from NAM and environmental concern have a significant effect on purchase intention. That is, altruistic and pro-environmental cognition can also influence purchase intention for PH, which is a type of high-cost product. This result echoes some scholars conducting research on durable and high-cost products (He and Zhan, 2018). He and Zhan (2018) found that NAM is powerful in explaining the intention to adopt electric vehicles. Therefore, NAM is also suitable for interpreting purchase intention in the PH context.

5.3 Independence and relevance of TPB and NAM regarding the purchase intention to PH

Previous studies have proposed how individuals' cognition is related to their behavioral intentions (Liu *et al.*, 2018; Yeow and Loo, 2022). The current research classifies cognition into SK and EC. SK represents rational and egoistic cognition, while EC stands for altruistic and pro-environmental awareness, which are relatively independent in theory. Evidently, SK is significantly related to AT(β=-0.275) and PBC(β=0.452) when it does not significantly relate to AC, which is the beginning of this sequential process NAM model. That is, SK mainly influences constructs in TPB with minimal impact on constructs in NAM. Hence, SK is suitable to be the antecedent

of constructs from TPB. This result remains consistent with research illustrating TPB is suitable in the egoistic and rational context (Armitage and Conner, 2001; Kim *et al.*, 2018). Meanwhile, EC has a strong impact on AC(β=0.539) when it is not statistically related to AT and PBC, which are constructs from TPB, showing that EC mainly has an impact on constructs from NAM. Therefore, EC is acceptable to be the antecedent of constructs from NAM. The finding is echoed by previous studies (Moon, 2021; Yeow and Loo, 2022).

With the help of two antecedents of constructs from TPB and NAM, it becomes more apparent to study how the two theories work separately to influence purchase intention toward PH and the in-depth inner correlations between TPB and NAM. For example, AC has a significant influence on SN(β=0.232), while AT is significantly related to PN(β=0.320), which also demonstrates the effectiveness and reasonableness of integrating TPB and NAM. In addition, SK (β=−0.229) and EC(β=0.206) can directly influence purchase intention, though H5 is not supported. In summary, this integrative framework of TPB and NAM is systematic and appropriate to explain the formation of purchase intention toward PH according to the relatively separate effects on PH and inner correlations between TPB and NAM, particularly adding two antecedents to the integrative framework.

5.4 Control variables

All of the five demographic characteristics of respondents in Table 1 are used as control variables, with the first option of each item defined as 1, the next defined as 2, and so on in the data analysis. Four out of five control variables are not statistically significant toward PH (see Figure 6), which suggests the results from this integrative framework are not varied by most demographic characteristics of respondents, including gender, age, education, and income. Therefore, the findings of this research are reliable and valid in explaining the formation of purchase intention toward PH. The only significant control variable, namely occupation, deserves to be further researched. That is, practitioners' purchase intention toward PH varies from normal consumers. Given that practitioners are numbered 1, normal consumers are numbered 2, and the standardized path correlation between occupation and purchase intention is 0.379, practitioners are less willing to purchase PH compared with normal residents, which is not echoed by previous research (Zhang *et al.*, 2017).

As illustrated in the previous section, it is reasonable to appear the current scenario that purchase intention of practitioners varies from normal consumers (see Figure 3).

However, this situation means that many residents are facing uncertainty and at risk when they have no idea about PH. Moreover, 18 experts who have worked on PH projects for over two years and did not participate in filling in the questionnaire were interviewed on their decisions when purchasing PH and the reasons for their choice. Most of them show a relatively negative attitude toward purchasing PH. They reported that construction workers are not familiar with prefabricated technology, which may cause potential quality defects. The technology of manufacturing prefabricated components in a factory is not mature, and the quality and safety of such components have not been verified for a long time.

On the bases of the present policy and development stage of PH, the dual contradiction in the PH market is presented in Figure 4. For residents, PH as a significant outlay deserves substantial consideration (Adabre and Chan, 2019), which means they need to trust their own knowledge and cognition when making this decision. Nevertheless, most of them have no idea of the invisible technological innovation of PH, which implies they need to trust in authority. Trust in authority refers to individuals believing the authority is willing to protect their benefits (De Cremer and Tyler, 2007). The degree to which residents would trust in authority is unknown in the current PH market, and how to achieve an equilibrium for residents to rely on their own information and trust in authority when making such significant decisions requires further research. For the government, on the one hand, full disclosure should be made to guarantee consumers' rights when facing high-cost products. On the other hand, the target of carbon neutrality requires the rapid promotion of PH, which means it is a good strategy to just focus on the environmental benefits of PH without mentioning its hidden risks. So, how to realize an equilibrium point in the promoting policy of PH remains a contradiction for the government.
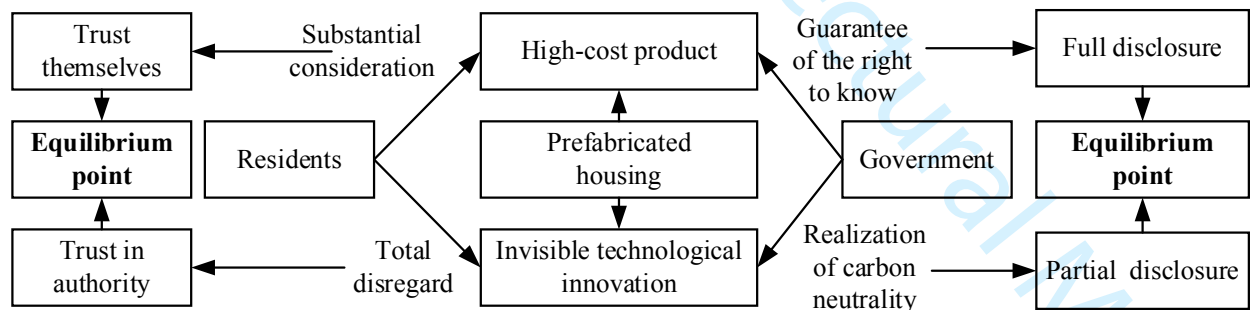

Figure 4. The dual contradiction in the PH market

6. Theoretical contributions and practical implications

6.1 Theoretical contributions

This research concentrated on the formation of citizens' purchase intention, making the following theoretical contributions. First, this study extends the knowledge of psychological decision-making theories in the field of purchase intention by proposing an integrative framework of TPB and NAM. The results show a systematic and comprehensive understanding of what psychological variables have an impact on and how they work in various paths regarding consumers' decision-making in the PH domain. Second, the results of this research contribute to specifying and refining the applicable contexts of TPB and NAM by adding two antecedents, indicating how rational and egoistic factors are related to TPB and how constructs in NAM process in the altruistic and pro-environmental context. Lastly, given that PH is featured by its high-cost and hardly observable changes compared with traditional housing, this research contributes to the literature by being one of the first to propose an integrative framework to investigate the purchase intention toward a high-cost product with invisible technological innovation.

6.2 Practical implications

Apart from theoretical contributions, this research also presents practical implications for the government and related stakeholders. First, environmental concern is significantly related to purchase intention and has a significant impact on awareness of consequence, the beginning of the sequential process model, which indicates citizens value the environmental performance of housing. Therefore, it will be effective for the government and other stakeholders to publicize the pro-environmental features of PH to citizens to promote its adoption and acceptance. Second, given that subjective norm has a significant impact on purchase intention and other constructs from TPB, social fitness influences the option toward PH in the rational context. This result can imply that the adoption and acceptance of PH will increase rapidly after the first batch of consumers think highly of PH, indicating developers should pay much attention to the quality and performance of PH at present. Lastly, the concerning and uncertain factors proposed by practitioners are likely to be disregarded when developers communicate with consumers, which may harm market transparency and aggravate information asymmetry. Given this possibility, the government should consider taking action to create a disclosure platform that shows the features of this technology and potential risks to citizens to guarantee consumers' right to know and choose.

7. Conclusion

This study focused on psychological decision-making processes on consumers' purchase intention toward PH. In particularly, this research aims to acquire a systematic and comprehensive understanding of how to increase the adoption of PH. The findings manifest that citizens' purchase intention is influenced by egoistic and altruistic cognition. An effective strategy is to show citizens the pro-environmental features of PH to promote its adoption because they value the environmental performance of housing. Meanwhile, consumers' SK also plays a vital role in decision-making when purchasing PH. The current situation indicates the potential existence of low market transparency and high information asymmetry in PH markets.

Although some findings and implications are proposed in this paper, limitations should also be considered. This study was developed on the current policies. That is, subsidies for developers can offset the higher price of PH, and further research should be conducted to investigate how the intention will change according to different policies over time. Lastly, further research needs to be carried out on the dual contradiction in the PH market for a more reasonable and equitable development of PH.
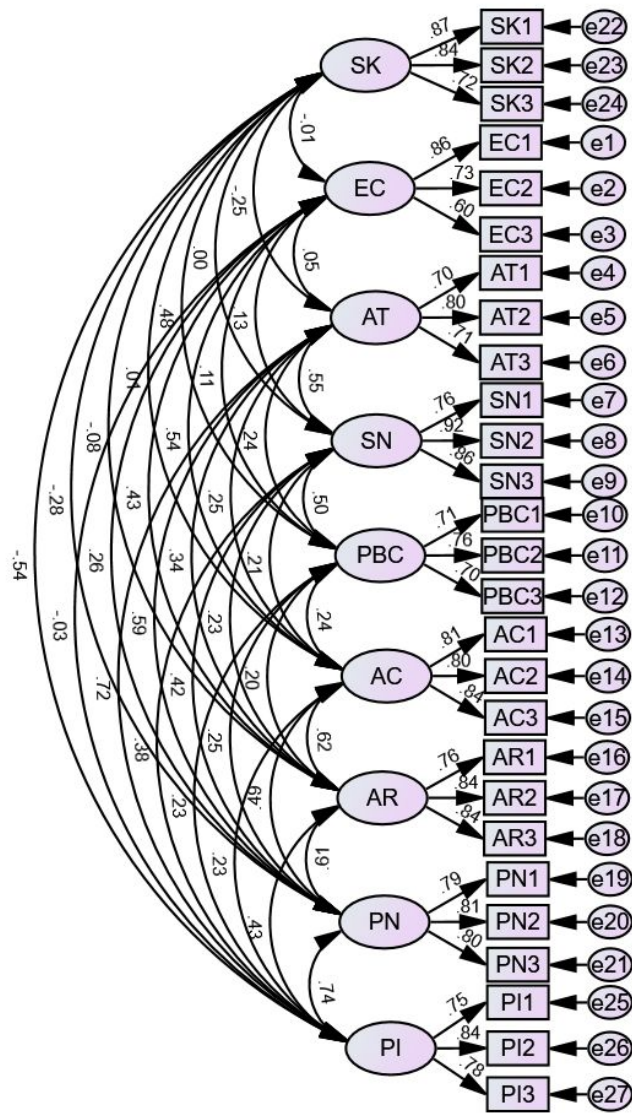
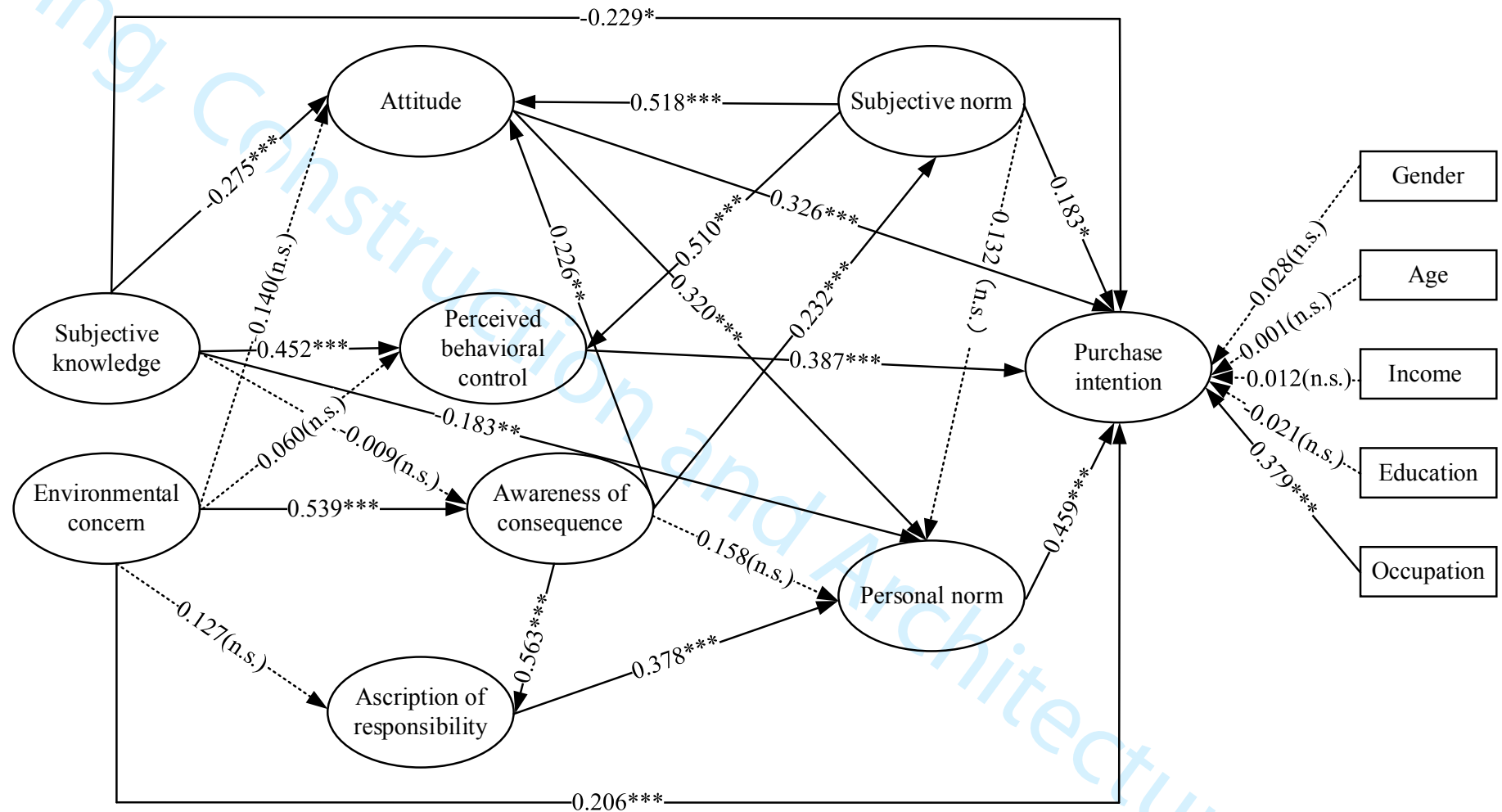Figure 5. Final measurement model ($\chi2/df = 1.613$; IFI = 0.949; TLI = 0.937; CFI = 0.948; RMSEA = 0.051)

Figure 6. Estimated structural model ($\chi2$/df = 1.745; IFI = 0.919; TLI = 0.902; CFI = 0.917; RMSEA = 0.056).

Note: ***p < 0.001, **p < 0.01, *p < 0.05, n.s. p > 0.05. Solid line: significant path coefficient; dashed line: not significant path coefficient.

References

Adabre, M.A. and Chan, A.P.C. (2019), "Critical success factors (CSFs) for sustainable affordable housing", *Building and Environment*, Vol. 156 No. March, pp. 203–214.

Ajzen, I. (1991), "The theory of planned behavior", *Organizational Behavior And Human Decision Processes*, Vol. 50 No. 2, pp. 179–211.

Alghoul, S.K., Rijabo, H.G. and Mashena, M.E. (2017), "Energy consumption in buildings: A correlation for the influence of window to wall ratio and window orientation in Tripoli, Libya", *Journal of Building Engineering*, Vol. 11 No. June 2016, pp. 82–86.

Armitage, C.J. and Conner, M. (2001), "Efficacy of the theory of planned behaviour: A meta-analytic review", *British Journal of Social Psychology*, Vol. 40 No. 4, pp. 471–499.

Ashaduzzaman, M., Jebarajakirthy, C., Weaven, S.K., Maseeh, H.I., Das, M. and Pentecost, R. (2022), "Predicting Collaborative Consumption Behaviour: A Meta-Analytic Path Analysis on the Theory of Planned Behaviour", *European Journal of Marketing*, Vol. 56 No. 4, pp. 968–1013.

Cao, X., Li, X., Zhu, Y. and Zhang, Z. (2015), "A comparative study of environmental performance between prefabricated and traditional residential buildings in China", *Journal of Cleaner Production*, Vol. 109, pp. 131–143.

Chan, K.H., Chong, L.L. and Ng, T.H. (2022), "Integrating extended theory of planned behaviour and norm activation model to examine the effects of environmental practices among Malaysian companies", *Journal of Entrepreneurship in Emerging Economies*, Vol. 14 No. 5, pp. 851–873.

Clemons, E.K. (2008), "How information changes consumer behavior and how consumer behavior determines corporate strategy", *Journal of Management Information Systems*, Vol. 25 No. 2, pp. 13–40.

De Cremer, D. and Tyler, T.R. (2007), "The effects of trust in authority and procedural fairness on cooperation", *Journal of Applied Psychology*, Vol. 92 No. 3, pp. 639–649.

Cronbach, L.J. (1951), "Coefficient alpha and the internal structure of tests", *Psychometrika*, Vol. 16 No. 3, pp. 297–334.

Ding, Z., Wen, X., Zuo, J. and Chen, Y. (2023), "Determinants of contractor's construction and demolition waste recycling intention in China: Integrating theory of planned behavior and norm activation model", *Waste Management*, Vol. 161 No. March, pp. 213–224.

Dou, Y. (2021), "Development strategy for prefabricated construction projects : a tripartite evolutionary game based on prospect theory", *Engineering, Construction and Architectural Management*, Vol. 30 No. 1, pp. 105–124

Ekanayake, E.M.A.C., Shen, G. and Owusu, E.K. (2022), "Capabilities to withstand vulnerabilities and boost resilience in industrialized construction supply chains : a Hong Kong study", *Engineering, Construction and Architectural Management*, Vol. 29 No. 10, pp. 3809–3829.

Flynn, B.B., Schroeder, R.G. and Sakakibara, S. (1994), "A framework for quality

management research and an associated measurement instrument", *Journal of Operations Management*, Vol. 11 No. 4, pp. 339–366.

De Groot, J. and Steg, L. (2007), "General beliefs and the theory of planned behavior: The role of environmental concerns in the TPB", *Journal of Applied Social Psychology*, Vol. 37 No. 8, pp. 1817–1836.

De Groot, J. and Steg, L. (2009), "Morality and prosocial behavior: The role of awareness, responsibility, and norms in the norm activation model", *Journal of Social Psychology*, Vol. 149 No. 4, pp. 425–449.

Hameed, M.A., Counsell, S. and Swift, S. (2012), "Journal of Engineering and A conceptual model for the process of IT innovation adoption in organizations", *Journal of Engineering and Technology Management*, Vol. 29 No. 3, pp. 358–390.

Hamzah, M.I. and Tanwir, N.S. (2021), "Do pro-environmental factors lead to purchase intention of hybrid vehicles? The moderating effects of environmental knowledge", *Journal of Cleaner Production*, Vol. 279.

Han, H. (2014), "The norm activation model and theory-broadening: Individuals' decision-making on environmentally-responsible convention attendance", *Journal of Environmental Psychology*, Vol. 40, pp. 462–471.

Han, H. and Hwang, J. (2015), "Norm-based loyalty model (NLM): Investigating delegates' loyalty formation for environmentally responsible conventions", *International Journal of Hospitality Management*, Vol. 46, pp. 1–14.

Han, H. and Hyun, S.S. (2017), "Drivers of customer decision to visit an environmentally responsible museum: merging the theory of planned behavior and norm activation theory", *Journal of Travel and Tourism Marketing*, Vol. 34 No. 9, pp. 1155–1168.

Harland, P., Staats, H. and Wilke, H.A.M. (2007), "Situational and personality factors as direct or personal norm mediated predictors of pro-environmental behavior: Questions derived from norm-activation theory", *Basic and Applied Social Psychology*, Vol. 29 No. 4, pp. 323–334.

He, X. and Zhan, W. (2018), "How to activate moral norm to adopt electric vehicles in China? An empirical study based on extended norm activation theory", *Journal of Cleaner Production*, Vol. 172, pp. 3546–3556.

Hong, J., Qiping, G., Mao, C., Li, Z. and Li, K. (2020), "Life-cycle energy analysis of prefabricated building components : an input e output-based hybrid model", *Journal of Cleaner Production*, Vol. 112 No. 2016, pp. 2198–2207.

Hu, S., Zhang, Y., Yang, Z., Yan, D. and Jiang, Y. (2022), "Challenges and opportunities for carbon neutrality in China's building sector—Modelling and data", *Building Simulation*, Vol. 15 No. 11, pp. 1899–1921.

Hwang, B. and Tan, J.S. (2012), "Green Building Project Management: Obstacles and Solutions for Sustainable Development", *Sustainable Development*, Vol. 349 No. July 2010, pp. 335–349.

Jhawar, A., Kumar, P. and Israel, D. (2023), "Impact of materialism on tourists' green purchase behavior: Extended norm activation model perspective", *Journal of Vacation Marketing*, available at:https://doi.org/10.1177/13567667231178328.

Judge, M., Warren-myers, G. and Paladino, A. (2019), "Using the theory of planned behaviour to predict intentions to purchase sustainable housing", *Journal of Cleaner Production*, Vol. 215, pp. 259–267.

Kang, S.E. (2022), "Travelers' pro-environmental behaviors in the Hyperloop context: Integrating norm activation and AIDA models", *International Journal of Tourism Research*, Vol. 24 No. 6, pp. 813–826.

Kim, J.J., Kim, I. and Hwang, J. (2021), "A change of perceived innovativeness for contactless food delivery services using drones after the outbreak of COVID-19", *International Journal of Hospitality Management*, Vol. 93 No. November 2020, p. 102758.

Kim, Y.G., Woo, E. and Nam, J. (2018), "Sharing economy perspective on an integrative framework of the NAM and TPB", *International Journal of Hospitality Management*, Vol. 72 No. July 2017, pp. 109–117.

Kline, R.B. (2015), *Principles and Practice of Structural Equation Modeling*, Guilford publications.

Lehberger, M., Kleih, A.K. and Sparke, K. (2021), "Panic buying in times of coronavirus (COVID-19): Extending the theory of planned behavior to understand the stockpiling of nonperishable food in Germany", *Appetite*, Vol. 161 No. January, p. 105118.

Li, X., Wang, C., Alashwal, A. and Bora, S. (2020), "Game analysis on prefabricated building evolution based on dynamic revenue risks in China", *Journal of Cleaner Production*, Vol. 267, p. 121730.

Liang, H. and Zhang, S. (2019), "Impact of supervisors' safety violations on an individual worker within a construction crew", *Safety Science*, Vol. 120, pp. 679–691.

Liu, Y., Hong, Z., Zhu, J., Yan, J., Qi, J. and Liu, P. (2018), "Promoting green residential buildings: Residents' environmental attitude, subjective knowledge, and social trust matter", *Energy Policy*, Vol. 112 No. June 2017, pp. 152–161.

Majeed, S., Kim, W.G. and Kim, T. (2023), "Perceived green psychological benefits and customer pro-environment behavior in the value-belief-norm theory: The moderating role of perceived green CSR", *International Journal of Hospitality Management*, Vol. 113 No. April, p. 103502.

Moon, S.J. (2021), "Effect of consumer environmental propensity and innovative propensity on intention to purchase electric vehicles: Applying an extended theory of planned behavior", *International Journal of Sustainable Transportation*, Vol. 16 No. 11, pp. 1032–1046.

Nnorom, I.C., Ohakwe, J. and Osibanjo, O. (2009), "Survey of willingness of residents to participate in electronic waste recycling in Nigeria – A case study of mobile phone recycling", *Journal of Cleaner Production*, Vol. 17 No. 18, pp. 1629–1637.

Rafael, J., Lopes, N., Araújo, R. De, Laureano, J., Rodríguez, M. and Ávila, S. (2019), "A new model for assessing industrial worker behavior regarding energy saving considering the theory of planned behavior , norm activation model and human reliability", *Resources, Conservation & Recycling*, Vol. 145 No. February, pp.

268–278.

De Ruyter, K. and Wetzels, M. (2000), "With a little help from my fans - Extending models of pro-social behaviour to explain supporters' intentions to buy soccer club shares", *Journal of Economic Psychology*, Vol. 21 No. 4, pp. 387–409.

Sang, P., Yao, H., Zhang, L., Wang, S., Wang, Y. and Liu, J. (2020), "Influencing factors of consumers' willingness to purchase green housing: a survey from Shandong Province, China", *Environment, Development and Sustainability*, Vol. 22 No. 5, pp. 4267–4287.

Schwartz, S. (1976), "Responsibility and Helping in an Emergency : Effects of Blame , Ability and Denial of Responsibility", Vol. 39 No. 4, pp. 406–415.

Schwartz, S.H. (1977), "Normative Influences on Altruism", *Advances in Experimental Social Psychology*, Vol. 10, pp. 221–279.

Schwartz, S.H. (1973), "Normative explanations of helping behavior - critique, proposal, and empirical test", *Journal of Experimental Social Psychology*, Vol. 9 No. 4, pp. 349–364.

Shen, K., Li, X., Cao, X. and Zhang, Z. (2021), "Prefabricated housing subsidy analysis in China based on an evolutionary game model", *Journal of Civil Engineering and Management*, Vol. 27 No. 7, pp. 553–570.

Shin, H., Nicolau, J.L., Kang, J., Sharma, A. and Lee, H. (2022), "Travel decision determinants during and after COVID-19: The role of tourist trust, travel constraints, and attitudinal factors", *Tourism Management*, Vol. 88 No. September 2021, p. 104428.

Song, J., Cai, L., Yuen, K.F. and Wang, X. (2023), "Exploring consumers' usage intention of reusable express packaging: An extended norm activation model", *Journal of Retailing and Consumer Services*, Vol. 72 No. December 2022, p. 103265.

Song, Y., Wang, J., Liu, D., Huangfu, Y., Guo, F. and Liu, Y. (2021), "The influence of government's economic management strategies on the prefabricated buildings promoting policies: Analysis of quadripartite evolutionary game", *Buildings*, Vol. 11 No. 10.

Steg, L. and De Groot, J. (2010), "Explaining prosocial intentions: Testing causal relationships in the norm activation model", *British Journal of Social Psychology*, Vol. 49 No. 4, pp. 725–743.

Tam, V.W.Y., Tam, C.M., Zeng, S.X. and Ng, W.C.Y. (2007), "Towards adoption of prefabrication in construction", *Building and Environment*, Vol. 42 No. 10, pp. 3642–3654.

Teng, Y., Li, K., Pan, W. and Ng, T. (2018), "Reducing building life cycle carbon emissions through prefabrication : Evidence from and gaps in empirical studies", *Building and Environment*, Vol. 132 No. October 2017, pp. 125–136.

Teng, Y. and Pan, W. (2020), "Estimating and minimizing embodied carbon of prefabricated high-rise residential buildings considering parameter, scenario and model uncertainties", *Building and Environment*, Vol. 180 No. February, p. 106951.

Tonglet, M., Phillips, P.S. and Read, A.D. (2004), "Using the Theory of Planned

Behaviour to investigate the determinants of recycling behaviour: A case study from Brixworth, UK", *Resources, Conservation and Recycling*, Vol. 41 No. 3, pp. 191–214.

Vafaei-Zadeh, A., Wong, T.K., Hanifah, H., Teoh, A.P. and Nawaser, K. (2022), "Modelling electric vehicle purchase intention among generation Y consumers in Malaysia", *Research in Transportation Business and Management*, Vol. 43 No. February 2021, p. 100784.

Vaske, J.J., Jacobs, M.H. and Espinosa, T.K. (2015), "Carbon footprint mitigation on vacation : A norm activation model", *Journal of Outdoor Recreation and Tourism*, Vol. 11, pp. 80–86.

Wang, B., Ren, C., Dong, X., Zhang, B. and Wang, Z. (2019), "Determinants shaping willingness towards on-line recycling behaviour: An empirical study of household e-waste recycling in China", *Resources, Conservation and Recycling*, Vol. 143 No. January 2019, pp. 218–225.

Wang, J., Qin, Y. and Zhou, J. (2021), "Incentive policies for prefabrication implementation of real estate enterprises: An evolutionary game theory-based analysis", *Energy Policy*, Vol. 156 No. January, p. 112434.

Wang, Z., Sun, Q., Wang, B. and Zhang, B. (2019), "Purchasing intentions of Chinese consumers on energy-efficient appliances: Is the energy efficiency label effective?", *Journal of Cleaner Production*, Vol. 238, p. 117896.

Van Der Werff, E. and Steg, L. (2015), "One model to predict them all: Predicting energy behaviours with the norm activation model", *Energy Research and Social Science*, Vol. 6, pp. 8–14.

Wu, G., Yang, R., Li, L., Bi, X., Liu, B. and Li, S. (2019), "Factors in fl uencing the application of prefabricated construction in China : From perspectives of technology promotion and cleaner production", *Journal of Cleaner Production*, Vol. 219, pp. 753–762.

Xue, J., Shen, G.Q., Yang, R.J., Zafar, I., Ekanayake, E.M.A.C., Lin, X. and Darko, A. (2020), "Influence of formal and informal stakeholder relationship on megaproject performance: a case of China", *Engineering, Construction and Architectural Management*, Vol. 27 No. 7, pp. 1505–1531.

Yeow, P.H.P. and Loo, W.H. (2022), "Antecedents of green computer purchase behavior among Malaysian consumers from the perspective of rational choice and moral norm factors", *Sustainable Production and Consumption*, Vol. 32, pp. 550–561.

Yuen, K.F., Chua, G., Wang, X., Ma, F. and Li, K.X. (2020), "Understanding public acceptance of autonomous vehicles using the theory of planned behaviour", *International Journal of Environmental Research and Public Health*, Vol. 17 No. 12, pp. 1–19.

Zhang, X., Geng, G. and Sun, P. (2017), "Determinants and implications of citizens' environmental complaint in China: Integrating theory of planned behavior and norm activation model", *Journal of Cleaner Production*, Vol. 166, pp. 148–156.

Zhang, X., Skitmore, M. and Peng, Y. (2014), "Exploring the challenges to industrialized residential building in China", *Habitat International*, Vol. 41, pp.

176–184.

Zhang, Y., Wang, Z. and Zhou, G. (2013), "Antecedents of employee electricity saving behavior in organizations: An empirical study based on norm activation model", *Energy Policy*, Vol. 62, pp. 1120–1127.

Zheng, X., Lu, Y., Le, Y., Li, Y. and Fang, J. (2018), "Formation of Interorganizational Relational Behavior in Megaprojects: Perspective of the Extended Theory of Planned Behavior", *Journal of Management in Engineering*, Vol. 34 No. 1, p. 04017052.

Zhou, J., Qin, Y. and Fang, S. (2019), "Impacts of consumers and real estate enterprises on the implementation of prefabrication in residential buildings: The moderating role of incentive policies", *Sustainability*, Vol. 11 No. 18.

Appendix

Table A1. Measures of constructs

Constructs	Measurement items	Key sources
Subjective knowledge (SK)	SK1: I know what PH means. SK2: I know why we need to develop PH. SK3: I know the advantages of PH over traditional in-situ housing.	(Liu *et al.*, 2018)
Environmental concern (EC)	EC1: I think environmental problems are getting more and more serious in recent years. EC2: I think individuals have the responsibility to protect the environment. EC3: The condition of the environment affects the quality of my health.	(Hamzah and Tanwir, 2021; Moon, 2021)
Attitude (AT)	AT1: Purchasing PH is good. AT2: Purchasing PH is valuable. AT3: Purchasing PH is beneficial.	(Armitage and Conner, 2001; Kim *et al.*, 2021)
Subjective norm (SN)	SN1: If I bought PH, most people who are important to me would agree with my decision. SN2: If I bought PH, most people who are important to me would support my decision. SN3: If I bought PH, it would be consistent with the trend of social development.	(Armitage and Conner, 2001; Kim *et al.*, 2021)
Perceived behavioral control (PBC)	PBC1: I believe I have enough opportunity and resources (money) to purchase PH. PBC2: I am confident that if I want, I can purchase PH. PBC3: I feel that purchasing PH is totally within my control.	(Armitage and Conner, 2001; Kim *et al.*, 2021)
Awareness of consequence (AC)	AC1: Purchasing PH can help reduce energy depletion. AC2: Purchasing PH can help reduce environmental degradation. AC3: Purchasing PH can help reduce pollutant emissions.	(Schwartz, 1977; Wang *et al.*, 2019)

Table A1. (continued)

Constructs	Measurement items	Key sources
Ascription of responsibility (AR)	AR1：I am responsible for the problem of energy depletion caused by not purchasing PH. AR2：I am responsible for the problem of environmental deterioration caused by not purchasing PH. AR3：I am responsible for the discharge of pollutants caused by not purchasing PH.	(Schwartz, 1977; Wang *et al.*, 2019)
Personal norm (PN)	PN1: I have a moral obligation to purchase PH. PN2: Purchasing PH is in line with my moral principles, values, and beliefs. PN3: I would feel guilty if I purchased traditional in-situ housing instead of PH.	(Schwartz, 1977; Wang *et al.*, 2019)
Purchase intention (PI)	PI1: I am willing to purchase PH. PI2: I am willing to live in PH. PI3: I am willing to recommend PH to my family and friends.	(Kim *et al.*, 2018; Wang *et al.*, 2019)