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Exploring Generation Z's Perceptions of Green Homes

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Abstract: In recent years, there has been an increase in environmental awareness in the United States, leading to steady growth in environmentally conscious consumerism. Looking specifically at green home marketing, understanding the consumer behavior of the next generation of homebuyers, Generation Z (GenZ), is important for environmental and business reasons. This study surveyed 116 university students to explore the influence of specific barriers and types of motivation (intrinsic, instrumental, and non-normative) on their perceptions of green homes. Our findings suggest certain barriers have more influence on GenZ consumers than others, with the perceived lack of choice in selecting Green Home Features (GHFs) as the top barrier, followed by a lack of information about GHFs, and then the perceived effort to analyze GHFs. Furthermore, for GenZ consumers, intrinsic and non-normative motivations seem to significantly affect their willingness to buy green homes, whereas instrumental motivation does not. Our findings expand on previous studies on green consumer behavior to provide a new benchmark for understanding GenZ's consumer behavior, specifically towards green homes. Our results can be used by marketers and policymakers to study future home trends, attract more potential buyers to green homes, and help create a sustainable environment for future generations.

Keywords: generation Z; green homes; green consumerism; dual-inheritance theory; normative motivation

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1. Introduction

People and nations are embracing the idea of sustainability and environmentally friendly lifestyles due to the escalating population and depletion of resources, causing issues such as climate change [1]. Moreover, as a new consumer generation emerges, the trend seems to be shifting towards responsible consumerism in many sectors and countries [2–6]. For example, a survey of Indian consumers indicated that environmental attitude and consciousness seem to be important to young consumers [6]. Similarly, when age was considered in recent research in eastern Europe [7] and Egypt [8], it represented the younger generation (born between 1997 and 2012 [9]), known as generation Z (GenZ), as concerned consumers about the environment. This trend is consistent with previous research showing that consumer purchasing choices change from generation to generation, as do attitudes and beliefs [10,11] and that the context in which a generation emerges shapes that generation's behavior and consumption [12]. Therefore, it is also not surprising to understand that cultural context influences consumer behavior. For example, when comparing the green purchasing behavior of consumers of two different cultural settings, that is, China and the United States (US), Chan and Lau [2] found significant behavioral differences in how to reach these two cultures.

The increased interest in sustainability and the environment is specifically relevant for the built environment because "buildings and construction together account for 36% of global final energy use and 39% of energy-related carbon dioxide (CO_2) emissions when upstream power generation is included" [13] (p. 6). In addition, owing to reducing the impact of the built environment on the planet, a movement to improve building

construction, generally termed 'green building,' has emerged. Its focus is on reducing the environmental impact of buildings and improving the quality of the built environment (including health impacts on users and community impact) throughout the life cycle of a building [14,15]. However, despite the increased interest, most green building research focuses on commercial buildings [15]. The few studies about green homes indicate that motivational factors are determinants in understanding how to increase the market for more sustainable housing options. For example, Tan [5] surveyed Malaysian homeowners about green home features and found four significant factors influencing their motivation to buy green homes, including "financial returns, healthy and sustainable environment, energy efficiency and livability" (p. 869). Zhang al. [16] showed government incentives to be the most important factor for young Chinese green homebuyers.

However, not only motivations affect consumer behavior toward green homes, but previous research also noted that psychological hassles could hinder green home purchasing behavior [17]. Despite this indication, a lack of understanding remains about the impact of barriers to GenZ's green consumer behavior as rising homebuyers.

Given the importance of the construction industry to the global economy and, more specifically, of residential construction to emerging nations [18] and the United States [19], the present study is timely, original, and important. The present study explores green home (GH) purchasing intentions of the next generation of homebuyers, GenZ consumers, factoring in negative feelings, or barriers, and motivations identified by theories of the evolution and psychology of culture. Its originality lies in evaluating the perspective of future GenZ home buyers on GHs through the lens of dual-inheritance theory or how genetic and cultural inheritance that they acquired through social learning affected their GH purchasing intention.

Furthermore, the current study makes two important contributions. First, it adds knowledge to the existing literature on GH consumer behavior, especially the consumer behavior of GenZ. Secondarily, the results from the present study can help green home marketers, manufacturers, and policymakers to re-evaluate their market strategy and develop promotional ideas that cater to the needs of these upcoming homebuyers in the United States. These contributions are relevant because, according to the National Association of Realtors [20], 88% of first home buyers fall between the ages of 22 to 29 years. Moreover, GenZ currently makes up 20% of the total US population [21], and as the next generation of homebuyers, they have the potential to significantly affect the future of the housing market [22].

2. Literature Review

As mentioned previously, GenZ is the generation born between the late 1990s and the early 2010s [9]. This generation has been exposed to the digital world since early in life, and they are more tech-savvy, educated, and community-oriented than previous generations [23]. According to Francis & Hoefel [12], the characteristics of GenZ are "undefined ID, communaholic, dialoguer, realistic." That is to say, they try to create their own identities through exploring and experimenting, are not bound to stereotypical thinking, and are vocal about their opinions.

Additionally, GenZ consumers are accustomed to getting services with less effort due to the digital revolution [24]. Previous research shows that GenZ consumers rely heavily on the internet to gather, compare, and analyze information before making a judgment [25,26], and they value the personalization of products [26]. However, despite this inclination toward a more sustainable orientation, previous research on GenZ and green consumerism showed that a lack of availability of green products could negatively affect GenZ's awareness about (and hence access to) them [8,27].

Compared to other generations, GenZ is more knowledgeable about environmental issues, tends to be more concerned about the environment, and considers pro-environmentalism an appealing social norm [7,9,28]. As consumers, GenZ individuals tend to research products and their brand values before buying, and they like goods that are customizable,

unique, and easy to search for and purchase. They also want goods recommended by friends, family, and online reviews and those with an ethical brand value and low environmental impact [12,29]. Therefore, to gain a competitive edge in the market, a company targeting GenZ consumers must know what motivates them to buy goods and services.

2.1. Green Consumerism and Green Homes

Today's consumers realize that their purchasing behavior could significantly affect the environment [30]. The extent to which individuals put effort into conscious consumerism depends on how much they support environmental consumerism or the belief that environmental degradation can threaten personal values and that individual actions can directly or indirectly protect the environment [31]. Some individuals who consciously act to achieve minimal negative environmental impact identify themselves as pro-environmentalists, and this form of consumer behavior is known as green consumerism [4]. However, despite increased interest in environmentally conscious intentions, research [27] on green consumerism suggests significant barriers must be addressed to improve green consumer behavior. These barriers include cost, availability, and time investment to increase knowledge or locate green products, creating a sense of "too hard to be green" [17,27].

In the built environment, the term "green building" has been largely associated with the United States Green Building Council (USGBC), a large organization that accredits professionals and certifies buildings that promote more environmentally conscious design and construction. Along these lines, a home is considered "green" if it has lower energy consumption, good indoor environmental quality (IEQ), use of environmentally low-impact materials, and a sustainable construction process [5,14].

Despite these benefits and the rise of responsible consumerism, research about consumers' intentions toward green homes is lacking [32]. This gap is even more concerning when analyzing that homebuyers are interested in green, environmentally friendly homes. For example, in a recent market report from the National Association of Home Builders [33], 78% of homebuyers mentioned concern about the environmental impact of a home. Still, only 15% mentioned they would pay for a green home. These green home premiums can raise the cost of a home by 5% to 10% [34]. However, when the cost was not a concern, green products were preferable to homebuyers compared to non-green alternatives [33].

Moreover, the few recent research published on green home consumerism seems to be focused on the Asian and Australasian contexts. Nevertheless, their results suggested that utilizing behavioral theories can help to explain consumers' behavioral intentions toward green homes [32,35], and that financial incentives, environmental concerns, health, and energy efficiency were found to successfully describe homeowners' understanding of green homes [5].

2.2. Dual-Inheritance Theory and Normative Motivation

Psychologically speaking, the motivations of sustainability and environmentalism that drive GenZ consumers are the products of culturally inherited values, or norms, so to understand these motives, it is important to consider the nature of normative motivations in general. Such motives are brought clearly into focus by dual-inheritance theory (DIT). This framework explains human evolution in terms of two distinct mechanisms of inheritance: genetic inheritance and cultural inheritance, which is defined as social learning [36–38]. According to Houkes [11], culture is anything from etiquette rules, policies, laws, languages, religious beliefs, technologies, and scientific theories to skills where one learns information from other individuals. In other words, culture is anything that can be inherited or transmitted through social learning. Psychological traits acquired through social learning can be designated "cultural traits," and models of Darwinian evolution can be applied to cultural traits in the same way they are applied to genetic traits, albeit resulting in different dynamics. This approach has been highly successful in explaining the evolution of cooperation in humans, and central to this account are the motivations

involved in following and enforcing norms [36,39], which are parts of what Davis et al. [40] refer to as "the norm system" within the human mind.

Once genetic selection had created sophisticated capacities for social learning in humans, it became possible for cultural selection to favor certain norms or socially learned standards and rules, specifying what is right and wrong within a given culture [41]. However, in an environment filled with norms, genetic fitness is strongly affected by the punishments and rewards involved in enforcement. As a result, cultural selection eventually created a social environment that favored genetic adaptations for identifying, following, and enforcing cultural norms [36,41]. Among these genetically inherited capacities of cultural psychology are two different types of normative motivation, or motivation to do what is right and avoid what is wrong. Intrinsic motivations are about doing the right thing "on principle"—just because it is right—whereas instrumental motivations are about avoiding punishment and gaining approval and rewards from norm enforcement [36]. Additionally, just as these two types of motivation apply to any other type of norm, such as norms against lying or stealing, they also apply to norms of environmentalism and sustainability. For example, to genuinely believe that protecting the environment is the right thing to do, and to be motivated to protect the environment because it is the right thing to do, is to be intrinsically motivated to follow norms of environmentalism. By contrast, to be motivated to protect the environment simply to receive a tax subsidy, or to avoid being fined for violating regulations of the EPA, is to be instrumentally motivated to follow norms of environmentalism. Often, both types of motivation occur together, favoring the same action in an additive way. However, in other circumstances, they come apart, and may even conflict, canceling or neutralizing each other.

For the current study, motivations of environmentalism and sustainability (normative motivations) were distinguished from self-interested, practical considerations in terms of money and health (non-normative motivation) [40]. Moreover, normative motivations were divided into intrinsic (personal) motivations and instrumental (extrinsic, external) motivations. As the name suggests, motivation originating in personal beliefs, values, and attitudes is called intrinsic motivation. By contrast, motivation from external factors like acceptance from family and friends, influence from social trends, or avoiding fines can be categorized as instrumental motivation.

Consumer theory identifies the stages of the consumer decision-making process, or the stages consumers move through before they decide on purchasing, using, or disposing of a good or service [42]. Stankevich [42] argues that the first stage of the decision-making process is need-recognition about what motivates a consumer to buy a particular product. Since the motivations of green consumerism ultimately depend on the norms of environmentalism and sustainability, these norms dictate the relevant needs in the consumer decision-making process. This relationship underscores the importance of understanding consumer decision-making's intrinsic and instrumental motivations when buying a green home.

Additionally, non-normative motivations such as economic and perceived health benefits also influence individual decision-making [5]. For example, if a person wishes to purchase a light bulb and has two options with similar prices, that person will decide to buy one based on factors like energy consumption or effects on the eye. Similarly, if a shopper wishes to purchase a shirt and sees a deal to buy one and get another 50% off, that shopper may be influenced to buy a different shirt than the one they originally intended. Neither of these cases involves normative views about what is right and wrong, but they reveal that non-normative motivations of self-interest are also clearly important when analyzing consumer behavior based on motivations.

2.3. Variable Identification

Variables in this study were identified based on previous literature and include three different motivation types: intrinsic motivation, instrumental motivation, and non-normative motivation; and three barrier types: lack of knowledge, lack of information, and

perceived effort. More information on how each is understood for the present study is given below:

- Barriers:
  - *Perceived effort:* access to information plays a vital role in GenZ's decision-making processes [12,27], and they may be accustomed to getting products with less effort due to the digital revolution [24]. Furthermore, Tan et al. [27] indicated that the perceived personal investment needed to acquire green products would affect consumers' perceptions about being green.
  - *Lack of information:* Previous research indicated that environmental awareness and knowledge have a positive effect on green consumer behavior [5,16,43,44]. Therefore, there is a need to evaluate the impact of awareness and information availability on GenZ homebuyers' willingness to buy GHs and GHFs.
  - *Lack of choice:* GenZ consumers are interested in creating their own identities and personalizing experiences [12]. This implies that the lack of choice may be perceived as a barrier to buying GHs and GHFs. In addition, previous academic research and market reports suggested that the lack of availability of green home products was a significant barrier to increasing the willingness of buyers to acquire green homes. This is also relevant given that in many American homes, little customization is available, and the builders select most of their features.
- Motivations:
  - *Intrinsic*: This motivation relates to an individual's perception that buying GHs and GHFs is the right thing to do. Previous research indicates that intrinsic motivations can predict green consumerism [45]. Our definition of intrinsic is related but slightly different than that of [46] in that it focuses on the "right thing to do," whereas the previous researchers indicated intrinsic as an individual's interests.
  - *Instrumental*: This motivation relates to a person's response to external factors, including social norms. Examples of it include a person's response to the opinions in the media, those from family and peers, and the influence of policies, laws, and standards, all of which were found to affect consumer behavior [47] significantly. Furthermore, previous research indicates that a person's consumption activities reflect their social relationships and obligations towards family, friends, community, and social networks [4,43,46,48].
  - *Non-normative*: Non-normative motivations include motivations that are not affected by social norms or rules. Some examples include property values, incentives, and healthier living conditions. For example, previous research indicates that green home features can increase the resale price of a home [4] largely due to benefits such as improved living conditions and better energy performance [5,16]. Furthermore, the four variables identified in Tan's [5] research can be classified under the present motivation type because they rely on objective measures, whereas the intrinsic and instrumental are subjective to an individual. Some of the non-normative motivations included in the present study echo the "identified" motivation named by Gilal et al. [46], in which green consumerism can be influenced by self-perceived benefits, which was shown to have significant effects on green consumer behavior, particularly those of males.

3. Materials and Methods

The present research uses a quantitative survey approach and focuses on variables influencing consumer needs to buy GHs in terms of different types of normative or non-normative motivations. Other variables include the situational barriers consumers perceive concerning purchasing green homes, which also affect needs recognition. The study will

focus on three main barriers: (1) lack of information; (2) freedom to choose products, given that home customizability may be limited; and (3) lack of time or perceived effort to gather and analyze information about green homes. The third barrier was included due to the fragmented nature and complexity of the construction industry. Figure 1 illustrates the conceptual framework of the present study.

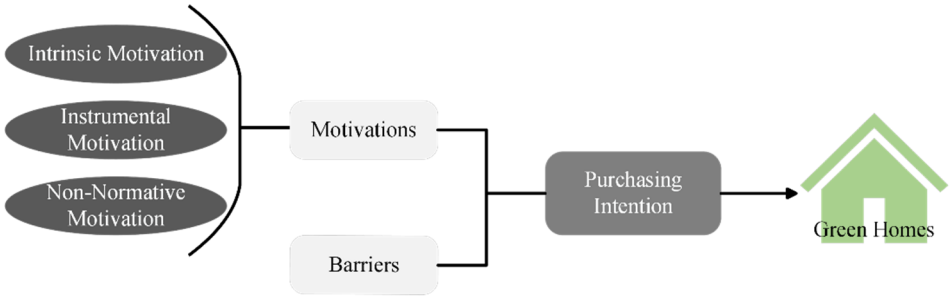


Figure 1. Conceptual framework for the study.

Two main research questions guide this exploratory study:

1. Which type of motivations most influence GenZ consumers' willingness to purchase green homes?
2. Which barriers are most perceived by GenZ consumers as a hindrance to buying green homes?

To do this, the authors used a survey approach. After the initial survey development, a pilot test was conducted with twenty-one students to evaluate the readability and flow of the survey. Qualtrics was used to host the electronic survey. Based on the findings from the pilot study, a few adjustments were made to the survey's wording, items, and sequence. The final survey instrument contained twelve questions divided into three main blocks of questions: (1) demographics; (2) green homes and their features, and perspective on green homes; and (3) consumer behavior. The first block contained five demographic questions, including age group, gender, academic standing, cultural location, and environment the participant grew in. The second block focused on the participants' choices of green home features and their perspectives on green homes and green home certifications. In this block, 11 green home features were identified based on the housing characteristics of the Residential Energy Consumption Survey (RECS) 2015 dataset [49] and two recent market reports [20,34]. These features were related to either (a) energy-efficient products or systems; (b) products or systems impacting the indoor environmental quality; (c) water-conserving products or systems; (d) renewable energy systems; and (e) materials and resource-conserving products. The last block specifically asked the participants about their motivation and barriers to purchasing a green home, and this will be the focus of the present study. Most questions included in blocks two and three used a 5-point Likert scale (from strongly disagree to strongly agree). In block three, three statements were included for barriers—one for each type studied—and twelve for motivations—four for each type (intrinsic, instrumental, and non-normative). The internal consistency of the final survey was measured using Cronbach's alpha and was deemed acceptable ($\alpha = 0.888$).

Moreover, the population considered for this research is GenZ, while the data set includes GenZs participants enrolled in a public university in the midwestern United States (US). We recruited participants from a university because the students enrolled hail from different parts of the US with different cultural backgrounds, which could effectively eliminate the cultural inheritance bias. For recruitment, the electronic survey was distributed to students at Purdue University-Main Campus in West Lafayette, Indiana, in April 2021. The sample for this study consisted of students in the 18- to 24-year age group. Direct email invitations were sent to 3000 students and ten official student organizations chosen by one of the researchers at the beginning of April 2021. Additional recruitment was done electronically, through one of the researcher's contact lists, in person, and through flyers.

The results were analyzed using descriptive and inferential statistical analysis. Frequency, mean, standard deviation, and minimum and maximum are reported for each type of barrier and motivation. For inferential statistics, two types of econometric approaches were employed. Multinomial logistic regression was used to address the first research question. It evaluated the significant difference in the association between motivation type to the willingness to buy GHs. For this approach, the dependent variable is the willingness to buy GHs; the independent variables are the motivation types—intrinsic, instrumental, and non-normative motivations. The value for each motivation type was computed for each respondent using the simple average of their answers for the four statements included in each type. This approach was suitable because it balanced the goal of the analysis, the type of data, and the expected sample size. The data satisfied the assumptions of the proposed approach—independent observations, absence of multicollinearity, linear relationship between the type of motivations with logit transformation of willingness to buy GHs, and absence of outliners. A Friedman test was used for the second research question to evaluate the difference between barriers, using a significance level of $\alpha = 0.05$. Once more, the data satisfied the assumptions of the proposed approach—participants measured all the barrier types, and the data measured was ordinal (5-point Likert scale).

4. Results

A total of n = 116 valid responses were received. Out of these, 56% (n = 65) were females, 39.7% (n = 46) were males, 2.6% (n = 3) self-identified as 'other' gender, and 1.7% (n = 2) participants preferred not to disclose their gender. Most of these participants were originally from, or self-identified culturally with, the United States (n = 86, 74.1%), followed by Asia (n = 27, 23.3%) and other countries (n = 3, 2.6%). Furthermore, a significant number of participants were from suburban areas (n = 69, 51.3%) followed by urban (n = 29, 26.7%) and rural areas (n = 18, 14.7%). In terms of academic standing, 33.6% (n = 39) participants were graduate students, whereas 65.5% (n = 76) were undergraduates (freshman n = 19, 16.4%; sophomore n = 21, 18.1%; junior n = 19, 16.4%; senior n = 17, 14.7%). One participant indicated an academic standing of "other."

Participants were also asked to compare their perceptions of the terms "green" and "sustainable", as they are often used interchangeably in the construction industry. Interestingly, participants' answers were very much split, with 35% (n = 41) of the respondents believing that the two terms mean the same thing, 32.8% (n = 38) respondents indicating that sustainable homes are more environmentally friendly, and the other 31.9% (n = 37) respondents indicating otherwise.

The survey also evaluated participants' perceptions of third-party certification programs for green or sustainable homes (such as LEED, Energy Star, or WELL Building Standard). Among the 116 respondents, the vast majority of respondents (n = 65, 56%) selected "I think it is interesting and I would like to learn more about these certification programs." On the same question, the remaining respondents answered in varied ways: 14.7% (n = 17) selected "it is extremely important to me, 16.4% (n = 19) selected "It does not matter if I get a certificate or not," 12.9% (n = 15) selected "I do not know anything about certification programs".

Furthermore, participants were asked about their perceptions and knowledge about certain green home features. Of the 11 GHFs included in the survey, more than one-third of the participants indicated they were unfamiliar with grey water recycling, followed by heat pumps, while one-fourth did not know about tankless water heaters. On the other hand, solar panels and energy-efficient appliances were recognized by participants. Table 1 includes the overall findings.

Table 1. Unknown green home features.

Green Home Feature	Number of Participants Who Did Not Know about This Feature	Total Number of Participants per Item	%
Greywater recycling	44	115	37.9
Heat pumps	36	116	31
Tankless water heater	30	116	25.9
Low volatile organic compounds (VOC) paint and carpet materials	17	116	14.7
Water-efficient irrigation	11	115	9.5
Rainwater harvesting	5	116	4.3
Dual-flush toilets and low-flow faucets/shower heads	4	116	3.4
Eco-friendly building materials	1	116	0.9
Recycled or reclaimed home products	1	116	0.9
Energy-efficient appliances	0	116	0
Solar panels	0	116	0

Furthermore, the researchers compared the perceptions for each GH feature for participants who knew all features (n = 45). In this question, participants were asked to rate each of the 11 features on a scale of 1 (not interested at all) to 5 (extremely interested) if they were to agree to buy this feature for their forever home, considering that money would not be a factor in the decision. Table 2 summarizes the results and indicates that the features that seem more attractive for GenZ respondents who knew all GH features were energy-efficient appliances, followed by solar panels and heat pumps. These three features were also the only ones with a standard deviation lower than one and a minimum higher than one, indicating more agreement among participants.

Table 2. Comparison of the level of interest in green home features for participants that knew all indicated features (n = 45).

Green Home Feature	Mean	Standard Deviation	Minimum	Maximum
Energy-efficient appliances	4.60	0.618	3	5
Solar panels	4.44	0.893	2	5
Heat pumps	4.04	0.952	2	5
Dual-flush toilets and low-flow faucets/shower heads	3.93	1.031	1	5
Low volatile organic compounds (VOC) paint and carpet materials	3.93	1.116	1	5
Eco-friendly building materials	3.84	1.242	1	5
Rainwater harvesting	3.80	1.100	1	5
Tankless water heater	3.80	1.079	1	5
Recycled or reclaimed home products	3.76	1.228	1	5
Greywater recycling	3.58	1.177	1	5
Water-efficient irrigation	3.58	1.097	1	5

4.1. Descriptive Statistics

Table 3 shows the aggregated descriptive statistics for the three different types of motivation, given that each type of motivation had four statements. The aggregated results are based on the average value of the answers for the four statements of each respondent. Only respondents that answered all four statements were included in the aggregated results for motivation type. Results show that the participants believed that intrinsic motivations are the most important (mean = 4.06, SD = 0.806), followed by non-normative motivations

(mean = 4.03, SD = 0.702), though the level of agreement on the latter is slightly higher. Instrumental motivation (mean = 3.23, SD = 0.661) was the least valued among all the motivation types and had a relatively lower standard deviation.

Table 3. Aggregated descriptive statistics for types of motivation.

Motivation Type	n	Mean	Standard Deviation	Minimum	Maximum
Intrinsic	115	4.06	0.81	1.00	5.00
Non-normative	116	4.03	0.70	1.50	5.00
Instrumental	115	3.23	0.66	1.50	4.75

Table 4 presents the descriptive statistics for the 12 Likert-type items included in the survey about personal motivations to buy green homes. When items were analyzed individually, we note that reduced utility bills (a non-normative motivation) is seen as the most influential of the individual items, followed by a belief in sustainability (an intrinsic item) and the desire to live in a healthier environment. On the other hand, the four instrumental items ranked at the bottom of the list, which concurs with the findings in Table 3.

Table 4. Descriptive statistics for motivation items.

Item	Motivation Type	n	Mean	Standard Deviation	Minimum	Maximum
Reduced utility bills	Non-normative	116	4.28	0.776	1.00	5.00
Belief in sustainability	Intrinsic	116	4.22	0.914	1.00	5.00
Live in a healthier environment	Non-normative	116	4.21	1.017	1.00	5.00
Desire to prevent climate change	Intrinsic	116	4.11	0.976	1.00	5.00
Desire to contribute to future generations	Intrinsic	116	4.08	1.120	1.00	5.00
Improved living quality	Non-normative	116	4.00	0.996	1.00	5.00
Feeling of personal responsibility	Intrinsic	115	3.85	1.028	1.00	5.00
Increase in home value	Non-normative	116	3.65	0.887	1.00	5.00
Make friends and family proud	Instrumental	115	3.51	1.021	1.00	5.00
Tax benefits and other incentives	Instrumental	116	3.44	0.841	1.00	5.00
Approval from neighbors	Instrumental	116	3.06	0.989	1.00	5.00
Pressure from other people to be sustainable	Instrumental	116	2.91	2.91	1.00	5.00

Moreover, the researchers' assessed barriers reflecting participants' perceptions of obstacles to adopting green features in the home. Results are presented in Table 5. Among the participants, lack of choice (mean = 3.81, standard deviation (SD) = 1.025) was perceived to be the greatest barrier, and at the same time, it had the largest standard deviation. Followed by that was lack of information (mean = 3.77, SD = 0.983). The participants indicated that effort was the least important barrier (mean = 3.57, SD = 1.018).

Table 5. Descriptive Statistics for Barriers in Buying Green Homes.

Barrier Type	n	Mean	Standard Deviation	Minimum	Maximum
Lack of choice	115	3.81	1.025	1.00	5.00
Lack of information	115	3.77	0.98	1.00	5.00
Perceived effort	115	3.57	1.02	1.00	5.00

Moreover, participants' willingness to buy was assessed using a 5-point Likert Scale. The results show that participants seem very willing to buy a green home, with a mean

of 4.23 (standard deviation = 0.77; n = 115). Furthermore, though not directly part of the present research, the survey also asked participants about green premiums. For this question, our results show that participants were, on average, willing to pay almost a quarter more for green homes when compared to the cost of conventional homes. However, results also show that the standard deviation on answers about green home premiums was quite high (n = 113, mean = 24.58%, standard deviation = 16.34), suggesting a low agreement on the topic.

4.2. Inferential Statistics

Inferential tests were performed on the data to address the two research questions for the present study. The analysis for the first research question used a multinomial test due to it having four items within each motivation type. The goal was to verify statistically relevant differences between the three types of motivation types (intrinsic, instrumental, and non-normative) at a 0.05 significance level.

First, the researchers checked for multicollinearity among variables using collinearity diagnostic in SPSS statistical software. Findings show a variation inflation factor (VIF) ranging from 1.526 to 1.936, indicating moderate but not severe correlation among variables. Other assumptions like goodness-of-fit and model fitting for performing multinomial logistic regressions were checked, and no severe violations were found.

Table 6 includes the summary results for the multinomial test. The test results at $\alpha = 0.05$ show that intrinsic (p-value = 0.002) and non-normative (p-value = 0.025) motivations have significant influences on the willingness to buy green homes. However, instrumental motivation (p-value = 0.929) does not significantly influence the willingness to buy green homes.

Table 6. Likelihood Ration Tests for Motivations.

Effect	Chi-Square	Df	Sig.
Intercept	37.537	3	0.000 *
Intrinsic motivation	15.115	3	0.002 *
Instrumental motivation	0.455	3	0.929
Non-normative motivation	9.325	3	0.025 *

* significance at the 0.05 level.

A Friedman test was performed to answer the second research question because each barrier was measured using one survey item. Because Friedman is a non-parametric test, the non-normality of the data should not affect its outcomes. The results from this test indicated a significant difference between some of the barriers to buying green homes, based on $\chi^2 = 6.834$ (chi-square) and p-value = 0.033 ($\alpha = 0.05$). The mean ranks from the Friedman test follow the findings from the descriptive statistic in that lack of choice seems to be the most significant barrier, followed by lack of information and then perceived effort. The result from the Friedman test was followed up by a Wilcoxon signed-ranks comparison at $\alpha = 0.017$ (using a conservative Bonferroni correction). Results from the Wilcoxon test indicated that the differences between barriers were insignificant at the established level, as seen in Table 7. Further studies using a larger sample size might be able to provide more meaningful results despite using a conservative correction.

Table 7. Wilcoxon signed-rank test comparing barrier types.

Barrier	Z	Asymptotic Significance (2-Tailed)
Lack of choice	−0.057	0.954
Lack of information	−1.886	0.059
Perceived effort	−2.111	0.035

5. Discussion

The results in the present research can be better understood once situated against previous literature. Therefore, the authors present discussions about the findings related to motivations and barriers for generation Z consumers to buy green homes.

5.1. Motivations

The descriptive statistics of the present research suggest that the top three motivations to buy GHs and install GHFs are reduced utility bills, followed by a personal interest in contributing to environmental sustainability, and a perception of health benefits. This finding aligns with the results from the multinomial analysis, where the intrinsic and normative motivations significantly affect the GenZ consumers' willingness to buy GHs (p-value = 0.002; p-value = 0.025). Tan's study [5] indicated that cost savings on electricity bills were the top motivation for homeowners to buy GHs, which concurs with the current finding. By contrast, certain motivations with low influence in Tan's study, including increased home value or rentals, healthy living experience, and perceived responsibility towards the community, were among the top motivations as perceived by the GenZ consumers. Though this may be the case, it should be acknowledged that Tan's [5] study focused on homeowners living in GHs, whereas the current research studied GenZ consumers who are potential home buyers. Perceptions might change as people experience living in green homes.

Furthermore, the present study suggests that instrumental motivations have a low influence on GenZ consumers' willingness to buy GHs, including avoiding shame and disapproval from neighbors. These motivations fall under the instrumental motivation type, which, when tested, did not significantly affect the GenZ consumers' willingness to buy GHs (p-value = 0.929). This concurs with the Gilal et al. [46] findings, where introjected motivations (motivations to avoid feelings of shame or guilt) had a trivial influence over green consumer behavior. The same study concluded that identified motivations (motivations related to the image) had more influence on green consumption behavior than intrinsic motivation, which is different from our findings. One reason for this could be that the study considered only the Pakistani millennial generation, and the division of motivations differed from the current study. Since attitudes and perspectives vary from generation to generation, the results might be expected to change. Furthermore, Tan et al. [27] argue that the green stigma from negative perceptions of an individual based on their green consumption behavior may create resistance towards green consumerism. However, this argument should be considered with caution, as Tan et al. [27] was a literature review and has not been tested with GenZ consumers.

5.2. Barriers

This study's results on barriers affecting GHFs consumption indicate differences among the three measured barrier types (p-value = 0.033 at $\alpha = 0.05$): lack of information, perceived effort, and lack of choice. Interestingly, when inferential post hoc tests were conducted, the barriers were not significantly different from each other.

The descriptive findings provided more insight. For example, the descriptive statistics for barriers show that respondents somewhat agreed that barriers do hinder their adoption of GHFs, and they perceived the level of hindrance from these barriers to be nearly the same. This could be because GenZ consumers tend to be realistic, and their consumption characteristics tend to be uniquely tailored to their needs and ethics [12].

The least perceived hindrance identified by descriptive statistics was the perceived effort necessary to analyze different features. The reason could be that GenZ consumers spend more time on digital platforms and are known to be digital natives [12]. However, the mean value still recognizes effort to be a barrier. The reason might be due to the difficulty of gathering valid, trustworthy data since information on green homes is scattered on the digital platform. This finding concurs with Tan et al.'s [27] study, where the researchers concluded that consumers' intention to buy energy-efficient products was influenced by a lack of trustworthy product information (e.g., benefits, savings), and this lack of information

became a potential barrier. In the same study, the researchers found that another significant barrier to consumers' willingness to buy energy-efficient products was the idea that green products are too time-consuming or difficult to obtain [27]. These results concur with the notion of perceived effort as a significant barrier.

Though choice seems to be valued by GenZ consumers [12], Peattie [43] suggests an opposing argument, indicating that having limited 'choice editing,' meaning restricting the choice of the consumers to a selected number of GHFs, is a potential way to attract more consumers towards the GH consumption path. The idea is that this approach solves the problem of information overload related to GHFs and reduces the perception of effort [43]. Our findings differ from Peattie's [43], but this might be worth exploring further, especially concerning GenZ.

5.3. Limitations of the Current Study

Limitations are inherent to any research. First, the data collection for the present study was performed during the second year of the COVID-19 pandemic, during which some Purdue university courses were still held online or hybrid, and social participation was low. Furthermore, the initially planned 7-point Likert scale, and 15 GHFs were reduced to a 5-point scale and 11 features, respectively, to reduce the cognitive effort of respondents. The number of valid responses in the final data collection to evaluate differences in preference for green home features was greatly reduced because many respondents were unaware of certain features. Finally, the present study is limited to GenZs participants enrolled in a midwestern public university in the United States; therefore, attempts to generalize findings to other cultures and settings should be made with caution.

6. Conclusions

The present study used a survey approach to evaluate the perceptions of generation Z consumers about barriers and motivations in buying green homes and green home features. The study population was university students in a large midwestern American university. Our findings indicate a lack of respondent awareness about greywater recycling, heat pumps, and tankless water heaters, whereas all respondents knew about energy-efficient appliances and solar panels. When comparing the findings for the respondents who knew all proposed features, energy-efficient appliances and solar panels were identified as the ones respondents would likely agree to buy.

Moreover, though the body of research on green consumer behavior has been given considerable attention over the past few decades, little attention has been given to the consumption behavior of GHs in connection with motivations and barriers; even fewer investigated the consumer behavior of the younger generation as it pertains to green homes and their green features. After addressing these gaps, our results show that intrinsic, followed by non-normative motivations seem to affect GenZ participants' willingness to buy a green home, whereas instrumental motivation does not seem to influence their choice. The low relevancy of non-normative motivation was not surprising compared to previous literature. However, it was interesting to see that intrinsic motivation remains a strong influence on respondents' values. This means consumers are willing to pay personal costs to pursue these goals. This finding added the fact that non-normative motivations, such as the benefits of a green home to produce a healthier living environment and potential future monetary return, may also explain their willingness to pay a premium for green homes. Thus, this research extends previous literature by demonstrating how a theory of normative motivations can be used to bridge the gap between the GenZ consumer's attitude and their intention related to buying green homes.

Furthermore, three barriers to buying green homes were compared, and though the initial statistical analysis indicated a difference among them, follow-up procedures using a conservative adjustment (Bonferroni) did not. An analysis of the descriptive statistic for barriers suggests that lack of choice and lack of information may be more relevant than perceived effort, though more research should be done to confirm this finding.

Finally, in addition to informing future researchers, our findings provide helpful guidance for marketers and policymakers related to the residential construction sector. For *marketers* working in the residential sector, our results suggest that targeting the internalization of green homes and their features to GenZ consumers, followed by focusing on the perceived benefits of GHs and GHFs to health and future return on investment, is a good strategy. For *policymakers*, we note that instrumental motivations, which in this research include providing tax incentives, did not seem to be valued as much as other types of motivation (intrinsic and non-normative) by the next generation of homebuyers. Therefore, policymakers need to re-evaluate their strategies to incentivize the creation of a more built environment in light of the motivations of the next generation of consumers, who seem more driven by internal and non-normative motivations.

Some suggestions for further research about the GenZ consumer's perception of green homes and green home features include analyzing: (1) the impact of access to information towards buying a green home; (2) the effect of knowledge and awareness of benefits and savings on green home purchasing intention; (3) the perceptions of green homes and green home features by GenZ consumers using a longitudinal and cross-cultural approach; and (4) evaluating the difference between the green home premium in purchasing intention and the actual market premiums homebuyers are willing to pay to live in a green home. Furthermore, the results can be expanded from further statistical analysis with a larger sample size, considering the findings of the present research.

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