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Causal Model among Environmental Concern, Environmental Knowledge, Social Influence, Green Attitude, Green Purchase Intention: Generation Z and Generation Y

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Abstract

This research aims to: (1) investigate the influence of environmental concern, environmental knowledge, and social influence on green attitudes towards green products in e-commerce; (2) examine the influence of green attitudes on green purchase intentions for green products in e-commerce; and (3) compare green purchase intentions for green products in e-commerce between Generation Z and Generation Y. The research utilized a quantitative approach. The sample comprised 1,071 e-commerce buyers from Generation Z and Generation Y in Thailand. Data were collected through an electronic questionnaire and analyzed using descriptive statistics, including frequency, percentage, mean, standard deviation, dependent t-test, and structural equation modeling (SEM) with LISREL software.

The results indicated that the causal relationship model, incorporating environmental concern, environmental knowledge, social influence, green attitude, and green purchase intention for green products in e-commerce for Generation Z and Generation Y, was consistent with the empirical data. This was supported by a chi-square value with a p-value greater than 0.05, indicating that the null hypothesis could not be rejected and that the theoretical model fitted the data well. Additionally, (1) the predictor variables—environmental concern, environmental knowledge, and social influence—explained 81% of the variance in green attitude, with all predictors having a statistically significant positive impact on green attitude; and (2) green attitude, as a predictor, explained 99% of the variance in green purchase intention for green products in e-commerce.

Keywords: Environmental Concern, Environmental Knowledge, Social Influence, Green Attitude, Green Purchase Intention

Introduction

Since 2020, the retail trade sector has experienced a significant decline (Dolega & Lord, 2020), while online shopping or e-commerce has gained substantial popularity due to its enhanced accessibility (Cairncross, 2001). This shift has been further accelerated by the COVID-19 pandemic, which has profoundly altered consumer behavior. With the continuous growth of e-commerce businesses globally, including Thailand, the Thai e-commerce market has been positioned as the fastest-growing in Asia, ranking first across the continent. Furthermore, Thailand ranks third globally for online product purchases and second in online purchases via mobile phones (Global Digital Stat, 2022). Generation Z and Generation Y represent the two groups with the highest internet usage. In Thailand, 47.7% of people use the internet for buying and selling products and services through e-commerce platforms, which have become a popular channel for online transactions (Electronic Transactions Development Agency, 2021).

Countries worldwide, including Thailand, are currently facing significant environmental challenges, such as global warming, environmental degradation, and the depletion of natural resources. These issues have influenced consumer decision-making, with an increasing preference for products that minimize negative impacts on natural ecosystems, both directly and indirectly (Smith, 2009). A key group that plays a crucial role in driving the use of green products is the Green Generation Millennials (Generation Y), who are also the group with the highest purchasing power (Forbes, 2023). On the other hand, Generation Z is known for its affinity with shopping, technology, and the internet, with a strong preference for online rather than offline purchases. They are less attached to brand-name products (Neto et al., 2018) and are highly aware of various societal issues, including environmental problems, making them a driving force for change (Parker & Igielnik, 2020). This trend reflects an increasing tendency to consume green products, which is driven not only by considerations of price and quality but also by underlying values, beliefs, and norms (Caruana, 2007).

The primary factor that drives the success and growth of any business is customer purchases. In businesses focused on environmental products, purchase intention is of particular importance. The intention to purchase green products in e-commerce arises from various factors and variables, with positive green attitudes being one of the significant influences on purchase intention. Customers with favorable attitudes are more likely to intend to buy (Suki, 2013). Moreover, environmental concern and environmental knowledge are also linked to purchase intention and attitudes (Ritter et al., 2015; Liao et al., 2020). Consumers who are environmentally concerned tend to choose products that benefit the environment (Yaacob & Zakaria, 2011). They perceive the value of products or services based on their alignment with environmental needs and expectations for sustainability (Chen & Chang, 2012). Social influence also plays a role in shaping purchase intention for green products, often through peer pressure (Punitha & Rahman, 2011). Consequently, it is crucial to examine the factors influencing consumer attitudes

that enhance the intention to purchase green products.

Additionally, understanding how e-commerce businesses can effectively promote sustainable consumption and address critical gaps in current knowledge of green purchasing behavior is imperative. The findings of this research can provide actionable insights for policymakers and businesses, enabling them to design targeted marketing strategies tailored to green products. These strategies could focus on leveraging generational preferences, such as using social media to reach tech-savvy consumers or emphasizing transparency and sustainability to build trust. Moreover, the research can guide the development of policies and incentives that align consumer motivations with broader environmental goals, fostering long-term sustainable consumption practices.

Given these observations, the researcher recognizes the importance of studying environmental concern, environmental knowledge, social influence, green attitude, and green purchase intention for green products via e-commerce channels. The objectives of this research are: (1) to examine the influence of environmental concern, environmental knowledge, and social Influence on green attitude towards green products in e-commerce; (2) to explore the impact of green attitude on green purchase intention for green products in e-commerce; and (3) to compare the green purchase intention for green products in e-commerce between Generation Z and Generation Y.

Literature review

In recent times, environmental protection has become a crucial issue for society, governments, and business organizations (Head, 1996) across many countries. Growing concerns have led to the development of products that protect and conserve the environment for future generations, such as recycling initiatives, green marketing, and the promotion and distribution of products in a way that minimizes environmental harm (Narula, 2016). China, despite taking time to recognize environmental degradation caused by rapid economic growth, which led to ecological damage, pollution, and the depletion of essential resources (Chen, 1998), has become increasingly sensitive and responsive to environmental issues compared to other countries (McEven et al., 2006). Similarly, the United States has seen consumer surveys indicating that 75% of American consumers are more likely to purchase green products, while 85% prefer to buy from companies prioritizing corporate social responsibility. Additionally, 93% of Americans have reported taking actions to conserve energy in the past two years, highlighting the growing environmental awareness in the market (Solar City, 2013). Banerjee (2012) noted that Walmart, a leading retailer, successfully implemented a green marketing campaign called "The Walmart Mom," which demonstrated that consumers are willing to purchase and pay more for green products if they are of high quality, reasonably priced, and easy to evaluate.

Another study found that positive attitudes towards a green lifestyle led consumers to purchase and use products responsibly. Furthermore, it was observed that consumers with an internal locus of control tend to save more energy while using products and exhibit more environmentally

responsible consumption behaviors. Due to differing experiences, generational groups have developed varied perspectives and behaviors. Generation Y (born between 1980 and 1994) (Hill & Lee, 2012) is defined by Rogers (2013) as “the born green" generation, having grown up in a society where environmental consciousness has become the norm. They are more concerned about environmental issues than other generational groups (Williams & Page, 2011). With the increasing financial resources and population of Generation Y globally, marketing managers have designed strategies to understand their behavior (Dabija &Băbut, 2019). Beall (2017) observed that social media acts as a platform for Millennials to access and share information, and they tend to use online customer service before opting for in-person services. It was noted that nearly 85% of Millennials seek assistance for purchases through mobile phones. Moreover, Millennials are both cost-conscious and socially aware, often making purchasing decisions based on a desire to contribute positively to the environment.

Generation Z, also known as the " internet generation" or the "Facebook generation," refers to those born between 1995 and 2010 (Chaturvedi et al., 2020). Generation Z consumers are more knowledgeable about environmental issues and motivated to take environmentally friendly actions (Adnan et al., 2017). They are also more willing to change their attitudes and switch to green products (Amed et al., 2019). Additionally, Generation Z values affordability and eco-friendliness in the products they choose.

Lee (2008) defined environmental concern as the emotional involvement related to environmental issues, while Said et al. (2003) described environmental concern as the beliefs, feelings, and levels of personal involvement towards the environment. Aman, Harun, and Hussein (2012) provided examples of consumer emotions, such as anger when witnessing environmental destruction, which leads to awareness and a willingness to address these issues through environmental conservation (Chan, 1996). Consumers with higher environmental concern perceive the impact of their consumption on the environment (Newton, Tsarenko, Ferraro, and Sands, 2015) and are more likely to change their lifestyle to reduce their environmental footprint. Environmental concern is a significant factor influencing pro-environmental behaviors, such as waste reduction (Fujii, 2006). Additionally, environmental concern indirectly influences behavior through attitudes, often referred to as " ecological concern," which positively affects the intention and behavior of purchasing green products (Nittala, 2014). It also affects ecological knowledge, purchase intention, and actual buying behavior (Zhao et al., 2014). For instance, consideration of green products have both direct and indirect effects on the willingness to purchase green electrical products at premium prices (Hansla et al., 2008). Consumers with high environmental concern are more likely to evaluate the environmental performance of products and prioritize environmental attributes (Policarpo & Aguiar, 2020).

Albayrak, Aksoy, and Caber (2013) categorized environmental concerns into three levels: (1) egoistic concern, focusing on the direct impact on oneself, such as health, finances, and lifestyle; (2) altruistic concern, focusing on the well-being of others in the community and humanity; and

(3) biospheric concern, focusing on protecting ecosystems and the planet without considering human benefits, prioritizing nature and ecological conservation.

Kinnear and Taylor (1974) defined environmental knowledge as a set of ecological knowledge related to environmental issues, while Chan and Lau (2002) defined it as the amount of knowledge individuals have about environmental problems. Debora Indriani et al. (2019) highlighted that environmental knowledge is a key factor affecting consumer purchase intention, as knowledge of environmental issues and solutions encourages consumers to be more cautious with their product choices. The environmental impact of product use is carefully considered, especially when purchasing green products that involve environmentally friendly ingredients and production processes (Indriani et al., 2019).

According to Gan et al. (2008), environmental knowledge can be divided into two types: (1) understanding the impact of products on the environment and (2) knowledge about green products. In countries, such as Malaysia, environmental knowledge and environmental concern are factors influencing the intention to purchase green products (Aman et al., 2012). Similar studies in Indonesia have shown that environmental knowledge affects green purchase intention through attitudes as a mediating variable—when consumers have high environmental knowledge, their purchase intention also increases (Aman et al., 2012). Smith and Paladino (2010) and Saichao (2016) also supported that environmental knowledge significantly influences consumer attitudes and behaviors when choosing green products.

Research hypotheses

Based on the literature review, the following hypotheses were developed:

Hypothesis 1: The causal relationship model among environmental concern, environmental knowledge, social influence, green attitude, and green purchase intention for green products in e-commerce, supported by the empirical data.

Hypothesis 2: Environmental concern, environmental knowledge, and social influence positively influence green attitude towards green products in e-commerce.

Hypothesis 3: Green attitude positively influences green purchase intention for green products in e-commerce.

Hypothesis 4: Green purchase intention for green products in e-commerce differs between Generation Y and Generation Z.

Research methodology

Sampling process and methodology

This research uses a quantitative methodology. The population comprises of e-commerce buyers from Generation Z and Generation Y in Thailand. The research sample included 1,071 e-commerce buyers from these generational groups. The sample size determination was guided by Hair et al. (1998), who suggested an appropriate sample size of between 10-20 respondents per

parameter. For the SEM analysis in this study, the sample size met the recommended criteria. A stratified random sampling method was employed, with screening questions ensuring that respondents had previously purchased products through e-commerce and were from Generation Z or Generation Y. The data was collected entirely online from April to July 2024 by distributing a survey link via email and Facebook to targeted e-commerce buyers among Generation Z and Generation Y. A screening question was included to ensure the sample met the study's criteria. These generations were chosen due to their high internet usage rates (Electronic Transactions Development Agency, 2021) and Generation Y's substantial purchasing power and significant role in adopting green products, being recognized as the Green Generation Millennials (Forbes, 2023). Additionally, Generation Z is recognized for its stronger connection to online shopping compared to offline shopping (Neto et al., 2018).

Measurement of variables

The researcher reviewed related literature and research to identify variables including environmental concern, environmental knowledge, social influence, green attitude, and green purchase intention for green products in e-commerce, focusing on Generation Z and Generation Y. Operational definitions were formulated according to the research conceptual framework, and measurement tools were developed for all five variables using a 5-point Likert scale questionnaire. There were two latent endogenous variables: (1) Green Attitude, measured by three observed variables—(a) Cognitive, (b) Affective, and (c) Behavioral; and (2) Green Purchase Intention, measured by two observed variables—(a) Trend to Buy and (b) Willingness to Buy. Additionally, there were three latent exogenous variables: (1) Environmental Concern, measured by three observed variables—(a) Egoistic Concern, (b) Altruistic Concern, and (c) Biosphere Concern; (2) Environmental Knowledge, measured by two observed variables—(a) Understanding the Impact of Products on the Environment and (b) Knowledge in Green Products; and (3) Social Influence, measured by two observed variables—(a) Persuasion and (b) Conformity.

Reliability

The researcher administered a pilot test of the revised questionnaire with 30 participants to assess the clarity of the questions and the time required for completion. The collected responses were used to evaluate the quality of the questionnaire by analyzing reliability using Cronbach's alpha coefficient. The questionnaire's reliability ranged from 0.977 to 0.982, as shown in Table 1.

Table 1 Reliability

variance	Number of Items	Reliability	
		Pilot Sample	Actual Sample
Egoistic Concern	3	0.982	0.955
Altruistic Concern	3	0.980	0.950
Biosphere Concern	3	0.977	0.951
Understand the Impact of Environment)	3	0.977	0.950
Knowledge in the Green Product)	3	0.978	0.950
Persuasion	3	0.977	0.950
Conformity	3	0.978	0.950
Cognitive	3	0.977	0.948
Affective	3	0.977	0.951
Behavioral	3	0.977	0.949
Trend to buy	4	0.977	0.949
Willingness to buy	3	0.977	0.949
Sample Size		**30**	**1071**

Data collection

The data for this research was collected using a close-ended questionnaire developed by the researcher. The questions in the questionnaire addressed environmental concern, environmental knowledge, social influence, and green attitude towards the green purchase intention of green products in e-commerce for Generation Z and Generation Y, along with general demographic information. The data collection was conducted entirely online, with the questionnaire link being distributed to e-commerce buyers from Generation Z and Generation Y.

Scoring criteria for analysis

The scoring criteria for interpretation in this research were based on the average score level, divided into five categories as follows: (1) Scores between 1.00 - 1.80 represent a very low level; (2) Scores between 1.81 - 2.60 represent a low level; (3) Scores between 2.61 - 3.40 represent a medium level; (4) Scores between 3.41 - 4.20 represent a high level; and (5) Scores between 4.21 - 5.00 represent a very high level.

Statistical analysis

Data analysis was divided into four parts:

1. General Information: Analyzed using descriptive statistics such as percentages.

2. Analysis of Environmental Concern, Environmental Knowledge, Social Influence, Green Attitude, and Green Purchase Intention: Descriptive statistics including frequency, percentage, mean, and standard deviation were used.

3. Comparative Analysis of Differences in Environmental Concern, Environmental Knowledge, Social Influence, Green Attitude, and Green Purchase Intention: Differences between Generation Z and Generation Y were analyzed using the t-test (dependent).

4. Structural Equation Modeling (SEM) was employed to examine the consistency of the causal relationship model with the empirical data. The direct and indirect influences of environmental concern,

environmental knowledge, social influence, green attitude, and green purchase intention were calculated using the LISREL software. SEM is particularly suited for analyzing complex causal relationships among latent variables due to its ability to handle measurement errors and assess both direct and indirect effects (Christ et al., 2014).

Limitations

1. Online Surveys: The use of online surveys may have introduced response bias, potentially affecting the accuracy of the findings.

2. Focus on Generations Z and Y: While focusing on Generations Z and Y provides valuable insights into tech-savvy and influential consumer groups, the findings may not be generalizable to other generational cohorts, such as Generation X or Baby Boomers, who may exhibit distinct purchasing behaviors.

Results

1. Demographic Information

Out of the 1,071 respondents, the majority were female (60.1%), belonged to Generation Y (61.7%), had a bachelor's degree (68.3%), were students (50.5%), had an average monthly income below 15,000 THB (39.4%), and were single (78.9%). The most common online shopping platform used was Shopee (63.6%). The frequency of e-commerce purchases in the past month was more than four times (29.9%), and the frequency of online purchases in the past six months was more than six times (52%). The most recent items purchased through e-commerce were clothing, fashion accessories, shoes, and jewelry (46%).

2. Analysis of environmental concern, environmental knowledge, social influence, green attitude and green purchase intention

From Table 2, the analysis of environmental concern for e-commerce services showed that respondents had a high level of environmental concern (mean = 3.95). Among the components, biosphere concern had the highest mean score at a high level (mean = 4.08), which was higher than altruistic concern (mean = 3.95) and egoistic concern (mean = 3.82).

The analysis of environmental knowledge indicated that respondents had a high level of environmental knowledge (mean = 4.03). Specifically, knowledge about green products had the highest mean score at a high level (mean = 4.09), followed by understanding the impact of products on the environment, also at a high level (mean = 3.97).

The analysis of social influence revealed that social influence was at a high level (mean = 3.88). The aspect of motivating others to recognize the importance of green products had the highest mean score at a high level (mean = 4.92), followed by conformity in using green products, which was also at a high level (mean = 3.84).

The analysis of green attitude showed that respondents had a high level of green attitude (mean = 4.09). The feeling towards green products had the highest mean score at a high level (mean = 4.14), followed by behavior related to green products, which was also at a high level (mean = 4.08).

The analysis of green purchase intention found that respondents had a high level of intention to purchase green products (mean = 4.00). The trend to buy green products had the highest mean score at a high level (mean = 4.01), followed by willingness to buy green products, which was also at a high level (mean = 3.99).

Table 2 The basic statistics

Variable	Mean	S.D.	Interpretation
environmental concern	**3.95**	**0.64**	**High**
egoistic concern	3.82	0.76	High
altruistic concern	3.95	0.75	High
biosphere concern	4.08	0.71	High
environmental knowledge	**4.03**	**0.64**	**High**
understand the impact of environment	3.97	0.70	High
knowledge in the green product	4.09	0.69	High
social influence	**3.88**	**0.71**	**High**
persuasion	3.92	0.74	High
conformity	3.84	0.76	High
green attitude	**4.09**	**0.65**	**High**
cognitive	4.04	0.71	High
affective	4.14	0.71	High
behavioral	4.08	0.70	High
green purchase intention	**4.00**	**0.67**	**High**
trend to buy	4.01	0.70	High
willingness to buy	3.99	0.73	High

3. Development and evaluation of the causal relationship model of environmental knowledge, social influence, attitude, and green purchase intention in e-commerce: Generation Z and Generation Y

The evaluation of the causal relationship model of environmental knowledge, social influence, green attitude, and green purchase intention in e-commerce for Generation Z and Generation Y aimed to assess the model's consistency with empirical data. The model included two endogenous latent variables: green attitude, measured by three observed variables—cognitive, affective, and behavioral; and green purchase intention, measured by two observed variables—trend to buy and willingness to buy. The model also included three exogenous latent variables: environmental concern, measured by three observed variables—egoistic concern, altruistic concern, and biosphere concern; environmental knowledge, measured by two observed variables—understanding the impact of environment and knowledge in green products; and social influence, measured by two observed variables—persuasion and conformity.

The data indicated a high level of correlation among variables. Therefore, the researcher tested for multicollinearity using Tolerance and Variance Inflation Factor (VIF) values. The results showed that all Tolerance values were not close to zero, and

all VIF values were less than 10, indicating that multicollinearity was not a concern.

Hypothesis 1: The causal relationship model of environmental concern, environmental knowledge, social influence, hreen attitude, and hreen purchase intention in e-commerce is consistent with empirical data.

The results of evaluating the causal relationship model showed that the model fit well with the empirical data. The chi-square value (χ^2 = 21.43, df = 13, p = 0.065) indicated a p-value greater than 0.05, suggesting that the null hypothesis—that the theoretical model developed is consistent with the empirical data—cannot be rejected. The Goodness of Fit Index (GFI = 1.00) and Adjusted Goodness of Fit Index (AGFI = 0.98) were close to 1, while the Root Mean Square Residual (RMR = 0.0018) and Root Mean Square Error of Approximation (RMSEA = 0.00) were close to zero, as shown in Tables 4, 5, and 6.

Upon examining the factor loadings of the five variables, all 11 observed variables in the research model had positive factor loadings and were significantly different from zero at the 0.01 level. For environmental concern , the observed variable biosphere concern had the highest factor loading (0.89), followed by altruistic concern with a factor loading of 0.88, and egoistic concern with a factor loading of 0.69. For environmental knowledge, the observed variable knowledge in green products had the highest factor loading (0.85), followed by understanding the impact of environment with a factor loading of 0.84. For social influence, the observed variable conformity had the highest factor loading (0.88), followed by persuasion with a factor loading of 0.87. For green attitude, the observed variable cognitive had the highest factor loading (0.91), followed by behavioral with a factor loading of 0.86, and affective with a factor loading of 0.79.

For green purchase intention, the observed variable trend to buy had a factor loading of 0.87, and willingness to buy had a factor loading of 0.87.

Table 3 The causal relationship model

Latent variables→Observed variable		Parameter Estimate		SE	t
		Raw Score	Standard Score		
Measurement Model					
Matrix LX (Loading weights of observable variables)					
environmental concern	egoistic concern	0.52	0.69	0.02	23.56**
	altruistic concern	0.66	0.88	0.02	31.57**
	biosphere concern	0.63	0.89	0.02	28.38**
environmental knowledge	understanding the impact	0.59	0.84	0.02	31.57**
	knowledge in green products	0.58	0.85	0.02	32.30**
social influence	persuasion	0.64	0.87	0.02	34.12**
	conformity	0.67	0.88	0.02	34.46**
Matrix LY (Loading weights of latent variables)					
green attitude	cognitive	0.64	0.91	<-->	<-->
	affective	0.56	0.79	0.02	34.99**
	behavioral	0.60	0.86	0.02	37.81
green purchase intention	trend to buy	0.63	0.87	<-->	<-->
	willingness to buy	0.63	0.87	0.02	32.55**
Matrix GA (Gamma)					
environmental concern -> green attitude		0.18	0.18	0.06	3.25**
environmental knowledge -> green attitude		0.32	0.32	0.11	3.05**
social influence -> green attitude		0.43	0.43	0.07	5.78**
Matrix BE (BETA)					
environmental concern -> green purchase intention		0.99	.0.99	0.03	38.72**

Note: *** $p<.01$*

Hypothesis 2: Environmental concern, environmental knowledge, and social influence have a positive impact on green attitude in e-commerce.

The standardized influence coefficients of the variables in the model that serve as predictors or causal factors of green attitude revealed that:

1. The environmental concern variable had a positive total influence on green attitude, with an influence size of 0.18, which was statistically significant. This indicates that environmental concern causes users to develop a positive attitude.

2. The environmental knowledge variable had a positive total influence on green attitude, with an influence size of 0.32, which was statistically significant. This means that environmental knowledge causes users to develop a positive attitude.

3. The social influence variable had a positive total influence on green attitude, with an influence size of 0.43, which was statistically significant. This indicates that social influence causes users to develop a positive attitude.

The standardized influence coefficients of the predictor variables on green purchase intention in e-commerce revealed that:

1. The environmental concern variable had an indirect positive influence on green purchase intention through green attitude, with an influence size of 0.18, which was statistically significant.

2. The environmental knowledge variable had an indirect positive influence on green purchase intention through green attitude, with an influence size of 0.32, which was statistically significant. This indicates that environmental knowledge causes users to have an intention to purchase green products in e-commerce.

3. The social influence variable had a positive total influence on green purchase intention through green attitude, with an influence size of 0.43, which was statistically significant. This indicates that social influence causes users to have an intention to purchase green products in e-commerce.

From Table 4, when considering the reliability of each observed variable, it was found that the reliability values ranged from 0.66 to 0.82. The observed variable cognitive attitude had the highest reliability, followed by biosphere concern

Table 4 The statistical results of the analysis and the reliability

IV	DV					
	green attitude			green purchase intention		
	TE	IE	DE	TE	IE	DE
environmental concern	**0.18**	-	**0.18**	**0.18**	-	**0.18**
	(0.06)	-	(0.06)	(0.06)	-	(0.06)
	3.25**	-	3.25**	3.25**	-	3.25**
environmental knowledge	**0.32**	-	**0.32**	**0.32**	-	**0.32**
	(0.11)	-	(0.11)	(0.11)	-	(0.11)
	3.05**	-	3.05**	3.05**	-	3.05**
social influence	**0.43**	-	**0.43**	**0.43**	-	**0.43**
	(0.07)	-	(0.07)	(0.07)	-	(0.07)
	5.78**	-	5.78**	5.78**	-	5.78**
Statistic: Chi-square = 21.53; df = 13; P = 0.063; GFI = 1.00; AGFI =0.98; RMR =0.0041; RMSEA =0.00						

Variable	EC	AC	BC	UIE	KGP	Per
Reliability	0.66	0.77	0.78	0.70	0.71	0.76
Variable	Cog	Aff	Beh	Trend	Willing	
Reliability	0.82	0.62	0.73	0.76	0.76	

Note: *TE = total effect; IE = indirect effect; DE = direct effect*
*** Sig: 0.01; numbers in (): standard error; bold numbers: standardized effect sizes*

Hypothesis 3: Green attitude has a positive influence on green purchase intention

Considering the coefficient of determination (R^2) for the structural equation of the internal variables, including green attitude ($R^2 = 0.81$), it was found that the predictor variables—environmental concern, environmental knowledge, and social influence explained 81% of the variance in green attitude.For green purchase intention in e-commerce ($R^2 = 0.99$), it was found that the predictor variable green attitude explained 99% of the variance in green purchase intention. The details of the influence size among variables are as follows:

Table 5 The statistical results of the analysis of green attitude, and green purchase intention

	DV		
	green purchase intention		
IV	**TE**	**IE**	**DE**
green attitude	0.99	-	0.99
	(0.03)	-	(0.03)
	32.55**	-	32.55**
Statistic: Chi-square = 21.53; df = 13; P = 0.063; GFI = 1.00; AGFI =0.98; RMR =0.0018; RMSEA =0.00			

Structural Equation of Variables		Att	Intent		
R SQUARE		0.81	0.99		
Correlation Matrix of Variables	Att	Intent	Concern	Know	Social
Att	1.000				
Intent	0.99**	1.000			
Concern	0.80**	0.80**	1.000		
Know	0.87**	0.87**	0.86**	1.00	
Social	0.87**	0.86**	0.79**	0.90**	1.00

Note: *TE = total effect; IE = indirect effect; DE = direct effect*
*** Sig: 0.01; numbers in (): standard error; bold numbers: standardized effect sizes*

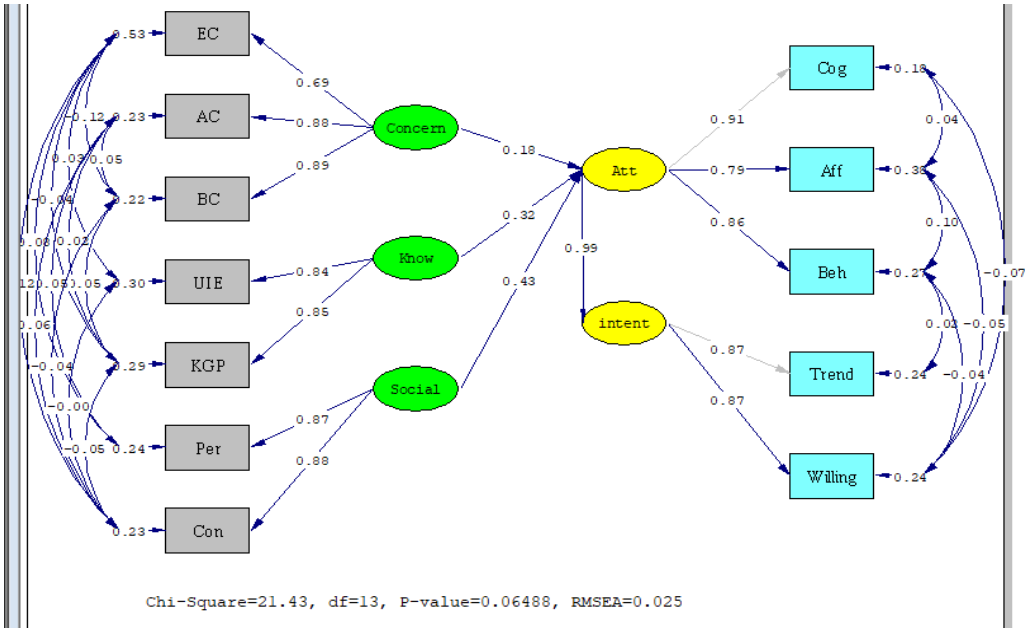


Figure 1 Causal relationship model

***p<0.01*

Note: environmental concern (Concern), egoistic concern (EC), altruistic concern (AC), biosphere concern (BC), environmental knowledge (Know), understanding the impact of products on the environment (UIE), knowledge in green products (KGP), social influence (Social), persuasion (Per), conformity (Con), green attitude (Att), cognitive (Cog), affective (aff), behavioral (Beh), green purchase intention (intent), trend to buy (Trend), willingness to buy (Willing)

4. Comparative analysis of differences in levels of environmental concern, environmental knowledge, social influence, green attitude, and green purchase intention in e-commerce between Gen Z and Gen Y

The comparative analysis of the average levels of environmental concern, environmental knowledge, social influence, green attitude, and green purchase intention in e-commerce between Generation Z (Gen Z) and Generation Y (Gen Y) was conducted using t-tests. The analysis covered five variables, with the details outlined below:

1) Environmental Concern The comparison of average levels of environmental concern between Gen Z and Gen Y in Table 2 showed that Gen Y had a higher average level of environmental concern compared to Gen Z (MGenY = 3.98, MGenZ = 3.93). When comparing the differences in average scores using t-tests, it was found that Gen Y and Gen Z did not have a statistically significant difference in environmental concern at the 0.05 level (t = -1.417, df = 1069, p = 0.157).

2) Environmental Knowledge The comparison of average levels of environmental knowledge between Gen Z and Gen Y in Table 1 showed that Gen Y had a higher average level of environmental knowledge compared to Gen Z (MGenY = 4.05, MGenZ = 4.03). When comparing the differences in average scores using t-tests, it was found that Gen Y and Gen Z did not have a statistically significant difference in average environmental knowledge at the 0.05 level (t = 0.532, df = 1069, p = 0.595).

3) Social Influence The comparison of average levels of social influence between Gen Z and Gen Y in Table 1 showed that Gen Y had a higher average level of social influence compared to Gen Z (MGenY = 3.92, MGenZ = 3.85). When comparing the differences in average scores using t-tests, it was found that Gen Y and Gen Z did not have a statistically significant difference in average social influence at the 0.05 level (t = 1.477, df = 1069, p = 0.140).

4) Green Attitude The comparison of average levels of green attitude between Gen Y and Gen Z in Table 1 showed that Gen Z had a higher average level of green attitude compared to Gen Y (MGenZ = 4.09, MGenY = 4.08). When comparing the differences in average scores using t-tests, it was found that Gen Y and Gen Z did not have a statistically significant difference in average green attitude at the 0.05 level (t = 0.201, df = 1069, p = 0.834).

5) Green Purchase Intention The comparison of average levels of green purchase intention between Gen Z and Gen Y in Table 1 showed that Gen Y had a higher average level of green purchase intention compared to Gen Z (MGenY = 4.02, MGenZ = 3.99). When comparing the differences in average scores using t-tests, it was found that Gen Y and Gen Z did not have a statistically significant difference in average green purchase intention at the 0.05 level (t = 0.820, df = 1069, p = 0.412).

Discussion

The analysis indicates that the respondents have a high level of environmental concern, especially

concerning biosphere-related issues, which is higher than concern for others or for themselves. This can be explained by Dunlap and Jones (2002), who stated that environmental concern involves awareness of environmental problems and the willingness to address them. Those who prioritize biosphere concerns tend to have stronger attitudes and behaviors toward purchasing green products (Paul et al., 2016).

The analysis also shows that respondents have a high level of environmental knowledge, particularly about green products. This aligns with Singh and Bansal (2012), who stated that knowledge about green products plays a key role in fostering positive attitudes towards them. Environmental knowledge can enhance consumers' purchase intentions, as it raises awareness of the environmental impact of products, increasing the likelihood of choosing green products (Zhuang et al., 2010).

The results show that social influence is at a high level, where persuading others about the importance of green products being the most influential factor. This can be explained by Kalafatis et al. (1999), Who argued that social influence is a key factor affecting purchasing behavior, especially the influence from friends and family, who pressure or motivate consumers to align their purchasing behavior with environmental conservation ideals. Furthermore, social support also positively influences attitudes toward green products (Cohan, 2009).

The study found that social influence affects the intention to purchase green products, consistent with Lee (2008), who noted that social influence plays a significant role in consumer behavior, particularly among younger consumers. Influence from friends and family have a significant effect on their behavior and choice to purchase green products.

The analysis indicates that respondents have a high level of green attitude, which is consistent with Ajzen and Fishbein's (2000) theory, which states that a positive attitude will result in consistent intentions and behavior. If consumers have a positive attitude toward green products, they are more likely to support and purchase them. This positive attitude is also linked to knowledge about green products, which makes consumers feel confident and willing to buy (Kim et al., 2012).

Consumers with a high level of knowledge about green products tend to have better attitudes and purchase intentions, consistent with Matthes et al. (2013), who stated that knowledge of product value helps promote purchasing behavior. Having sufficient information about the benefits of green products builds consumer confidence in purchasing and supporting such products.

The analysis found that respondents have a high level of green purchase intention, particularly regarding the trend to buy green products. This is consistent with Ottman (1992) and Sarumathi (2014), who noted that green purchase intention is a key indicator of consumer behavior. The more positive consumers' attitudes and social influences, the more likely they are to support and buy green products (Paul et al., 2016).

The development of the causal relationship model of environmental knowledge, social influence, attitude, and green purchase intention found that the model significantly fits empirical data.

The factors of environmental concern, knowledge, and social influence positively influence attitude and purchase intention, consistent with Ajzen (1988), who stated that these factors directly impact consumer purchasing behavior.

The results further indicate that Generation Y exhibits higher levels of environmental concern, environmental knowledge, and social influence compared to Generation Z. This aligns with Williams and Page (2011), who described Gen Y as a "born-green" generation, having grown up in a society where environmental awareness was the norm. Gen Y is more concerned about environmental issues than other generations. This observation is supported by Beall (2017), who noted that Gen Y frequently utilizes social media to receive and share information.

However, Generation Z has a higher level of green attitude compared to Gen Y, which can be explained by their greater access to technology and social media, allowing them to quickly and efficiently become aware of environmental issues and conservation trends (Chaturvedi et al., 2020). Gen Z, often called the "internet generation," are also increasingly aware of environmental issues and motivated to engage in green behavior (Adnan et al., 2017). They are willing to change their attitudes and adopt green products (Amed et al., 2019) and emphasize affordable and green products. Both Gen Y and Gen Z place importance on green products, suggesting that they are likely to drive more green consumption behaviors in the long term. These generational differences indicate that marketing strategies for green products should be tailored to leverage Gen Z's affinity for technology and Gen Y's higher purchasing power, ensuring targeted approaches that align with the distinct values and behaviors of each group.

Recommendations

1. Academic Research Recommendations

- Theory Development: Expand theories on environmental knowledge, attitude, and social influence to better understand their impact on green purchase intention, particularly for Generations Z and Y.

- Comparative Research: Conduct studies across generational cohorts, such as Baby Boomers and Generation X, to identify differences in green purchasing behavior and broaden consumer insights.

2. Managerial Recommendations

- Marketing Strategy: Develop marketing campaigns using social media platforms to highlight the long-term benefits of green products, targeting the values and preferences of Generations Z and Y. Focus on relatable messages that resonate with their lifestyle and environmental concerns. For example, TOMS Shoes' "One for One" program effectively engaged socially conscious buyers by emphasizing its environmental and social impact.

- Building Trust Through Transparency: To meet modern consumers' expectations for transparency, businesses should provide accurate and verifiable information about their products, including the use of sustainable resources, eco-friendly production methods, and recyclable packaging. This approach fosters trust and encourages green purchasing behavior. For instance, Unilever's commitment to 100% recyclable plastic packaging by 2025,

coupled with transparent reporting on sustainability goals.

- Encouraging Social Conformity: Businesses can leverage social influence by creating opportunities for consumers to share their green product experiences with peers. Supporting discussions or online sharing within social groups can motivate sustainable purchasing behaviors and amplify awareness of eco-friendly products. Starbucks' "Reusable Cup Campaign" fostered a sense of environmental responsibility among customers, encouraging them to share their participation on social media, which amplified the campaign's reach and influence.

Suggestions for future research

- Purchase Motivation: Explore economic (e.g., cost savings), emotional (e.g., responsibility or pride), and social (e.g., peer influence) drivers of green purchases to better understand consumer decision-making complexities.

- Cross-Cultural Studies: Future research should focus on exploring how diverse cultural contexts influence Green Purchase Intention. This includes analyzing the role of cultural values, traditions, and societal expectations in shaping consumer attitudes toward sustainability. For instance, countries with collectivist cultures may prioritize green purchasing as a group responsibility, while individualist cultures may focus more on personal benefits. Comparative studies across nations with differing economic conditions and policy frameworks can further illuminate the interplay between culture, governmental initiatives, and market dynamics in driving green consumer behavior.

- Behavioral Outcomes: Investigate actual consumer behaviors through longitudinal studies to determine if green purchase intentions result in consistent, long-term actions. Assess the effectiveness of marketing strategies and identify barriers to sustainable consumption.

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